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THE MARINE HALOVELIINAE (HEMIPTERA: VELIIDAE) OF SINGAPORE, MALAYSIA AND THAILAND, WITH SIX NEW SPECIES OF *XENOBATES* ESAKI

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ABSTRACT. - More than 150 species of water striders and their allies (Hemiptera, Gerromorpha) representing five families, nine subfamilies, and 25 genera, inhabit the marine environment, chiefly coastal areas of tropical seas in habitats with a strong tidal influence. The Southeast Asian fauna of marine water striders is particularly diverse and species-rich. The present paper deals with the marine Haloveliinae (Veliidae) of Singapore, Malaysia, and Thailand. They are classified in three genera, *Xenobates* Esaki, *Haloveloides* Andersen, and *Halovelia* Bergroth. *Xenobates singaporensis*, *mandai* (Singapore), *murphyi* (Singapore, Malaysia, Philippines), *argentatus* (Malaysia, Thailand, Philippines), *pictus*, and *maculatus* (Malaysia) are described as new. *Haloveloides sundaensis* Andersen, *Halovelia malaya* Esaki, *abdominalis* Andersen, *lannae* Andersen, and *halophila* Andersen are redescribed. Keys to adults of all species are provided and their distributions mapped.

KEY WORDS. - *Xenobates*, new species, Veliidae, Haloveliinae, marine, Singapore, Malaysia, Thailand.

INTRODUCTION

More than 150 species of semiaquatic bugs (Hemiptera, Gerromorpha) representing five families, nine subfamilies, and 25 genera, inhabit the marine environment, chiefly coastal areas of tropical seas in habitats with a strong tidal influence (Andersen & Polhemus, 1976; Andersen, 1982, 1991, 1999). This group includes the familiar water striders (families Gerridae, Veliidae) which are conspicuously adapted to life on the surface film of water and which are part of an animal community known as *pleuston* (Andersen, 1982; Murphy, 1990a). The Southeast Asian fauna of marine water striders is particularly diverse and species-rich. The best known are the sea skaters, genus *Halobates* Eschscholtz (Herring, 1961; Cheng & Fernando, 1969; Andersen & Foster, 1992) belonging to the Gerridae. Other marine gerrids belong to the genera *Asclepios* Distant, *Rheumatometroides* Hungerford & Matsuda, and *Stenobates* Esaki (Polhemus & Cheng, 1982; Polhemus & Polhemus, 1996). In the family Veliidae, the genera *Halovelia* Bergroth, *Haloveloides* Andersen, and *Xenobates* Esaki comprise marine species (Andersen, 1989a, 1989b, 1992; Andersen & Weir, 1999). These genera belong to the subfamily Haloveliinae which also includes the limnic genera *Entomovelia* Esaki and *Strongylovelia* Esaki (Andersen, 1982). Almost all *Halovelia* species inhabit the intertidal zone of coral reefs and are therefore called coral bugs (Andersen, 1989a). *Xenobates* species live on tidal streams in mangrove swamps and are therefore called *mangrove bugs* (Andersen & Weir, 1999).

The first species of marine haloveliine water striders recorded from Malaysia was *Halovelia malaya* described by the Japanese hemipterist T. Esaki (1930) based on specimens collected at Pulau Angsa, on the West coast of peninsular Malaysia. Additional species of *Halovelia* and *Haloveloides* were described by Andersen (1989a, 1989b, 1992) from southern Thailand, Malaysia, and Singapore. Finally, Murphy (1990a, 1990b) recorded *Halovelia malaya* and a species of *Xenobates* from Singapore. In the present paper, I describe six new species of *Xenobates* from Singapore, Malaysia, and southern Thailand, and redescribe four species of *Halovelia* and one species of *Haloveloides* known to occur in these areas.

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MATERIAL AND METHODS

Haloveliine water striders can be collected in nearshore, marine habitats (estuaries, mangroves, intertidal coral reefs) by using a light-weight fishing net with a fine-meshed nylon or other rapid-drying bag. Specimens can be stored permanently in 70% alcohol although specimens often become discoloured (bleached) after a lengthy period of storage. In addition, the vestiture of silvery pubescence found in species of *Xenobates* is obscured in liquid preserved specimens. Dry mounting of synoptic series is therefore advisable. Methods for dissecting and examining the male genitalia of *Halovelia* are described by Andersen (1989a). The terminology used for the male genitalia is explained in that paper and below. All measurements are given in millimetres. The length of the femur is measured along the dorsal side of the limb, not including the trochanter. All adult specimens examined were apterous (wingless).

The present study is based upon material borrowed from the institutions listed as repositories below with the following abbreviations: AMNH: American Museum of Natural History, New York, U.S.A.; BMNH: Natural History Museum (formerly British Museum, Natural History), London, U.K.; BPBM: Bernice P. Bishop Museum, Honolulu, U.S.A.; JTPC: John T. Polhemus Collection, Englewood, Colorado, now belonging to the National Museum of Natural History, Washington, D.C., U.S.A.; LIPI: Museum Zoologiense Bogoriense, Bogor, Indonesia; NHMV: Natural History Museum, Vienna, Austria; SMF, Senckenberg Museum, Frankfurt, Germany; USNM: National Museum of Natural History, Washington, D.C., U.S.A.; ZMUC: Zoological Museum, University of Copenhagen, Denmark; ZRC: Zoological Reference Collection, Raffles Museum of Biodiversity Research, Singapore.

TAXONOMY

Key to the genera of marine Haloveliinae

1. Pronotum completely dark. Eye width less than 0.3x interocular width of head. Fore tibia of male with grasping comb (Figs. 29 and 37). Male genital segments withdrawn into pregenital abdomen and only slightly protruding from abdominal end (Figs. 26 and 38) ..... *Halovelia* Bergroth
- Pronotum with pale markings or spots. Eye width more than 0.4x interocular width of head. Fore tibia of male without grasping comb (Fig. 3). Male genital segments distinctly protruding from abdominal end (Figs. 1 and 5). 2

2. Fore trochanter of male with a conspicuous spine (Fig. 23). Middle femora more than 0.9x total length, at most with pilosity of short hairs along anterior margin (Fig. 22); ratio of middle tarsus and tibia about 0.8: 1 ..... *Haloveloides* Andersen
- Fore trochanter of male not modified as above. Middle femora less than 0.9x total length, with (Figs. 1 and 4) or without a row of bristle-like hairs along anterior margin (Figs. 13 and 17); ratio of middle tarsus and tibia less than 0.7: 1. .... *Xenobates* Esaki

Xenobates Esaki, 1930

Microbates Esaki, 1926: 153 (junior homonym of *Microbates* Sclater & Salvin, 1873 [Aves]). Type-species, *Microbates seminulum* Esaki, 1926, by original designation and monotypy.

