

## New species and new records of Haloveliinae (Insecta: Heteroptera: Veliidae) from Vietnam

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### Abstract

Nine species of Haloveliinae are recorded from Vietnam. Five new species are described: *Strongylovelia albopicta* sp.n., *S. bipunctata* sp.n., *S. setosa* sp.n., *S. vasarhelyii* sp.n., and *Entomovelina quadripenicillata* sp.n. Three species are recorded from Vietnam for the first time: *Halovelina malaya* ESAKI, 1930, *Haloveloides sundaensis* ANDERSEN, 1992, and *Xenobates mandai* ANDERSEN, 2000.

**Key words:** Heteroptera, Veliidae, Haloveliinae, *Strongylovelia*, *Entomovelina*, *Xenobates*, *Halovelina*, *Haloveloides*, new species, first record, Vietnam.

### Zusammenfassung

Neun Arten aus der Unterfamilie Haloveliinae werden aus Vietnam nachgewiesen. Fünf davon werden neu beschrieben: *Strongylovelia albopicta* sp.n., *S. bipunctata* sp.n., *S. setosa* sp.n., *S. vasarhelyii* sp.n. und *Entomovelina quadripenicillata* sp.n. Drei Spezies werden erstmals aus Vietnam nachgewiesen: *Halovelina malaya* ESAKI, 1930, *Haloveloides sundaensis* ANDERSEN, 1992 und *Xenobates mandai* ANDERSEN, 2000.

### Introduction

The subfamily Haloveliinae consists of five described genera and more than fifty described extant species, all distributed in the Indo-West Pacific realm. Two genera (*Strongylovelia* and *Entomovelina*) inhabit freshwater, but three genera (*Halovelina*, *Haloveloides*, and *Xenobates*) live in marine coastal habitats, the last genus having a clear preference for mangroves. A key to southeast Asian genera of Veliidae (including the five genera mentioned) has been published by ANDERSEN & al. (2002). Among Veliidae, Haloveliinae are unique by the ability to jump from the water surface. Jumping is especially well developed in *Strongylovelia* and *Haloveloides*, while, on the other hand, some species of *Halovelina* are fast runners on land, too (Zettel, pers. observ.). Most likely this behaviour evolved parallel with similar locomotion in Gerridae and Hermatobatidae (ANDERSEN 1982), although in earlier times *Halovelina* and allied genera have been placed in the Halobatinae of the Gerridae (e.g., ESAKI 1924, 1926, 1930). A recent study (DAMGAARD & al. 2005), which combines morphological with molecular data, places *Halovelina* close to *Steinovelina* (Veliinae), but cannot confirm monophyly of the entire family Veliidae.

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The Haloveliinae fauna of Vietnam is nearly unstudied. Hitherto only one species has been recorded from Vietnam, i.e. *Halovelia bergrothi* (see HERRING 1958, ANDERSEN 1989a, and below). The presence of the genus *Strongylovelia* in Vietnam was mentioned by LANSBURY & ZETTEL (1997). This study presents data on nine species from Vietnam belonging to all five genera of Haloveliinae, describing five species as new to science and recording further three species as new to the country's fauna.

### Material and methods

Material studied consists of mostly dry-mounted and a few alcohol preserved specimens deposited in the following collections:

MNHN	Muséum National d'Histoire Naturelle, Paris, France
MTMB	Hungarian Natural History Museum (Magyar Természettudományi Múzeum), Budapest, Hungary
NHMW	Natural History Museum, Vienna, Austria
ZMHU	Zoological Museum, Hanoi University of Science, Vietnam
ZRC	Zoological Reference Collection, National University of Singapore

Material is referred by citing the original labels of the dry mounted specimens. Each single label is marked with " "; the backslash sign \ indicates the break of a line. Alcohol material is labelled in a slightly longer and differing form.

Insects were examined with a Leica Wild M10 binocular microscope (max. 128 x magnification); studies on parameres were made with an OLYMPUS BX40 compound microscope (max. 400 x magnification). Drawings were made with the help of a camera lucida fixed to these microscopes.

Measurements: Variation is given only for body length and body width and includes all type specimens. Other measurements refer to the holotype, the allotype, or the single macropterous specimen of *Strongylovelia vasarhelyii* sp.n. Body length is measured from the apex of the head to the tip of the proctiger. Measurements for body length and body width are given in millimetres. Measurements for lengths of antennomeres and leg segments are presented relative to antennomere 2 (= 1) and mesofemur (= 100), respectively.

Terminology follows LANSBURY & ZETTEL (1997) or ZETTEL (2003b).

### Genus *Strongylovelia* ESAKI, 1924

*Strongylovelia* contains very small limnic species with peculiar large yellow or yellowish white marks on the thorax. Hitherto sixteen species have been described from Taiwan (1 species), the Philippines (8), Borneo (4), Waleakodi near Sulawesi (1), New Guinea (1), and New Britain (1); several undescribed species are known from Sri Lanka, India, Southeast Asia, and Sumatra (ESAKI 1924, 1926, LUNDBLAD 1933, POLHEMUS 1979, ANDERSEN 1982, MURPHY 1990, LANSBURY 1993, YANG & KOVAC 1995, YANG & al. 1997, LANSBURY & ZETTEL 1997, ANDERSEN & al. 2002, ZETTEL 2003b, c; THIRUMALAI, in prep.; and unpublished data). Some notes on the general morphology and on the ecology of a few species of *Strongylovelia* have been provided by LANSBURY & ZETTEL (1997).

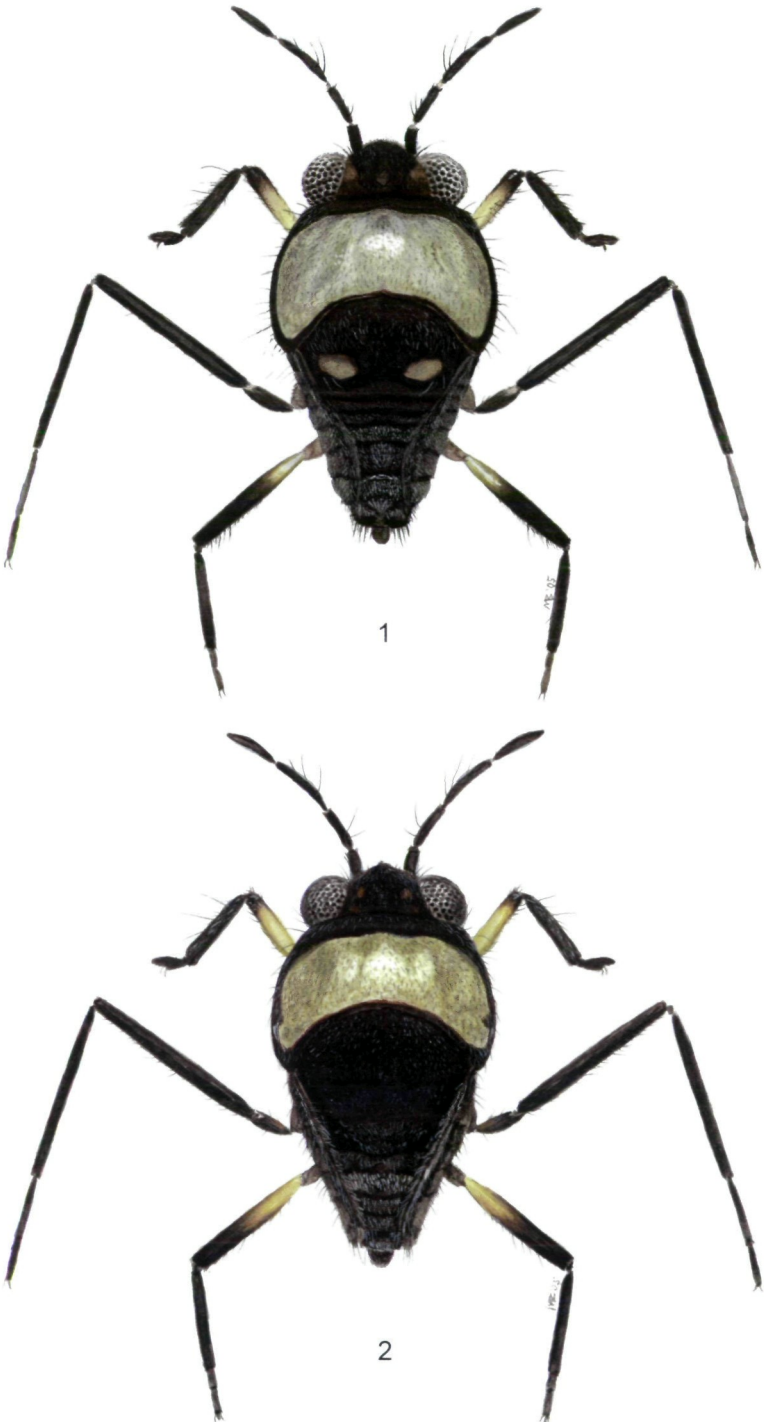
In this study, four new species from Vietnam are described. However, some single specimens of at least four other new species have not been considered, and several further undescribed species must be expected. Therefore, the following key will only help identify the described species, but identification still requires additional comparison with descriptions and illustrations. Habitats of new species of *Strongylovelia* are similar to those noted for some other species by ZETTEL & LANSBURY (1997) (Tran, pers. observ.).