Xenobates Esaki, 1927: 184 (nom. nov. for *Microbates* Esaki, 1926).

Colpovelia Polhemus, 1982: 7 (as subgenus of *Halovelia* Bergroth, 1893). Type-species, *Halovelia (Colpovelia) angulana* Polhemus, 1982, by original designation. Synonymised by Andersen 1989a: 85.

Diagnosis. - Small or very small water striders, adults always apterous (wingless). Body chiefly dark, usually with definite spots of silvery hairs on thorax and abdominal dorsum. Head largely pale between eyes. Antennae slender, 0.5-0.7x total length of insect. Pronotum very short (Figs. 1-2, pn), with transverse pale marking(s) in middle. Fore trochanter of male not modified; tibia without grasping comb (Fig. 3). Middle femur very long, 0.7-0.9x total length of insect, distinctly thickened proximally; femur with a row of bristle-like hairs along anterior margin, continuing on tibia and tarsus, relative length of hairs variable (Figs. 1, 4, and 13). Hind femur relatively short, more or less thickened proximally, especially in male. Connexiva of female (Fig. 2, co) usually obliquely inclined, sometimes vertically raised or inflexed upon abdominal dorsum. Abdominal venter of male sometimes tumid, distinctly depressed on sternum 7 (Fig. 5, s7); male genital segments conspicuous and distinctly protruding from pregenital abdomen; pygophore (segment 9) simple, subovate; parameres large, symmetrically developed, falciform (Figs. 5-6 and 15, pa); proctiger subovate (Fig. 15, pr). Hind margin

of sternum 7 of female straight or slightly produced in middle (Fig. 7, s7); proctiger (Figs. 2 and 7, pr) variable in shape, either protruding from segment 8 or more or less deflected, covering gonocoxa. (Generic description, see Andersen & Weir, 1999).

Distribution. - Oriental and Australian regions.

Remarks. - Esaki (1926) described this genus under the name "*Microbates*", which was preoccupied (in Aves) and subsequently changed to *Xenobates* (Esaki, 1927). The genus was monotypic and the type species, *X. seminudum* (Esaki), from New Guinea is peculiar in some characters, e.g. its tiny size, very distinct row of mesofemoral bristles, and trough-shaped female abdomen. Lansbury (1989) described several new species of haloveliines, placing some of these in the genus *Halovelia*, others in the genus *Xenobates*. Based upon a preliminary study of all described and many undescribed species, Andersen (1989a, 1992) pointed out that the few salient characters previously used to identify *Xenobates* were highly transitional. Subsequently, Andersen & Weir (1999) redefined the genus *Xenobates*, redescribing three species and describing seven new species from Australia, New Caledonia, and southern New Guinea.

Xenobates can be separated from *Halovelia* on the characters given in the key (above). The absence of a grasping comb on the male fore tibia and the protruding male genital segments are diagnostic characters for the genera *Xenobates* and *Haloveloides*. In addition, most species of *Xenobates* have extensive pale markings on the head and pronotum, and more or less extensive silvery pubescence which often forms definite spots on the mesonotum and the abdominal dorsum. The mesotibial hair fringe originally used (Esaki, 1926) to define the genus has turned out to be quite variable among species, both in the relative length and colour of hairs. At present, *Xenobates* contains 14 described species (Lansbury, 1989, 1996; Andersen & Weir, 1999). In addition to the six species described in the present paper, the author has knowledge of about 10 undescribed species from India, Sri Lanka, Indonesia, and the Philippines. These species will be described in a forthcoming paper.

Key to species of *Xenobates* of Singapore, Malaysia and Thailand

1. Middle femora with anterior row of long, regularly spaced, bristle-like hairs (Figs. 1 and 4). 2
- Middle femora without anterior row of long, bristle-like hairs (or at most with pilosity of short hairs; Fig. 13). 4

2. Male abdominal venter with basal tumescence which forms a steep angle towards depressed sternum 7 (Fig. 5, s7); parameres very long, normally crossing each other above proctiger (Figs. 1 and 5, pa). Female abdomen posteriorly narrowed (Fig. 2); connexiva suberect, pilose. Pale marking of pronotum distinctly interrupted in middle. Length 1.5-1.6 mm (males), 1.75-1.8 mm (females). ..... *singaporensis*
- Male abdominal venter not modified as above; parameres long, but at most reaching or slight crossing each other above proctiger. Female abdomen more regularly tapering towards abdominal end (Fig. 8); connexiva obliquely raised throughout. Pale marking of pronotum not interrupted in middle. 3

3. Antennal segments 2 and 3 with long pilosity on anterior margin (Fig. 11). Basal part of male hind femur strongly incrassate. Length 1.5 mm (males), 1.7 mm (females). ..... *mandai*
- Antennal segments 2 and 3 with short pilosity and at most with a few long hairs on anterior margin (Fig. 8). Basal part of male hind femur thickened, but not strongly incrassate. Length 1.55-1.6 mm (male), 1.7-1.8 mm (females). ..... *murphyi*

4. Pronotum dark with transverse pale band or two transverse spots in posterior half; mesothorax without distinct pale markings (Figs. 13-14). Male abdominal venter with basal tumescence which forms a steep angle towards depressed sternum 7 (as in Fig. 5). Length 1.5-1.6 mm (males), 1.7-1.8 mm (females). ..... *argentatus*
- Pronotum chiefly pale; lateral parts of mesonotum and connexiva with distinct pale markings (Figs. 17 and 19). Male abdominal venter not modified as above. 5

5. Large species, length 1.75-1.8 mm (males), 2.0-2.1 mm (females). Antennae relatively short, 0.55-0.65x total length. Female mesonotum with distinct lateral, pale stripes (Fig. 17). ..... *pictus*
- Small species, length 1.45-1.55 mm (males), 1.65-1.8 mm (females). Antennae relatively long, 0.7-0.8x total length. Female mesonotum with anterolateral, pale spots (Fig. 19) ..... *maculatus*