**Auxiliary key to the species of *Strongylovelia* described from Vietnam (apterous morph)**

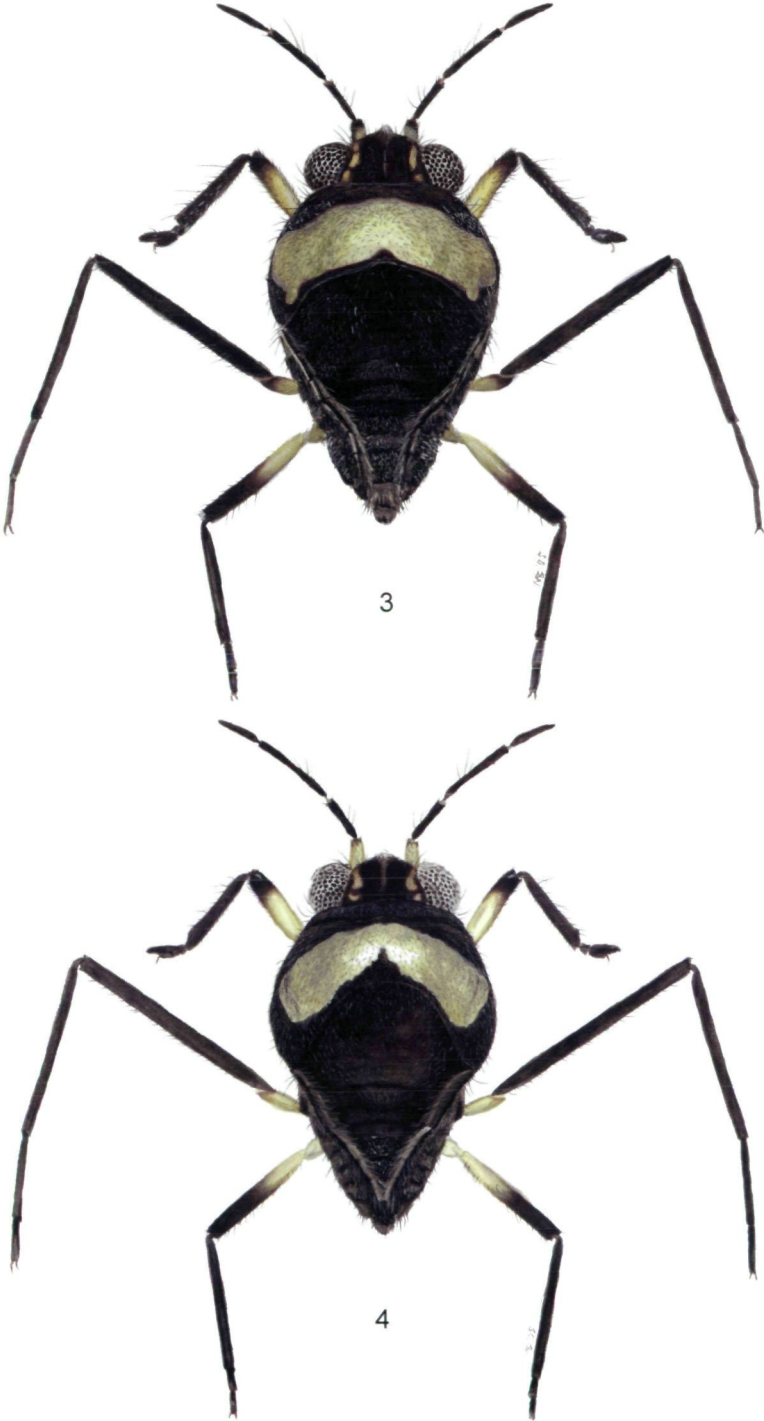
- 1 Antennomere 1 black. – Female: connexiva not strongly convergent (Figs. 1, 2); laterotergites only with short pilosity; sternite 2 laterally black ..... **2**
- Antennomere 1 yellow or leucine. – Female: connexiva strongly convergent (Figs. 3, 4); laterotergites at connexival margins with dense, relatively long pilosity; sternite 2 laterally with yellow mark (rarely very small and indistinct) ..... **3**
- 2 Black stripe on posterolateral margin of mesonotum (excluding stripe on mesopleura!) very narrow, approximately as wide as antennomere 3. – Female (Fig. 1): tergite 1 posterolaterally with pair of yellowish marks (which are very small in some specimens); sternite 2 with several long setae close to connexival margin, sternites 3 - 6 (or 4 - 6) only with short pilosity. – Male: longest setae of sternites 2 - 6 relatively short, ca. 0.08 mm long, shorter than length of tergite 7; paramere only slightly twisted, with apex strongly acuminate (Fig. 9) ..... ***S. bipunctata* sp.n.**
- Black stripe on posterolateral margin of mesonotum usually relatively wide, approximately as wide as base of mesofemur, but rarely as narrow as above. – Female (Fig. 2): tergite 1 completely black; sternites 2 - 7 each with at least one long seta. – Male: longest setae of sternites 2 - 6 long, ca. 0.1 mm long, slightly longer than length of tergite 7; paramere strongly twisted, with less acuminate apex (Fig. 10) ..... ***S. setosa* sp.n.**
- 3 Female (Fig. 3): yellow area on mesonotum reaching hind margin almost all over its width, except a minute black triangle at midline; tergite 1 posterolaterally with very long pilosity; connexiva nearly straight, distant from each other at segment 7; tergites 6 and 7, and especially 8, with distinct pilosity. – Male: tergites 4 - 7 with conspicuous, relatively long (ca. 0.05 mm) setae; paramere strongly curved and slightly twisted (Fig. 11) ..... ***S. vasarhelyii* sp.n.**
- Female (Fig. 4): mesonotum posteromedially widely black so that anterior and posterior margin of yellow area approximately parallelly curved; tergite 1 posterolaterally without conspicuous long pilosity; connexiva almost meeting each other at segment 7; tergites 6 - 8 only with very fine pilosity. – Male: tergites 4 - 7 without conspicuous setae; paramere less curved, but strongly twisted at basal third (Fig. 12) ..... ***S. albopicta* sp.n.**

***Strongylovelia bipunctata* sp.n. (Figs. 1, 5, 9)**

**Type material** (all apterous): holotype (♀, ZMHU), allotype (♂, ZMHU), and paratypes (5 ♀♀, 14 ♂♂; NHMW, ZRC) "VIETNAM, Quang Binh Prov.,\ Phong Nha, upstream of Thac\ Xoi waterfall, 15.VII.2004,\ Coll. Tran A.D.,DY0407"; paratypes: 1 ♀, 1 ♂ "VIETNAM, Ha Tinh Prov.,\ Vu Quang N'Park, Song Con,\ old Sao La station, 25.IV.2003,\ Coll. Tran A.D., TAD0307e" (ZRC); 1 ♀, 1 ♂ "VIETNAM, Ha Tinh Prov.,\ Vu Quang N'Park,\ small waterpools near Khe Lim,\ 24.IV.2003,\ Coll. Tran A.D., TAD0306" (ZRC); 2 ♂♂ "VIETNAM, Quang Binh Prov.,\ Phong Nha, a stream near \Forest Ranger station 37, 15.IV.2004,\ Coll. Tran A.D., DY0405" (ZRC).



Figs. 1 - 2: Habitus of females of Vietnamese species of *Strongylovelia* (dorsal view): (1) *S. bipunctata* sp.n., (2) *S. setosa* sp.n.



Figs. 3 - 4: Habitus of females of Vietnamese species of *Strongylovelia* (dorsal view): (3) *S. vasarhelyii* sp.n., (4) *S. albopicta* sp.n.

**Description of apterous female:** Measurements: Body length 1.35 - 1.45 mm (holotype 1.36 mm). Body width 0.79 - 0.86 mm (holotype 0.79 mm). Relative lengths of antennomeres 1 - 4: 1.1 : 1.0 : 1.7 : 1.3. Relative lengths of leg segments: profemur 44, protibia 46, protarsus 3+14, mesofemur 100, mesotibia 80, mesotarsus 34+22, metafemur 66, metatibia 51, metatarsus 7+14.

Body tear-shaped, relatively wide (Fig. 1); dorsal aspect black except dark orange marks along dorsal eye margin, mesonotum yellowish white except very narrow lateral margins, and one pair of dots on tergite 1 which is varying from large and yellowish white to small and orange in darkest specimen; in lateral aspect mesopleura yellowish white except dorsal margin and metapleura with variable mark from very large and yellowish white to indistinct and orange; in ventral aspect, head and abdomen black, thorax mainly whitish; antenna and legs brownish black, except metatrochanter, profemur except apex, and basal half of metafemur whitish, and all coxae whitish and variably infuscated.

Median pronotal length 0.35 times eye length; dorsum of thorax with very short, decumbent pilosity; in lateral aspect, head and mesonotum with scattered black erect setae, those on mesonotum distinctly shorter than those on head; posterior corners of mesometanotum slightly acute, apex without conspicuous long setae (Fig. 5); structures of abdomen very characteristic: in dorsal view (Fig. 1), connexiva converging until segment 6, parallel at segment 7; all sternites partly visible in dorsal view; sternite 2 laterally with several long, black setae close to dorsal margin, in one specimen also a single seta on sternite 3; following sternites without long setae; sternite 7 dorsally with longer, but not very conspicuous pilosity, especially at connexival corners; laterotergites and tergites 1 - 6 only with short pilosity; suture between tergites 1 and 2 weakly developed, but visible, medially strongly curved cephalad; all other sutures well developed; tergites 5 and 6 with slightly elevated median ridge; tergites 7 and 8 mostly shining (except hind margins); hind margin of tergite 7 distinctly convex, with dense, short pilosity; hind margin of tergite 8 with row of long, black setae. In lateral view (Fig. 5), sternites 3 - 7 and connexiva without long setae; connexival corners acute, with black pilosity; gonocoxa plate-like; proctiger small, directed ventrocaudad.

**Description of apterous male:** Measurements: Body length 1.05 - 1.15 mm (allotype 1.10 mm). Body width 0.66 - 0.69 mm (allotype 0.68 mm). Relative lengths of antennomeres 1 - 4: 0.9 : 1.0 : 1.7 : 1.3. Relative lengths of leg segments: profemur 47, protibia 44, protarsus 4+15, mesofemur 100, mesotibia 80, mesotarsus 33+23, metafemur 67, metatibia 49, metatarsus 9+13.

Colour similar to that of female, but tergite 1 in all specimens and metapleura in most specimens totally black, and yellow part of metafemur often restricted to basal third.

Median pronotal length 0.35 times eye length; black setae laterally on mesothorax as in female; dorsum of body generally with very short pubescence, only tergite 7 with some longer setae; sternites 2 - 7 each with pair of long black setae close to connexival margin; these setae relatively short, ca. 0.08 mm long, shorter than length of tergite 7; suture between tergites 1 and 2 weakly developed, but visible, medially slightly curved cephalad; all other sutures well developed; tergite 5 nearly 7 times as wide as long at midline; paramere (Fig. 9) strongly curved, moderately twisted, relatively broad except at strongly tapered distal part.

**Macropterous morph** unknown.

**Comparative notes:** This species belongs to the *S. esakii* group as defined by LANSBURY & ZETTEL (1997). Females can be distinguished from other species of the group easily by two characteristics, i.e., the pair of yellow dots on tergite 1 and the absence of long setae on sternites 4 - 7. For distinction from *S. setosa* sp.n. see the key.

**Distribution:** Central Vietnam (Quang Binh Province, Ha Tinh Province).

**Etymology:** Named for the two characteristic yellow dots on tergite 1 of the female.

***Strongylovelia setosa* sp.n.** (Figs. 2, 6, 10)

**Type material** (all apterous): holotype (♀, ZMHU) and allotype (♂, ZMHU) "VIETNAM, Quang Binh Prov.,\ Phong Nha, upstream of\ Thac Xoi waterfall, 15.VII.2004, Coll. Tran A.D., DY0407"; paratypes: 1 ♀ "VIETNAM, Quang Binh Prov.,\ Phong Nha, Chay stream,\ 17.VII.2004,\ Coll. Tran A.D., DY0410" (NHMW); 2 ♀♀ "VIETNAM\ Hoa Binh, 500m", "No.83.\ 21.X.1986.\ leg.Vásárhelyi" (MTMB); 1 ♂ "VIETNAM\ Moc Chau, 850m", "No.108.\ 26.X.1986.\ leg.Vásárhelyi" (MTMB).

**Description of apterous female:** Measurements: Body length 1.36 - 1.44 mm (holotype 1.36 mm). Body width 0.78 - 0.79 mm (holotype 0.78 mm). Relative lengths of antennomeres 1 - 4: 1.0 : 1.0 : 1.7 : 1.4. Relative lengths of leg segments: profemur 45, protibia 44, protarsus 4+15, mesofemur 100, mesotibia 87, mesotarsus 39+25, metafemur 68, metatibia 54, metatarsus 6+14.

Body tear-shaped, sides of abdomen not strongly convergent (Fig. 2); dorsal aspect black except dark orange marks along dorsal eye margin and mesonotum yellowish white except relatively broad lateral margins (one female from locality # DY0410 with narrow margin); in lateral aspect mesopleura and metapleura yellowish white except dorsal margin and acetabula, yellowish marks on meso- and metapleura more or less confluent; ventral aspect black, except prosternum and mesosternum yellowish white with infuscated acetabula; antenna and legs brownish black, except metatrochanter, profemur except apex, and basal half of metafemur whitish, and all coxae variably infuscated.

Median pronotal length 0.35 times eye length; dorsum of thorax with very short, decumbent pilosity; in lateral aspect, head and mesonotum with scattered black erect setae, those on mesonotum distinctly shorter than those on head; posterior corners of mesometanotum slightly acute, apex without long setae (Fig. 6); structures of abdomen relatively simple: in dorsal view (Fig. 2), connexiva nearly evenly converging; laterotergites slightly flapped over tergites so that all sternites partly visible in dorsal view; each sternite laterally with 1 - 2 long, black setae close to dorsal margin; sternite 7 dorsally with relatively long, but not very conspicuous pilosity, especially at connexival corners; laterotergites and tergites 1 - 7 only with short pilosity; suture between tergites 1 and 2 weakly developed, but visible, medially hardly curved cephalad; all other sutures well developed and nearly straight; all tergites without median elevation; tergites 6 and 8 anteromedially, tergite 7 mostly (except hind and lateral margins) shining; hind margin of tergite 7 slightly convex; tergite 8 medially with shallow impression, with hind margin bearing few long, black setae; in lateral view (Fig. 6), few long setae surpassing connexival margin; connexival corners acute, with black pilosity; gonocoxa plate-like; proctiger small, directed ventrocaudad.