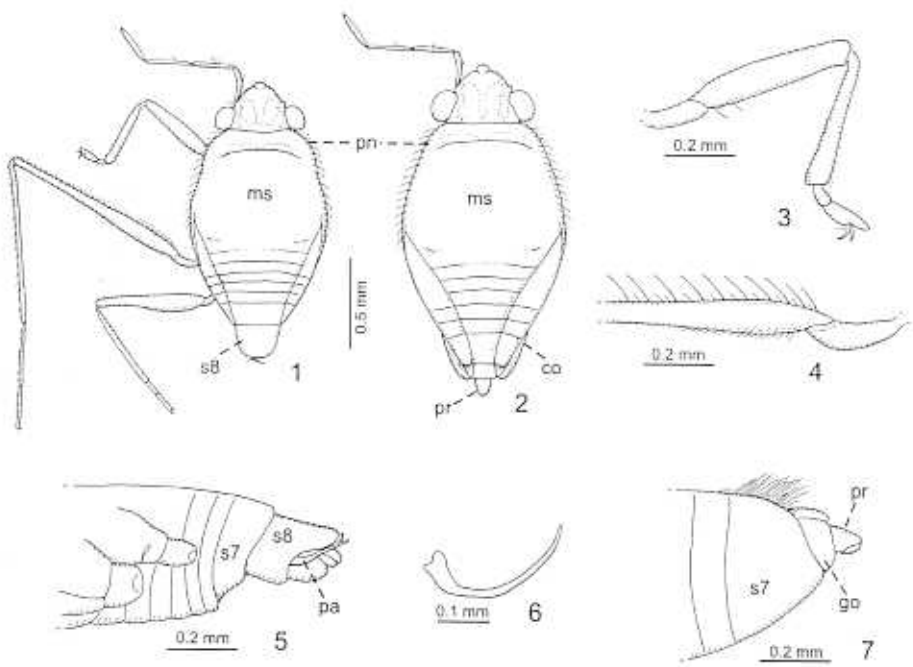
***Xenobates singaporensis*, new species**
(Figs. 1-7, 21)

Material examined. - Holotype - apterous male: SINGAPORE: Mandai, Mangrove Stream, 5

Aug.1976, L. Cheng (JTPC).

Paratypes - SINGAPORE: 21 males, 13 females, same data as holotype (JTPC). 3 males, Pulau Ubin, near Changi, CL 2221, 17 Oct.1986, J.T. & D.A. Polhemus (JTPC). 8 males, 5 females, Sungai Buloh, mangrove, 2 Feb.1986, D.H. Murphy (JTPC). 1 male, 8 females, Sungai Buloh, mangrove, shallow permanent pool, 9 Dec.1984, D.H. Murphy (ZRC). 3 males, 1 female, and nymphs, Sungai Buloh, small, slow flowing water, 23 Apr.1991, C.M. Yang (ZRC). 49 males, 7 females, Sungai Buloh, 24 Feb.1995, T.B. Lim (ZRC). 31 males, 9 females, Sungai Buloh, mangroves, low tide, 4 Oct.1996, C.M. Yang (ZRC). 2 males, 1 female, Pulau Ubin, Sungai Jelutong, 10-30 cm wide, small pool, 30 Jul.1997, K.L. Yeo (ZRC).

Description. - Holotype, apterous male: Length 1.56 mm, width 0.75 mm; body fusiform (Fig. 1), length 2.1x greatest width across thorax. Ground colour dark brown or black; head with a large U-shaped brownish yellow marking; posterior half of pronotum in middle with brownish yellow, transverse band which is interrupted in middle. Body with dense pubescence of short hairs and some longer, suberect hairs laterally on thorax; mesonotum with one anterolateral and two median patches of silvery hairs; abdominal dorsum with broad transverse band of silvery pubescence on terga 2, 3 and 7. Antennae and legs pale brownish; basal part of antennal segment 1, most of fore femur, all coxae and trochanters, and middle and hind femora beneath, yellowish. Ventral surface of body chiefly brownish; head, prosternum, and acetabula yellowish; genital segments light brown, parameres dark. Head length about 0.65x width across eyes (0.33: 0.50); eye width about 0.4x width of head between eyes (0.11: 0.29). Antennae 0.65x total length of insect (1.03: 1.56); lengths of antennal segments 1-4: 0.28, 0.21, 0.28, and 0.26; segment 2 shorter than segment 3; segment 4 thicker than segment 1; antennal segments with short pilosity and a few longer hairs. Lengths of leg segments (femur: tibia: tarsus): fore leg: 0.51, 0.41, and 0.18; middle leg: 1.16, 0.94, and 0.63; hind leg: 0.65, 0.49, and 0.21; fore femur width 0.11; fore tibia with a row of short spinous hairs on inner margin (Fig. 3); middle femur about 0.75x total length of insect, proximally thickened and with a row of regularly spaced, bristle-like, dark brown hairs along anterior margin (Fig. 4), each hair being slightly shorter than greatest width of femur (0.09: 0.10); a similar row of hairs on middle tibia and tarsus; lengths of middle tarsal segments 1 and 2: 0.35 and 0.28; hind femur proximally thickened, as thick as middle femur (0.11). Abdomen



Figs. 1-7. *Xenobates singaporensis*, new species. 1. Apterous male, dorsal habitus; antennae and legs of right side omitted. 2. Apterous female, dorsal habitus; antennae and legs omitted. 3. Male left fore leg. 4. Basal part of male middle femur. 5. Male abdominal end, lateral view. 6. Male left paramere. 7. Female abdominal end, lateral view. Abbreviations: co, connexivum; go, gonocoxae; ms, mesonotum, pa, paramere; pn, pronotum; pr, proctiger, s7, s8, abdominal segment 7 and 8.

broad at base, distinctly tapering posteriorly; abdominal venter with basal tumescence which forms a steep angle towards sternum 7 (Fig. 5). Genital segments relatively large, segment 8 produced on dorsal hind margin; parameres falciform and very long, usually crossing each other above proctiger; blade of each paramere (Fig. 6) slender and curved in lateral view, apex pointed.