**Description of apterous male:** Measurements: Body length 1.08 - 1.15 mm (allotype 1.08 mm). Body width 0.64 - 0.69 mm (allotype 0.69 mm). Relative lengths of antennomeres 1 - 4 (antenna of allotype broken, measurements taken from paratype): 0.8 : 1.0 : 1.7 : 1.4. Relative lengths of leg segments: profemur 41, protibia 39, protarsus 4+14, mesofemur 100, mesotibia 75, mesotarsus 36+? (broken), metafemur 59, metatibia 46, metatarsus 6+12.

Colour similar to that of female, but yellow part of metafemur restricted to basal third, and in the allotype yellowish mark on metapleura relatively small.

Median pronotal length 0.35 times eye length; black setae laterally on mesothorax and sternites similar with those of female, longest setae on sternites ca. 0.10 mm long; dorsum of body generally with very short pubescence, only tergite 7 with some longer setae; suture between tergites 1 and 2 weakly developed or indistinct; all other sutures well developed; tergite 5 nearly 7 times as wide as long at midline; paramere (Fig. 10) moderately curved at basal third, strongly twisted, broad except at narrow apex.

**Macropterous morph** unknown.

**Comparative notes:** This species belongs to the *S. esakii* group as defined by LANSBURY & ZETTEL (1997) and is extremely similar to *S. aberrans* LANSBURY & ZETTEL, 1997, which unfortunately is known only from the female holotype from Kalimantan, Borneo. Colour pattern and structure of the abdomen are nearly identical. However, a clear difference is found in the relatively short antennomere 3 of the female of *S. setosa* sp.n., which is ca. 1.7 times as long as the second, while the ratio in *S. aberrans* is 1.9. According to all information presently available on the limited distribution of species of *Strongylovelia*, it seems quite unlikely that a species of this genus occurs in Vietnam and in Borneo. A third, closely related but more distinct, undescribed species is known from Singapore.

**Distribution:** Northern and central Vietnam (Hoa Binh Province, Son La Province, and Quang Binh Province).

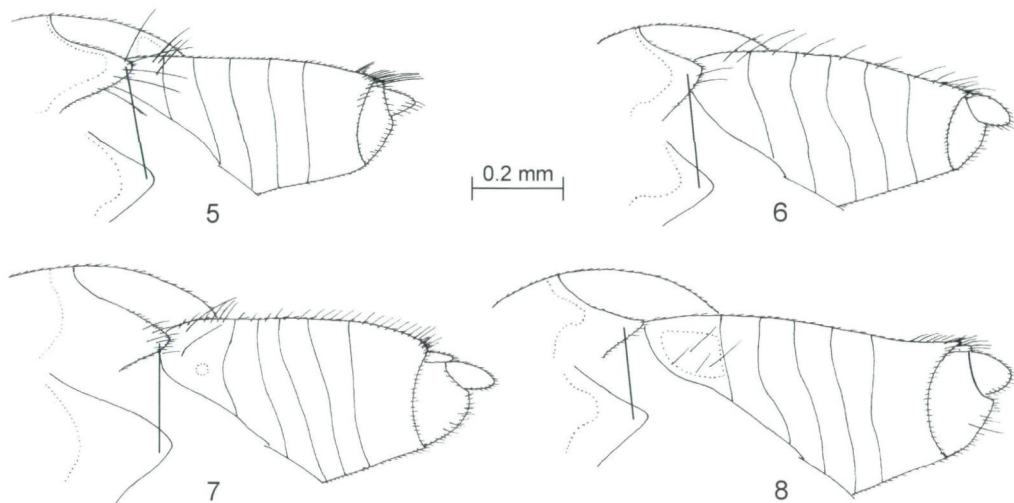
**Etymology:** The specific epithet is a Latin adjective which means "with setae" and refers to the relatively long setae on the abdomen of females and males.

### *Strongylovelia vasarhelyii* sp.n. (Figs. 3, 7, 11)

**Type material** (apterous, if not stated differently): holotype (♀, ZMHU), allotype (♂, ZMHU), and paratypes (3 ♀♀, 3 ♂♂; NHMW, ZRC) "VIETNAM, Lam Dong Prov., Da Lat, a stream running in to Dankia lake, 21.V.2003, Coll. Tran A.D., TAD0330"; 3 ♀♀, 3 ♂♂ "VIETNAM\ Suoi Vang, 18km\ NW of Da Lat", "No.308.\ 17.X.1988. leg.\ Vásárhelyi" (MTMB, NHMW); 6 ♀♀, 4 ♂♂, and 1 ♂ (macropterous-dealate) "S-VIETNAM: 15.4.1995\ 16km N Dalat-Ankreet\ 1400m 12°05'N 108°24'E\ Pacholatko & Dembicky" (NHMW); 1 ♀ "S VIETNAM, 40 km NW An Khe\ Buon Luoi, 14°10'N, 108°30'E\ 620-750m, 28.3.-12.4.1995\ leg. Pacholatko & Dembicky" (NHMW).

**Description of apterous female:** Measurements: Body length 1.56 - 1.70 mm (holotype 1.66 mm). Body width 0.90 - 1.02 mm (holotype 0.96 mm). Relative lengths of antennomeres 1 - 4: 1.2 : 1.0 : 1.2 : 1.5. Relative lengths of leg segments: profemur 47, protibia 49, protarsus 4+14, mesofemur 100, mesotibia 80, mesotarsus 35+21, metafemur 66, metatibia 57, metatarsus 10+14.





Figs. 5 - 8: *Strongylovelia*: abdomen of females, lateral view, and posterolateral corners of meso-metanotum, lateral and perpendicular view (inserted): (5) *S. bipunctata* sp.n., (6) *S. setosa* sp.n., (7) *S. vasarhelyii* sp.n., (8) *S. albopicta* sp.n.

Body tear-shaped, at thorax relatively wide, sides of abdomen strongly convergent (Fig. 3); dorsal aspect black except yellowish marks along dorsal eye margin and yellow mesonotum (but anterolateral areas, lateral margins, and a small triangle posteromedially black; note that dark narrow posterior stripe is metanotal part of meso-metanotum); in lateral aspect mesopleura yellow except dorsal margin and mesoacetabula, metapleura and sternite 2 each with a large yellow mark; ventral aspect black, except prosternum and mesosternum yellowish with strongly infuscated acetabula; antenna and legs brownish black, except first antennomere, meso- and metatrochanter, profemur except apex, and basal half of metafemur yellowish, and all coxae, pro- and mesotrochanters yellowish and variably infuscated.

Median pronotal length 0.35 times eye length; dorsum of thorax with very short, decumbent pilosity; in lateral aspect, head and mesonotum with scattered black erect setae, those on mesonotum distinctly shorter than those on head; posterior corners of meso-metanotum acute, apex only with short pilosity (Fig. 7); structures of abdomen very characteristic: connexiva at segments 2 and 3 vertical, in dorsal view (Fig. 3) strongly converging until segment 7, at base of segment 4 only weakly bent mesad; only sternite 2 laterally with few conspicuous setae, sternites 3 - 7 with relatively dense pilosity which is slightly longer at sternite 7, especially towards connexival corner; sternites 4 - 7 broadly visible in dorsal view; laterotergites at connexival margin with very dense, relatively long pilosity, anterior laterotergites mesally impressed, bare and shining (difficult to observe in oblique view); all tergites matt; suture between tergites 1 and 2 fully developed, strongly curved cephalad; all other sutures also well developed; tergite 1 with conspicuous long pilosity posterolaterally; all tergites with dense, relatively long, nearly appressed pilosity, more distinct medially, especially on tergites 6 - 8; tergite 8 with long, caudad and laterocaudad directed setae along hind margin; in lateral view (Fig. 7), sternites 3 - 7 and connexiva without long setae; connexival corners acute, with some longer pilosity; gonocoxa plate-like; proctiger small, directed ventrocaudad.

**Description of apterous male:** Measurements: Body length 1.19 - 1.25 mm (allotype 1.23 mm). Body width 0.70 - 0.74 mm (allotype 0.71 mm). Relative lengths of antennomeres 1 - 4: 1.0 : 1.0 : 1.8 : 1.3. Relative lengths of leg segments: profemur 46, protibia 47, protarsus 4+14, mesofemur 100, mesotibia 77, mesotarsus 32+23, metafemur 68, metatibia 54, metatarsus 7+14.

Colour generally darker than that of female, with small or medium-sized yellow mark on metapleura, consistently without yellow mark on sternite 2, and yellow part of metafemur restricted to basal third, but with black triangle posteromedially on mesonotum absent or at most very indistinct.

Median pronotal length 0.38 times eye length; black hairs laterally on mesothorax as in female; dorsum of body generally with very dense and relatively long pubescence, short erect setae on head, very short black setae scattered on meso-metanotum; tergites and laterotergites with semi-erect, black setae, increasing in length towards tergite 7 (ca. 0.05 mm long); sternites 2 - 7 each with pair of long black setae close to connexival margin; sutures between tergites 1 - 3 incomplete, all other sutures well developed; tergite 5 ca. 7 times as wide as long at midline; paramere (Fig. 11) strongly curved, slightly twisted, strongly tapered towards narrow apex.

**Description of macropterous male:** Body length 1.37 mm; body width 0.84 mm. Pronotal lobe large, black, with two ovate yellow marks; colour of pleura similar as in apterous male; wings broken off at base; tergites flatter than in apterous morph, with similarly long setae; abdominal carinae reaching base of sternite 2.

**Macropterous female** unknown.

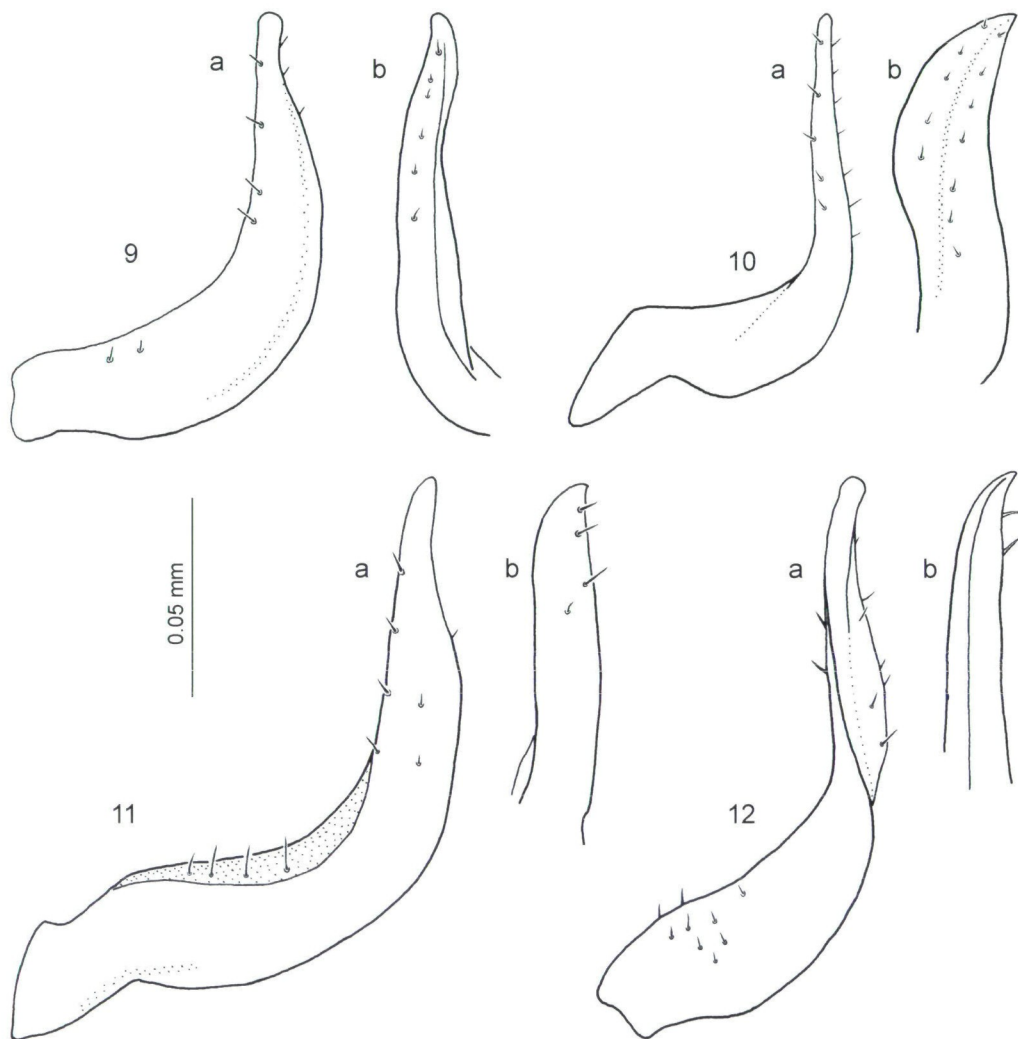
**Comparative notes:** This and the following species cannot be properly assigned to any of the described species groups. Although the general structure of the thorax – especially the posterolateral corner of the meso-metanotum – is similar to those of the species of the *S. esakii* group, the relatively complex structures of the abdomen of the females (e.g., strongly convergent connexiva, pilosity and impression of laterotergites) and the short, semi-erect pilosity on the thoracic dorsum of the male (of *S. vasarhelyii* sp.n. only) exclude them from this species group. For distinction of *S. vasarhelyii* sp.n. and *S. albopicta* sp.n. see the key. Both these species have similarities with the type species, *S. formosa* ESAKI, 1924 from Taiwan, e.g. by the yellowish antennomere 1 and a similarly shaped abdomen of the female (see ESAKI 1924, LANSBURY & ZETTEL 1997). However, *S. formosa* has a unique colour pattern with confluent yellow marks on mesonotum and mesopleura and totally black metapleura (LANSBURY & ZETTEL 1997).

**Distribution:** southern Vietnam (Lam Dong Province, Gia Lai Province).

**Etymology:** Named in honour of Dr. Vászárhelyi Tamás, Deputy Director of the Hungarian Natural History Museum, Budapest, who collected this and many other interesting species of aquatic and semiaquatic Heteroptera in Vietnam.

### *Strongylovelia albopicta* sp.n. (Figs. 4, 8, 12)

**Type material** (all apterous): holotype (♀, ZMHU), allotype (♂, ZMHU), and paratypes (4 ♀♀; NHMW, ZRC) "VIETNAM, Quang Binh Prov., \Phong Nha, Chay stream, \17.VII.2004, \ Coll. Tran A.D., DY0410" (NHMW); paratypes: 1 ♀ "VIETNAM\ Hoa Binh, 500m", "No.83.\ 21.X.1986.\ leg. Vászárhelyi" (MTMB);



Figs. 9 - 12: Parameres of males of Vietnamese species of *Strongylovelia*; (a) lateral view, (b) view perpendicular on distal part: (9) *S. bipunctata* sp.n., (10) *S. setosa* sp.n., (11) *S. vasarhelyii* sp.n., (12) *S. albopicta* sp.n.

2 ♂♂ "VIETNAM, Quang Binh Prov.,\ Phong Nha, Cha Noi, a stream under\ Deo Da Deo bridge, 13.VII.2004,\ Coll. Tran A.D., DY0403" (ZRC); 1 ♂ "VIETNAM, Dong Nai Prov.,\ Vinh Cuu, Vinh An, Da Kin stream,\ 11.V.2003, Coll. Tran A.D., TAD0317 (ZMHU); 1 ♂ "VIETNAM, Dong Nai Prov.,\ Vinh Cuu, Ma Da, Ma Da stream\ (1,3kmNE Rang Rang), 7.V.2003,\ Coll. Tran A.D., TAD0311 (ZRC).