Paratype, apterous female: Length 1.75 mm, width 0.89 mm; body subovate (Fig. 2), length about 2.0x greatest width across thorax. Colour and pilosity on body as in male. Head length about 0.65x width across eyes (0.35: 0.54); eye width about 0.35x width of head between eyes (0.11: 0.31). Antennae about 0.6x total length of insect (1.01: 1.75), with the same kind of pilosity as in male; length of antennal segments 1-4: 0.26, 0.21, 0.26, and 0.28. Thorax slightly convex above, with relatively short pilosity. Lengths of leg segments (femur: tibia: tarsus): fore leg: 0.54, 0.40, and 0.18; middle leg: 1.23, 0.99, and 0.68; hind leg: 0.64, 0.50, and 0.24; middle femur 0.7x total length; hind femur more slender than in male. Abdomen broad at base, distinctly tapering towards abdominal end; connexiva relatively narrow, obliquely raised in anterior parts, more suberect in posterior parts, there furnished with a mass of long hairs; sternum 7 distinctly longer than preceding two sterna together (0.25: 0.18), posterior margin slightly produced in middle. Tergum 8 relatively long; proctiger narrow, button-shaped, only slightly deflected (Fig. 7).

Other paratypes examined: Apterous males, length 1.53-1.58 mm, width 0.73-0.75 mm; apterous females, length 1.75-1.83 mm, width 0.88-0.90 mm. Colouration similar to holotype except for variation in the size of patches of silvery hairs on mesonotum and abdominal dorsum.

Distribution. - Singapore (see map, Fig. 21).

Remarks. - Named for the type area. The new species is characterised by the pale marking of pronotum being distinctly divided in middle, presence of two distinct patches of silvery hairs on mesonotum, relatively long antennae with sparse pilosity, and anterior row of long, bristle-like hairs on mesofemora. Males are distinguished by their modified abdominal venter and very long, slender parameres; females by the posteriorly narrowed abdomen with suberect, pilose connexiva, and narrow, deflected proctiger.

This mangrove bug is found on the surface of tidal streams and channels in mangrove swamps. Collected together with *Xenobates murphyi* and *mandai* n. spp. (see below) as well as with the marine gerrids *Asclepios annandalei* Distant (Gerridae, Halobatinae) and *Stenobates biroi* (Esaki) (Trepobatinae) (J. Polhemus, field notes).

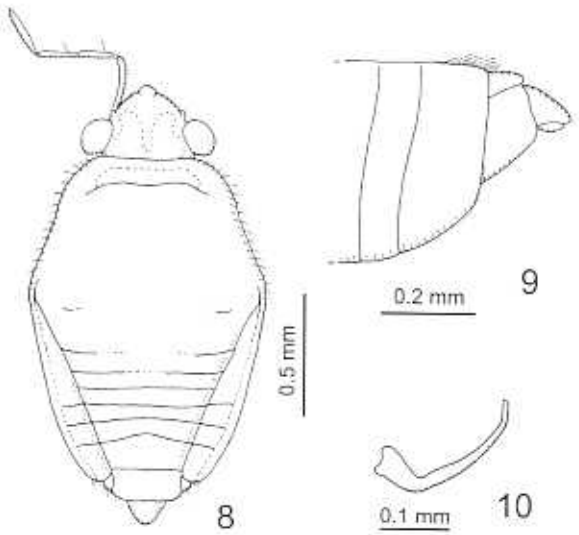
Xenobates murphyi, new species

(Figs. 8-10, 21)

Material examined. - Holotype - apterous male: SINGAPORE: Palau Ubin, mangrove creek, outside trees on rising tide, 13 May 1986, D.H. Murphy (JTPC).

Paratypes - SINGAPORE: 15 males, 20 females, same data as holotype (JTPC, ZMUC). 1 male, 1 female, Pulau Ubin, near Changi, CL 2221, 17 Oct.1986, J.T. & D.A. Polhemus (JTPC). MALAYSIA: 1 male, 3 females, Pulau Langkawi, Pantai Rhu, 16 Dec.1993, D. Kovac (SMF). 4 males, 16 females, and 1 nymph, Pahang, Pulau Tioman, Sungai Baharu, downstream, intertidal, 28 Jun.1996, C.M. Yang et al. (ZRC). 79 males, 63 females, and 5 nymphs, Pahang, Pulau Tioman, Sungai Baharu, 27 Jun.1997, H.K. Lua et al. (ZMUC, ZRC). 1 female, Sabah, mangroves 7 km S of Papar, CL 2042, 7 Aug.1985, J.T. & D.A. Polhemus (JTPC). PHILIPPINES: 3 females, Cebu, Moalboal coast, 8 Mar.1998, H. Zettel (NHMV).

Description. - Holotype, apterous male: Length 1.55 mm, width 0.79 mm; body fusiform, length 2.0x greatest width across thorax. Ground colour dark brown or black; head with a large U-shaped brownish yellow marking; posterior half of pronotum in middle with brownish yellow, transverse band. Body with dense pubescence of short hairs; mesonotum with one anterolateral and two indistinct median patches of silvery hairs; abdominal dorsum with silvery pubescence laterally on terga 2-4 and 5-7. Antennae and legs pale brownish; basal part of antennal segment 1, most of fore femur, all coxae and trochanters, and middle and hind femora beneath, yellowish. Ventral surface of body chiefly light brownish; genital segments light brown, parameres dark. Head length about 0.6x width across eyes (0.29: 0.50); eye width about 0.3x width of head between eyes (0.09: 0.31). Antennae about 0.5x total length of insect (0.80: 1.55); lengths of antennal segments 1-4: 0.23, 0.16, 0.19, and 0.23; segment 2 slightly shorter than segment 3; segment 4 thicker than segment 1; antennal segments with short pilosity and a few longer hairs. Lengths of leg segments (femur: tibia: tarsus): fore leg: 0.54, 0.41, and 0.19; middle leg: 1.40, 1.14, and 0.83; hind leg: 0.66, 0.50, and 0.21; fore femur width 0.09; fore tibia with a row of short spinous hairs on inner margin;



Figs. 8-10. *Xenobates murphyi*, new species. 8. Apterous female, dorsal habitus, legs omitted. 9. Female abdominal end, lateral view. 10. Male left paramere.

middle femur about 0.9x total length of insect, proximally thickened and with a row of bristle-like, brownish hairs along anterior margin, each hair being distinctly shorter than greatest width of femur (0.06); anterior margin of middle tibia and tarsus at most with a row of short hairs; lengths of middle tarsal segments 1 and 2: 0.49 and 0.34; hind femur proximally thickened, slightly thicker than middle femur (0.12). Abdomen broad at base, distinctly tapering posteriorly; abdominal venter slightly depressed but otherwise simple. Genital segments relatively large, segment 8 produced on dorsal hind margin; parameres falciform and long, barely crossing each other above proctiger; blade of each paramere (Fig. 10) relatively broad and curved in lateral view, apex pointed.