**Description of apterous female:** Measurements: Body length 1.48 - 1.54 mm (holotype 1.54 mm). Body width 0.91 - 0.95 mm (holotype 0.91 mm). Relative lengths of antennomeres 1 - 4: 0.8 : 1.0 : 2.0 : 1.3. Relative lengths of leg segments: profemur 42, protibia 44, protarsus 3+13, mesofemur 100, mesotibia 83, mesotarsus 37+20, metafemur 59, metatibia 54, metatarsus 8+13.

Body tear-shaped, at thorax relatively wide, sides of abdomen strongly convergent (Fig. 4); light colour yellowish white, relatively reduced compared to that of other Vietnamese species; dorsal aspect black except whitish marks along dorsal eye margin and mesonotum with characteristically shaped whitish mark (Fig. 4); in lateral aspect whitish marks on mesopleura, metapleura, and sternite 2 relatively small; ventral aspect black, except prosternum and mesosternum whitish with widely and strongly infuscated acetabula; antenna and legs brownish black, except first antennomere, meso- and metatrochanter, profemur except apex and basal half of metafemur whitish.

Median pronotal length 0.38 times eye length; dorsum of thorax with very short, decumbent pilosity; in lateral aspect, head and mesonotum with very short, scattered, black, erect setae; posterior corners of meso-metanotum slightly acute, apex with somewhat longer pilosity (Fig. 8); structures of abdomen very characteristic: connexiva nearly vertical, posteriorly more or less bent mesad, in dorsal view (Fig. 4) strongly converging and nearly meeting each other at segment 7, at base of segment 4 more or less distinctly bent mesad; sternite 2 laterally with row of long, very conspicuous, black setae, sternites 2 - 3 (- 4) with distinctly shining areas sublaterally; pilosity of sternites not very dense; sternites 3 - 7 without long setae, but sternite 7 with relatively long pilosity especially towards apex; sternites 4 - 7 broadly visible in dorsal view; laterotergites at connexival margin with very dense, relatively long pilosity, which is directed more mesad on segments 2 - 3 and more caudad on following segments; anterior laterotergites mesally with broad, bare and shining impressions; tergites 2 - 8 more or less shining, only with short, inconspicuous pilosity; suture between tergites 1 and 2 weakly impressed, strongly curved cephalad; suture between tergites 2 and 3 shallow, all other sutures well developed; tergites 7 and 8 mostly covered by sternites, hind margin of tergite 8 with relatively short, caudad directed pilosity; in lateral view (Fig. 8), sternites 3 - 7 and connexiva without long setae, but sternite 7 at connexivum with relatively long pilosity, especially towards slightly acute connexival corners; gonocoxa plate-like; proctiger small, directed ventrocaudad.

**Description of apterous male:** Measurements: Body length 1.21 - 1.24 mm (allotype 1.21 mm). Body width 0.68 - 0.71 mm (allotype 0.69 mm). Relative lengths of antennomeres 1 - 4: 1.0 : 1.0 : 1.9 : 1.4. Relative lengths of leg segments: profemur 41, protibia 43, protarsus 4+14, mesofemur 100, mesotibia 80, mesotarsus 35+23, metafemur 63, metatibia 53, metatarsus 8+14.

Colour generally darker than that of female, with totally black metapleura and sternite 2, and whitish part of metafemur restricted to basal third. Only one male with more yellowish marks.

Median pronotal length 0.40 times eye length; black hairs laterally on mesothorax as in female, relatively short; dorsum of body generally with relatively sparse pubescence (compared with previous species); short erect setae on head, very short black setae scattered on meso-metanotum; laterotergites and sternites close to connexival margin with relatively long black setae; in contrast, tergites with very inconspicuous, short, hardly erect setae, except somewhat longer on tergite 7; sutures between tergites 1 - 3 incomplete, all other sutures well developed; tergite 5 ca. 8 times as wide as long at midline; paramere (Fig. 12) very characteristic, weakly curved, very strongly twisted at basal third, and strongly tapered towards very narrow apex.

**Macropterous morph** unknown.

**Comparative notes:** A relatively small, whitish mark on the mesonotum and a reduced pilosity are characteristic for this species. It is relatively close to *S. vasarhelyii* sp.n. but can be easily distinguished by the diagnostic characteristics stated in the key.

**Distribution:** Widely distributed in Vietnam (Hoa Binh Province, Quang Binh Province, Dong Nai Province).

**Etymology:** The specific epithet derives from the Latin *albus* = white and *pictus* = painted; it refers to the usually whitish marks of this species.

### Genus *Entomovelina* ESAKI, 1930

This limnic genus is the least known among Haloveliinae. Although there are records of several undescribed species from Borneo (e.g., POLHEMUS & POLHEMUS 1990, ZETTEL & al. 1998) and one species is even known from southern China (P.P. Chen, pers. comm.), the single described species remains *E. doveri* ESAKI, 1930 from the Malay Peninsula (ESAKI 1930, ANDERSEN & al. 2002). A taxonomic revision is presently planned by P.P. Chen & al. Beside the type material of *E. quadripenicillata* sp.n., there is a single male from the Tam Dao National Park (Vinh Phuc Province), which differs in a more elongate apex of the paramere and an apically infuscated mesofemur and might represent a second species in Vietnam.

#### *Entomovelina quadripenicillata* sp.n. (Figs. 13 - 16)

**Type material** (all specimens apterous): holotype (♀, ZMHU), allotype (♂, ZMHU), and paratypes (6 ♀♀, 9 ♂♂, NHMW, ZMHU, ZRC): "VIETNAM, Vinh Phuc Prov., Tam Dao N'Park, Suoi Bua Lon, 19.VI.2003, Coll. Tran A.D., TAD0356"; paratypes: 1 ♀, 6 ♂♂ "VIETNAM, Ha Tinh Prov., Vu Quang N'Park, Khe Lim waterfall, 24.IV.2003, Coll. Tran A.D., TAD0304" (NHMW, ZRC); 5 ♀♀, 1 ♂ "VIETNAM, Ha Tinh Prov., Vu Quang N'Park, Song Con, old Sao La station, 25.IV.2003, Coll. Tran A.D., TAD0307a" (ZMHU, ZRC); 4 ♀♀, 1 ♂ "VIETNAM, Tam Dao, 1200m", "No.26. 12.X.1986. leg. Vásárhelyi" (MTMB, NHMW); 1 ♀, 4 ♂♂ "VIETNAM, Cuc Phuong, 400m", "No.68. 17.X.1986. leg. Vásárhelyi" (MTMB).

**Description of apterous female:** Measurements: Body length 1.54 - 1.75 mm (holotype 1.58 mm). Body width 0.88 - 0.96 mm (holotype 0.90 mm). Relative lengths of antennomeres 1 - 4: 1.4 : 1.0 : 1.9 : 1.7. Relative lengths of leg segments: profemur 43, protibia 48, protarsus 5+19, mesofemur 100, mesotibia 91, mesotarsus 37+27, metafemur 68, metatibia 66, metatarsus 7+16.

Body subovate, in dorsal view very stout (Fig. 13), in lateral view thorax and anterior tergites strongly convex; body black, head close to hind margin and pronotum in medial part with pruinose marks; antenna and legs black, except all coxae, all trochanters, profemur except apex and metafemur in basal two fifths yellow; dense pilosity grey, but on pronotum, on tergites 1 and 2 laterally, and on metapleura silverish.

Antenna relatively stout (Fig. 14); median pronotal length 0.57 times eye length; dorsum of head and thorax with dense, short and appressed pilosity and relatively short and erect setae; connexival margins relatively thick; sutures between all tergites visible; tergites 1 - 3 with similar pilosity as on thoracic nota, but setae longer; laterotergites 2 - 6 and tergites 4 - 6 without conspicuous setae; tergite 7 with two sublateral tufts of long



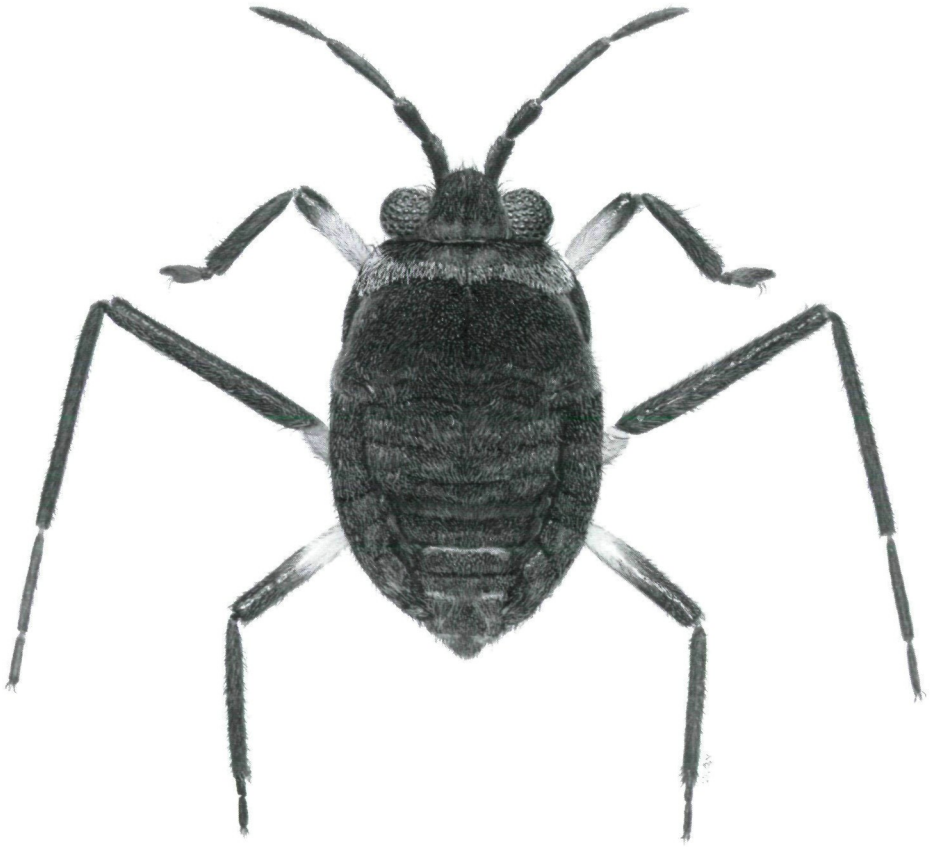


Fig. 13: Habitus of female of *Entomovelina quadripenicillata* sp.n., dorsal view.

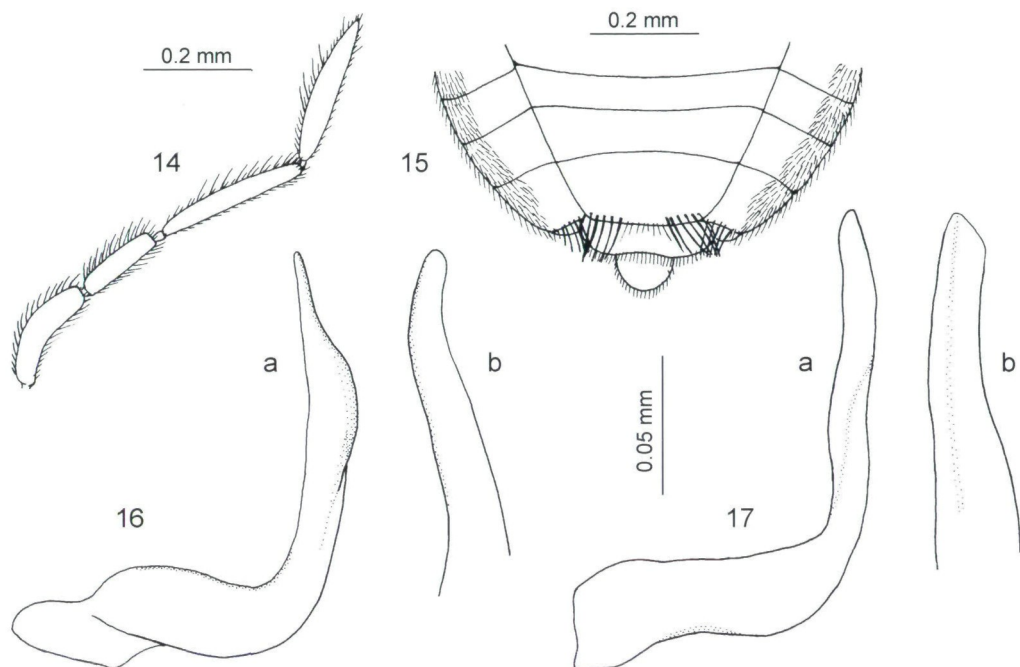
black setae along hind margin; laterotergite 7 with similar tufts apically (Fig. 14); tergites 6 and 7 somewhat shining; hind margin of tergite 7 medially slightly convex; hind margin of tergite 8 medially concave; gonocoxa partly covered by sternite 7; proctiger small, button-like.

**Description of apterous male:** Measurements: Body length 1.28 - 1.50 mm (allotype 1.36 mm). Body width 0.78 - 0.86 mm (allotype 0.79 mm). Relative lengths of antennomeres 1 - 4: 1.4 : 1.0 : 1.8 : 1.9. Relative lengths of leg segments: profemur 49, protibia 47, protarsus 4+18, mesofemur 100, mesotibia 90, mesotarsus 38+29, metafemur 69, metatibia 67, metatarsus 6+17.

Colour similar to that of female.

Median pronotal length 0.62 times eye length; dorsal surface with uniform short pilosity and relatively short setae; suture between meso-metanotum and tergite 1 partly obsolete; genitalia small; pygophore subovate; proctiger shield-shaped, ca. 0.85 times as wide as long; paramere (Fig. 16) hook-shaped, distal part with distinct dilatation.

**Macropterous morph** unknown.



Figs. 14 - 17: (14) antenna of female of *E. quadripenicillata* sp.n.; (15) distal part of abdomen of female of *E. quadripenicillata* sp.n., dorsal view (fine pilosity omitted); (16) paramere of *E. quadripenicillata* sp.n., (a) lateral view, (b) view perpendicular on distal part; (17) same for *Entomovelina doveri*.

**Comparative notes:** This species is closely related to *E. doveri*. It can be distinguished by smaller size and black base of the mesofemur, which is more or less orange in *E. doveri*. The general broad shape of the abdomen of the female is typical for all south-east Asian species of the genus, but some structural details are different in the two species: Females of *E. quadripenicillata* sp.n. have four characteristic tufts of long black setae: one pair sublaterally on the hind margin of tergite 7 and one pair apically on laterotergite 7 (Fig. 15). In *E. doveri* such tufts are not developed, but the relatively long pilosity is evenly distributed. The male of *E. quadripenicillata* sp.n. can be distinguished by the dilated distal section of the paramere, which is very slender in *E. doveri* (comp. Figs. 16 and 17). The following two specimens of *E. doveri*, both deposited in NHMW, have been used for comparison: one female labelled "MALAYSIA: Perak\ 5km E Taiping, Bukit\ Larut, 600-800 m\ leg.R.Schuh,3.8.1993" and one male labelled "MALAYSIA: Selangor\ Fraser Hill:\ Umgebung Gap, 900 m\ 12.-15.8.1993 lg. Schuh".

**Distribution:** northern Vietnam (Vinh Phuc Province, Ninh Binh Province, Ha Tinh Province).

**Habitats** (Tran, pers. observ.): Specimens have been collected in shaded sections of streams with little current and slowly flowing to nearly standing water.

**Etymology:** The specific epithet is a latinized adjective and means "with four brushes", which refers to the structures on abdominal segment 7 of the female.

### Genus *Halovelia* BERGROTH, 1893

This genus contains thirty-one extant marine species, which are distributed from Madagascar to Samoa (ANDERSEN 1989a, b, ZETTEL 1998). The phylogeny has been analysed by ANDERSEN (1989b). The common name "coral bugs" refers to the preferred habitat of most species, i.e., coral rocks in the intertidal zone. Only apterous specimens are known.