Paratype, apterous female: Length 1.75 mm, width 0.90 mm; body subovate (Fig. 8), length about 1.95x greatest width across thorax. Colour and pilosity on body as in male. Head length about 0.6x width across eyes (0.33: 0.53); eye width about 0.3x width of head between eyes (0.10: 0.34). Antennae about 0.5x total length of insect (0.84: 1.75), with the same kind of pilosity as in male; length of antennal segments 1-4: 0.23, 0.16, 0.20, and 0.25. Thorax slightly convex above, with relatively short pilosity except on sides. Lengths of leg segments (femur: tibia: tarsus): fore leg: 0.55, 0.41, and 0.23; middle leg: 1.40, 1.21, and 0.94; hind leg: 0.65, 0.53, and 0.21; middle femur 0.8x total length; hind femur as thick as in male. Abdomen broad at base, tapering towards abdominal end; connexiva relatively narrow, obliquely raised throughout; sternum 7 slightly longer than preceding two sterna together (0.18: 0.16), posterior margin almost straight. Tergum 8 relatively short; proctiger cone-shaped, slightly deflected, gonocoxae exposed (Fig. 9).

Other paratypes examined: Apterous males, length 1.55-1.63 mm, width 0.75-0.79 mm; apterous females, length 1.68-1.79 mm, width 0.88-0.94 mm. Colouration similar to holotype except for variation in the size of patches of silvery hairs on mesonotum and abdominal dorsum. Specimens stored in alcohol tend to loose some of the bristle-like hairs on middle femora.

Distribution. - Singapore, Malaysia (Langkawi Is., Pahang: Pulau Tioman, Sabah), Philippines (Cebu) (see map, Fig. 21).

Remarks. - Named after Professor D.H. Murphy, the collector of the type-series and the first to record the genus *Xenobates* from Singapore (Murphy, 1990a). Separated from *X. singaporensis*, new species, by the uninterrupted pale marking of pronotum, relatively shorter antennae, longer middle legs, and lack of long bristle-like hairs on middle tibia and tarsus. Male abdominal venter not modified as in the previous species; parameres relatively short and broad, barely crossing each other above proctiger. Female abdomen including connexiva simple and proctiger cone-shaped, slightly deflected. This species lives on the surface of tidal creeks in mangrove swamps. In Singapore collected together with, but less numerous than *Xenobates singaporensis*, new species (see above).

Xenobates mandai, new species
(Figs. 11, 12, 21)

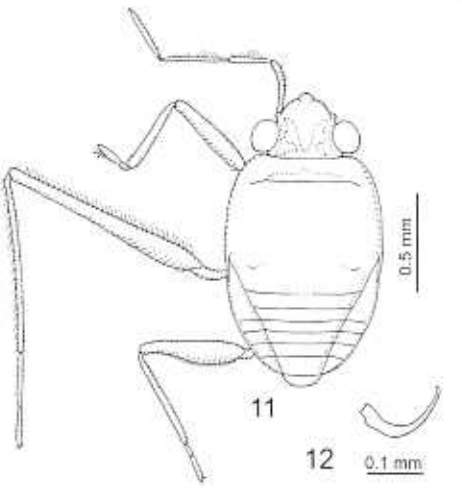
Material examined. - Holotype - apterous male: SINGAPORE: Mandai, Mangrove Stream, 5 Aug.1976, L. Cheng; deposited in the J.T. Polhemus collection, Englewood, Colorado.

Paratypes - SINGAPORE: 1 female, same data as holotype (JTPC); 1 female, Kranji mangrove estuary, CL 2215, 13 Nov.1986, J.T. & D.A. Polhemus (JTPC). 1 female, Sungai Buloh, mangrove, shallow permanent pool, 9 Dec.1984, D.H. Murphy (ZRC). 2 males, 2 females, Pulau Tekong, mangroves, *Thalassina* pools, 6 Dec.1984, D.H. Murphy (ZRC). 1 male, 2 females, Sungai Buloh, small, slow flowing water, 23 Apr.1991,

C.M. Yang (ZRC). 6 males, Sungai Buloh, 24 Nov.1995, T.B. Lim (ZRC). 11 males, 3 females, Sungai Buloh, mangroves, low tide, 4 Oct.1996, C.M. Yang (ZRC). 4 males, 4 females, Pulau Ubin, Sungai Jelutong, 10-30 cm wide, small pool, 30 Jun.1997, K.L. Yeo (ZRC).

Description. - Holotype, apterous male: Length 1.50 mm, width 0.80 mm; body subovate (Fig. 11), length 1.9x greatest width across thorax. Ground colour blackish; head with a large V-shaped brownish yellow marking; posterior third of pronotum in middle with brownish yellow, transverse band. Body with dense pubescence of short hairs; mesonotum with two large patches of silvery hairs; abdominal dorsum with lateral patches of silvery pubescence on terga 2, 3, 6 and 7. Antennae and legs pale brownish; basal part of antennal segment 1, most of fore femur, all coxae and trochanters, and middle and hind femora beneath, yellowish. Ventral surface of body chiefly dark brownish; head, prosternum, and acetabula yellowish; genital segments including parameres light brown. Head length about 0.55x width across eyes (0.30: 0.56); eye width about 0.35x width of head between eyes (0.12: 0.33). Antennae about 0.75x total length of insect (1.10: 1.50); lengths of antennal segments 1-4: 0.26, 0.20, 0.33, and 0.31; segment 2 shorter than segment 3; segment 4 as thick as segment 1; antennal segments 2 and 3 with long, suberect pilosity. Lengths of leg segments (femur: tibia: tarsus): fore leg: 0.49, 0.41, and 0.21; middle leg: 1.08, 0.90, and 0.50; hind leg: 0.63, 0.50, and 0.23; fore femur width 0.09; fore tibia with a row of short spinous hairs on inner margin before apex; middle femur about 0.7x total length of insect, proximally thickened and with a row of bristle-like, light brownish hairs along anterior margin, each hair being distinctly shorter than greatest width of femur (0.05); a similar row of hairs on middle tibia and tarsus; lengths of middle tarsal segments 1-2: 0.29 and 0.21; hind femur distinctly thickened in basal half (Fig. 11), much thicker than middle femur (0.14); hind margin of middle and hind femora with relatively long pilosity. Abdomen broad at base, distinctly tapering posteriorly; abdominal venter slightly tumose, posterior margin of sternum 6 raised, sternum 7 depressed. Genital segments relatively large, only slightly protruding beyond pregenital abdomen; parameres falciform, meeting but not crossing each other above proctiger; blade of each paramere (Fig. 12) slender and slightly curved in lateral view, distal part curved mesad, apex pointed.

Paratype, apterous female: Length 1.73 mm, width 0.93 mm; body subovate, length about 1.85x greatest width across thorax. Colour and pilosity as in male, but connexiva dark brownish and mesonotum with more extensive patches of silvery hairs. Head length about 0.6x width across eyes (0.36: 0.60); eye width about 0.3x width of head between eyes (0.10: 0.34). Antennae about 0.6x total length of insect (1.11: 1.73), with the same kind of pilosity as in male; length of antennal segments 1-4: 0.26, 0.21, 0.31, and 0.33. Thorax slightly convex above, with relatively short pilosity. Lengths of leg segments (femur: tibia: tarsus): fore leg: 0.51, 0.44, and 0.21; middle leg: 1.11, 0.93, and 0.54; hind leg: 0.64, 0.55, and 0.25; middle femur about 0.65x total length; hind femur much more slender than in male. Abdomen broad at base, tapering towards abdominal end; connexiva relatively narrow, obliquely raised; sternum 7 slightly longer than preceding two sterna together (0.20: 0.18), posterior margin almost straight. Tergum 8 relatively short and broad; proctiger button-shaped, not deflected, gonocoxae exposed.



Figs. 11-12. *Xenobates mandai* n. sp. 11. Apterous male, dorsal habitus, antennae and legs of the right side omitted. 12. Male left paramere.

Other paratypes examined: Apterous males, length 1.50-1.55 mm, width 0.80-0.83 mm; apterous females, length 1.73-1.78 mm, width 0.93-0.98 mm. Colouration similar to holotype except for variation in the size of patches of silvery hairs on mesonotum, metanotum, and on abdominal dorsum.

Distribution. - Singapore (see map, Fig. 21).

Remarks. - Named after the type locality. Separated from the two new *Xenobates* species described above by the unbroken pale marking of the pronotum, relatively long and densely pilose antennae, and incrassate male hind femora. Posterior margin of male abdominal sternum 6 raised; parameres relatively

short, not crossing each other above proctiger. Female proctiger button-shaped, not deflected. Found in tidal streams and pools in mangrove swamps. Collected together with *Xenobates singaporensis*, new species (see above) and the marine gerrid *Rheumatometroides insularis* (Gerridae, Trepobatinae) (Polhemus & Cheng, 1982).

Xenobates argentatus, new species
(Figs. 13-16, 21)

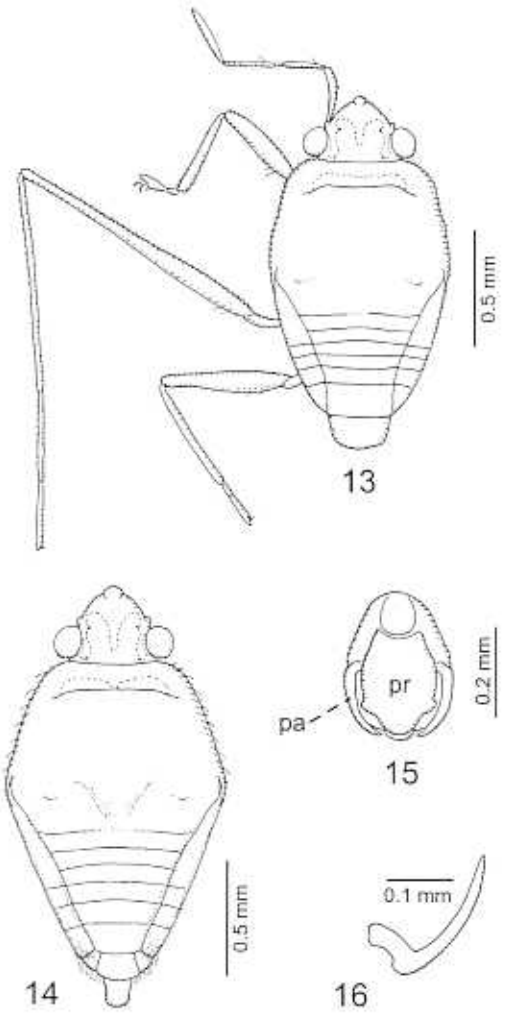
Material examined. - Holotype - apterous male: THAILAND: Phuket, mangroves N. of Phuket Marine Biological Center, 11 Feb.1989, Mogens Andersen; deposited in the Zoological Museum, University of Copenhagen.

Paratypes - THAILAND: 87 males,124 females, many nymphs, same data as holotype (ZMUC). 1 female and many nymphs, Phuket Island, Ao Nam-Bor mangrove, tidal channels, low tide, 22 Jan.1987, N.M. Andersen (ZMUC). 4 females, Phuket, Mangrove NW of Phuket Marine Biological Center, low tide, 4 Nov.1987, Mogens Andersen (ZMUC). MALAYSIA: 20 males, 20 females, Sarawak, Bako National Park, small pool, mangrove, 1 Jul.1994, K.L. Yeo (ZRC). PHILIPPINES: 74 males, 87 females, Mindanao, Zamboanga del Sur Prov., Santa Cruz Is. off Zamboanga, mangroves, CL 1996, 21 Jul.1985, J.T. & D.A. Polhemus (JTPC). 1 male, 2 females, Palawan, Puerto Princesa, 31 Aug.1984, Cambridge Univ. Exp. (JTPC). 2 females, Palawan, Puerto Princesa, mangroves, 1 Sep.1984, Cambridge Univ. Exp. (ZMUC).