### *Halovelia bergrothi* ESAKI, 1926

**Material from Vietnam examined:** 1 ♂, 1 ♀ "Chevey\ 5 - 29", "4"; 2 ♀♀ "Chevey\ Cauda", "7" (all MNHN).

**Notes on the localities** of *Halovelia* spp. and *Haloveloides* from Vietnam: In MNHN the authors found a collection of marine water striders from Vietnam in a box labelled "Gerridides marins d'Indo-chine (coll. Poisson via coll. B. Ehanno)". Material includes *Halovelia bergrothi*, *H. malaya*, *Haloveloides sundaensis* (Veliidae), *Halobates* spp. (Gerridae) and *Hermatobates* sp. (Hermatobatidae). All specimens were labelled with "Chevey" and a number (from 1 to 10) and there are additional papers in the box with descriptive details for each number. For the numbers recorded in this study the following informations are added:

- 4: "4. Mouillage de Cauda – pêche à la lumière, 9 à 11 h soir, 5 Août 29\ adultes et larves"
- 6: "6. Campagne de Lanessun, A. Krenyef, au feu, 1925\ adultes et larves"
- 7: "7. Appoulement de Cauda – adultes et larves\ pêche à la lumière"
- 8: "8. Pêche pélagique au feu 11-8-26\ adultes et larves"
- 9: "9. Mouillage de Bagnoi, lumière, 16-Oct 28\ adultes et larves"

The localities are very unclear as the collector(s) did not state the province name, and there are many anchorages ("mouillages") with the same name in Vietnam. From the personal knowledge of the second author, he speculates that all collections were probably taken in the central part of Vietnam, "Cauda" near Nha Trang.

**Taxonomical notes:** *Halovelia danae* HERRING, 1958 has been described from Nha Trang (HERRING 1958) in Vietnam and is considered a junior synonym of *H. bergrothi* by ANDERSEN (1989a). ANDERSEN (1989a) comprehensively discussed the intraspecific variability of several populations of *H. bergrothi*, which is widely distributed from Vietnam to Samoa, and dedicated a whole paragraph to the synonymy of *H. danae*. There remains little to add, except that the examined material is of dark colour, which supports Andersen's opinion that the light colour of the type specimens of *H. danae* may be an effect of storage in alcohol. It is noteworthy that – except from Vietnam – this widely distributed species is so far unknown from other areas of the southeast Asian mainland, including the well-studied Malay Peninsula.

### *Halovelia malaya* ESAKI, 1930

**Material from Vietnam examined** (first record!): 1 ♂ "Chevey\ 11.8.26", "8." (MNHN) (Notes on the locality see under *H. bergrothi*).



**Taxonomical notes:** The males of the *H. malaya* group are difficult to separate (ANDERSEN 1989b). Males of *H. malaya* can be distinguished from the two other south-east Asian species, *H. abdominalis* ANDERSEN, 1989 and *H. nicobarensis* ANDERSEN, 1989, by a bifid base of the dorsal vesicula sclerite (ANDERSEN 1989b). Because of the presence of this characteristic, the examined male is preliminarily identified as *H. malaya*, although the furcation of the dorsal sclerite is less developed than in the illustration by ANDERSEN (1989b: fig. 8). The record should be confirmed with females.

### **Genus *Haloveloides* ANDERSEN, 1992**

This genus contains thirteen described species in three monophyletic species groups and its centre of radiation is in the Philippines (ZETTEL 2003a). A key to the species has been provided by ZETTEL (2003). Only apterous specimens are known. Species live coastal; some species are known from the mixed-water zone of streams and rivers (ANDERSEN 1992, ZETTEL 2003a).

### ***Haloveloides sundaensis* ANDERSEN, 1992**

**Material from Vietnam examined** (first records!): 1 ♂, 1 ♀ "Chevey\ 9"; 6 ♀ ♀ "Chevey\ 11.8.26", "8."; 1 ♂, 2 ♀ ♀ "Chevey\ 6.\ 1925"; 2 ♀ ♀ "Chevey\ 8" (all MNHN) (Notes on the localities see under *Halovelia bergrothi*).

**Distribution:** This species has been recorded from Thailand, Malaysia, and Indonesia (ANDERSEN 1992); a distribution map is presented by ANDERSEN (2000). *Haloveloides sundaensis* can be collected around rocks along the sea shores at low tide (ANDERSEN 1992; Zettel, pers. observ.).

### **Genus *Xenobates* ESAKI, 1927**

This genus contains 20 described species, but many are still undescribed (ANDERSEN 2000). The known distribution area of *Xenobates* (including undescribed species) ranges from Sri Lanka to New Caledonia (ANDERSEN 2000). Habitat notes on all described species refer to mangroves. However, some species have been collected in a wide variety of coastal habitats, and others prefer *Nipa* swamps (I. Lansbury, pers. comm.; H. Zettel, pers. observ.).

### ***Xenobates mandai* ANDERSEN, 2000**

**Material from Vietnam examined** (first records!): 7 ♂ ♂, 2 ♀ ♀ "Ho Chi Minh City, Can Gio mangrove forest, 1km N of Long Giang Xay bridge, coll. Tran A.D., 17 May 2003, TAD0321" (ZMUH, ZRC); 6 ♂ ♂, 5 ♀ ♀ "Vietnam, Ho Chi Minh City, Can\ Gio mangrove forest, Long Giang\ Xay bridge, Coll. Tran A.D., 17\ May 2003, TAD0322" (NHMW, ZMUH, ZRC).

**Taxonomical notes:** Hitherto, this species has been only known from Singapore. Specimens from Vietnam have been compared with non-type specimens from Sungai Buloh, one of the paratype localities. Specimens from both localities agree well, with

one exception: In males from Singapore sternites 2 - 4 are medially slightly and narrowly elevated, so that the hind margin of sternite 6 has a low, angular shape in ventro-caudal view; but in males from Vietnam this elevation is slightly broader and less sharp, so that the hind margin of sternite 6 is roundish in the same view. However, other important characteristics such as the pilosity of body, legs, and antennae, the length, shape and curvature of the paramere of the males and the terminalia of the females are identical in the two populations; thus at present the above described difference is regarded as intraspecific.

## Discussion

This study raises the number of haloveliine species recorded from Vietnam from one (HERRING 1958, ANDERSEN 1989a) to nine. For discussion of the Vietnamese fauna of Haloveliinae, limnic and marine taxa are treated separately here.

All five freshwater species (genera *Strongylovelia* and *Entomovelina*) are known only from Vietnam so far. Some species, especially the widely distributed *S. albopicta* sp.n., can be expected to occur in neighbouring countries of southeast Asia (especially Laos, Cambodia, or southern China), but so far no studies are available for these countries. It is noteworthy, that there is hardly any overlap with the fauna of Thailand (according to the relatively rich material deposited in NHMW). Only one undescribed *Strongylovelia* species from Thailand is recorded by one specimen from Vietnam (not treated in this study). Nothing is presently known on endemism of *Strongylovelia* species on the continent, but endemism on islands is very high (see, e.g., LANSBURY & ZETTEL 1997 for Borneo and ZETTEL 2003b for the Philippine Islands). *Entomovelina quadripenicillata* sp.n. is the first genus record from "Indochina"; the genus is generally rare in southeast Asia. In recognition of some undescribed specimens of *Strongylovelia* and comparison with (unpublished) species numbers in Thailand, several more new species will be recorded in the future.

The marine genera (*Halovelia*, *Haloveloides*, *Xenobates*) have hardly been studied so far in Vietnam, because expedition material of the junior author is mainly from freshwater. The four species recorded in this study are all known from the Malay Peninsula (compare ANDERSEN 2000). ANDERSEN & al. (2002) have recorded eight species from Singapore and peninsular Malaysia (*Halovelia* 3, *Haloveloides* 1, *Xenobates* 4). A similar, eventually slightly reduced, set of species can be expected from Vietnam.

It can be predicted that the total number of species of Haloveliinae, which occur in Vietnam, is higher than twenty. However, research on this group is still at the beginning.

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