Description. - Holotype, apterous male: Length 1.53 mm, width 0.79 mm; body fusiform (Fig. 13), length about 1.9x greatest width across thorax. Ground colour dark brown or black; head with a large U-shaped brownish yellow marking; posterior half of pronotum in middle with brownish yellow, transverse band which is partly interrupted in middle. Body with dense pubescence of medium-length, pale hairs interspersed with silvery pubescence which is most conspicuous on mesonotum and on abdominal dorsum. Antennae and legs pale brownish; basal part of antennal segment 1, most of fore femur, all coxae and trochanters, and middle and hind femora beneath, yellowish. Ventral surface of body chiefly brownish; head, prosternum, and acetabula yellowish; genital segments light brown, parameres dark. Head length about 0.6x width across eyes (0.29: 0.49); eye width 0.35x width of head between eyes (0.10: 0.29). Antennae about 0.6x total length of insect (0.95: 1.53); lengths of antennal segments 1-4: 0.25, 0.19, 0.25, and 0.26; segment 2 distinctly shorter than segment 3; segment 4 thicker than segment 1; antennal segments with short pilosity. Lengths of leg segments (femur: tibia: tarsus): fore leg: 0.49, 0.40, and 0.18; middle leg: 1.25, 0.98, and 0.78; hind leg: 0.61, 0.50, and 0.22; fore femur width 0.10; fore tibia with a row of short spinous hairs on inner margin; middle femur about 0.8x total length of insect, proximally thickened but with only a few, short pale hairs along anterior margin (Fig. 13); lengths of middle tarsal segments 1 and 2: 0.43 and 0.35; hind femur proximally thickened, as thick as middle femur (0.11). Abdomen broad at base, distinctly tapering posteriorly; abdominal venter with basal tumescence which forms a steep angle towards the depressed sternum 7 (as in Fig. 5). Genital segments relatively large, segment 8 produced on dorsal hind margin; parameres falciform and long, not reaching each other above proctiger (Fig. 15); blade of each paramere (Fig. 16) relatively broad and curved in lateral view, apex blunt.

Paratype, apterous female: Length 1.76 mm, width 0.90 mm; body subovate (Fig. 14), length 1.95x greatest width across thorax. Colour and pilosity on body as in male. Head length about 0.65x width across eyes (0.31: 0.51); eye width about 0.3x width of head between eyes (0.10: 0.31). Antennae about 0.5x total length of insect (0.86: 1.76), with the same kind of pilosity as in male; length of antennal segments 1-4: 0.25, 0.18, 0.20, and 0.24. Thorax slightly convex above, slightly depressed posteriorly on each side of midline, with relatively long pilosity. Lengths of leg segments (femur: tibia: tarsus): fore leg: 0.49, 0.40, and 0.18; middle leg: 1.25, 1.05, and 0.86; hind leg: 0.64, 0.56, and 0.24; middle femur 0.7x total length; hind femur more slender than in male. Abdomen broad at base, distinctly tapering towards abdominal end (Fig. 14); connexiva relatively narrow, suberect and furnished with a mass of long hairs in posterior parts; sternum 7 distinctly longer than preceding two sterna together (0.24: 0.18), posterior margin almost straight. Tergum 8 relatively long; proctiger narrow, button-shaped, protruding or slightly deflected.

Other paratypes examined: Apterous males, length 1.50-1.56 mm, width 0.75-0.79 mm; apterous females, length 1.70-1.76 mm, width 0.88-0.90 mm. Colouration and pilosity similar to holotype; pale marking on pronotum distinctly interrupted in middle in some specimens.



Figs. 13-16. *Xenobates argentatus*, new species. 13. Apterous male, dorsal habitus, antennae and legs of right side omitted. 14. Apterous female, dorsal habitus, legs omitted. 15. Male pygophore, proctiger, and parameres. 16. Male left paramere.

Distribution. - Thailand (Phuket), Malaysia (Sarawak), Philippines (Mindanao, Palawan) (see map, Fig. 21).

Remarks. - Named after the conspicuous silvery pubescence on dorsal body surface. Quite similar to *X. murphyi* n. sp. (see above) and distinguished from this species by the absence of a row of long, dark hairs along anterior margin of middle femur, and the posteriorly narrowed, female abdomen with button-shaped, distinctly protruding proctiger. Pale marking of pronotum partly divided in middle. Antennae relatively short. Male abdominal venter tumose, steeply depressed before sternum 7. Found in tidal streams in mangrove swamps.

Xenobates pictus, new species
(Figs. 17, 18, 21).

Material examined. - Holotype - apterous male: MALAYSIA: Kelantan, Beach of Passionate Love, E of Kota Bharu, estuary, CL 2083, 20 Aug.1985, J.T. & D.A. Polhemus (JTPC).

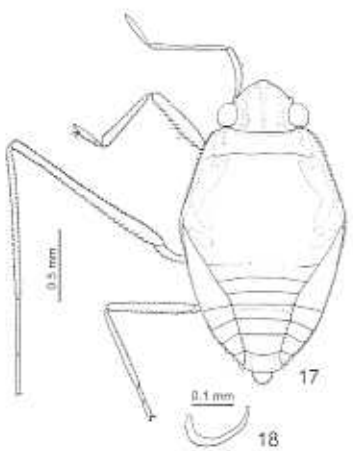
Paratypes - MALAYSIA: 11 males, 13 females, nymphs, same data as holotype (JTPC, ZMUC). 30 males, 17 females, Pahang, Pulau Tioman, Sungai Mentawak, 24 Jun.1997, H.K. Lua et al. (ZMUC, ZRC). 12 males, 8 females, Sarawak, Telok Pandan Besar, pool puddle, mangrove swamp, 28 Jun.1994, K.L. Yeo (ZRC).

Description. - Holotype, apterous male: Length 1.79 mm, width 0.90 mm; body fusiform, length about 2.0x greatest width across thorax. Ground colour dark brown or black with extensive yellowish markings; head chiefly pale, with a median and two lateral, longitudinal brownish stripes; pronotum chiefly pale; thoracic pleura with large pale markings; abdominal laterotergites and mediotergite 7 yellowish brown. Body with dense pubescence of medium-length, pale hairs interspersed with silvery pubescence which becomes denser on abdominal tergites 2, 3 and 7. Antennae and legs chiefly yellowish with brownish stripes on margins. Ventral surface of body chiefly brownish; head, prosternum, and acetabula yellowish; genital segments light brown, parameres pale. Head length about 0.65x width across eyes (0.36: 0.58); eye width 0.35x width of head between eyes (0.12: 0.34). Antennae about 0.65x total length of insect (1.15: 1.79); lengths of antennal segments 1-4: 0.33, 0.21, 0.30, and 0.31; segment 2 distinctly shorter than segment 3; segment as thick as segment 1; antennal segments with short pilosity. Lengths of leg segments (femur: tibia: tarsus): fore leg: 0.56, 0.51, and 0.21; middle leg: 1.30, 0.96, and 0.69; hind leg: 0.71, 0.52, and 0.24; fore femur width 0.13; fore tibia with a row of short spinous hairs on inner margin; middle femur about 0.7x total length of insect, proximally thickened, with numerous short, pale hairs along anterior margin; lengths of middle tarsal segments 1 and 2: 0.39 and 0.30; hind femur proximally thickened, as thick as middle femur (0.13). Abdomen broad at base, distinctly tapering posteriorly; abdominal venter

tumose, sternum 7 slightly depressed. Genital segments relatively large, segment 8 produced on dorsal hind margin; parameres falciform and long, barely reaching each other above proctiger; blade of each paramere (Fig. 18) slender and curved in lateral view, apex blunt.

Paratype, apterous female: Length 2.10 mm, width 1.13 mm; body subovate (Fig. 17), length 1.85x greatest width across thorax. Colour and pilosity as in male except that lateral parts of mesonotum, lateral spots on metanotum, abdominal mediotergites 5-7, and all of connexiva are yellowish. Head length about 0.6x width across eyes (0.39: 0.63); eye width about 0.35x width of head between eyes (0.13: 0.36). Antennae about 0.55x total length of insect (1.18: 2.10), with the same kind of pilosity as in male; length of antennal segments 1-4: 0.33, 0.24, 0.29, and 0.33. Thorax convex above, with relatively long pilosity on sides and posteriorly. Lengths of leg segments (femur: tibia: tarsus): fore leg: 0.59, 0.54, and 0.23; middle leg: 1.31, 1.05, and 0.71; hind leg: 0.73, 0.58, and 0.26; middle femur about 0.6x total length; hind femur more slender than in male. Abdomen broad at base, distinctly tapering towards abdominal end; connexiva relatively broad, obliquely raised and furnished with a mass of long hairs in posterior parts; sternum 7 distinctly longer than preceding two sterna together (0.23: 0.20), posterior margin almost straight. Tergum 8 relatively broad; proctiger cone-shaped, slightly deflected.

Other paratypes examined: Apterous males, length 1.75-1.95 mm, width 0.90-1.00 mm; apterous females, length 2.03-2.23 mm, width 1.06-1.18 mm. Colouration and pilosity similar to holotype; brownish markings on head and prontum more extensive in some specimens; pale markings on thorax and abdomen variable in shape and size.



Figs. 17-18. *Xenobates pictus*, new species. 17. Apterous female, dorsal habitus, antennae and legs of right side omitted. 18. Male left paramere.

Distribution. - Malaysia (Kelantan, Pahang: Pulau Tioman, Sarawak) (see map, Fig. 21).

Remarks. - Named for the extensive pale markings on body. Separated from all previously mentioned *Xenobates* species on account of its slightly larger size, pale head and pronotum, and extensive pale markings on thorax and abdominal dorsum, especially in females. The male abdominal venter is relatively simple and the female proctiger is cone-shaped, slightly deflected.

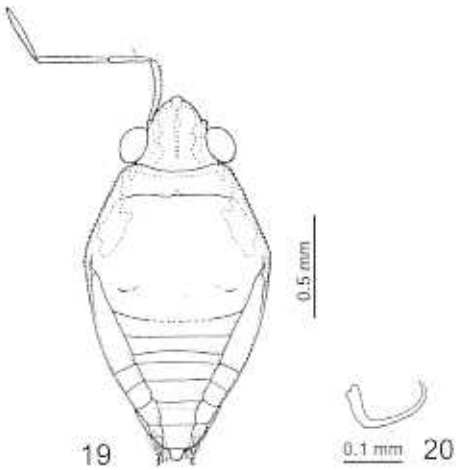
Xenobates maculatus, new species

(Figs. 19-21).

Material examined. - Holotype, apterous male: MALAYSIA: Sabah, mangroves 7 km S of Papar, CL 2042, 7 Aug.1985, J.T. & D.A. Polhemus (JTPC).

Paratypes - 3 males, 9 females, same locality data as holotype (JTPC, ZMUC).

Description. - Holotype, apterous male: Length 1.53 mm, width 0.78 mm; body fusiform, length 1.95x greatest width across thorax. Ground colour dark brown or blackish; head and pronotum chiefly yellowish; head with a median and two lateral, longitudinal brownish stripes; propleura yellowish, metapleura, and abdominal laterotergites with yellowish brown markings. Body with dense pubescence of medium-length, pale hairs interspersed with silvery pubescence which becomes denser on mesonotum and abdominal tergites 2, 3 and 7. Antennae and legs chiefly yellowish with brownish stripes on margins. Ventral surface of body chiefly dark brownish; head, prosternum, and acetabula yellowish; abdominal sterna yellowish brown in middle; genital segments pale brownish, parameres pale. Head length about 0.6x width across eyes (0.31: 0.51); eye width about 0.35x width of head between eyes (0.11: 0.29). Antennae about 0.8x total length of insect (1.19: 1.53); lengths of antennal segments 1-4: 0.31, 0.23, 0.35, and 0.30; segment 2 distinctly shorter than segment 3; segment 4 as thick as segment 1; antennal segments with short pilosity. Lengths of leg segments (femur: tibia: tarsus): fore leg: 0.51, 0.43, and 0.18; middle leg: 1.23, 0.94, and 0.59; hind leg: 0.70, 0.54, and 0.21;



Figs. 19-20. *Xenobates maculatus* n. sp. 19. Apterous female, dorsal habitus, antennae and legs of the right side omitted. 20. Male left paramere.

fore femur width 0.10; fore tibia with a row of short spinous hairs on inner margin; middle femur 0.8x total length of insect, proximally thickened, with numerous short, pale hairs along anterior margin; lengths of middle tarsal segments 1 and 2: 0.34 and 0.25; hind femur proximally thickened, as thick as middle femur (0.11). Abdomen broad at base, distinctly tapering posteriorly; abdominal venter tumose, sternum 7 distinctly depressed. Genital segments relatively large, segment 8 produced on dorsal hind margin; parameres falciform and long, barely reaching each other above proctiger; blade of each paramere (Fig. 20) slender and curved in lateral view, apex pointed.

Paratype, apterous female: Length 1.79 mm, width 0.90 mm; body fusiform (Fig. 19), length about 2.00x greatest width across thorax. Colour and pilosity as in male except that anterolateral parts of mesonotum, lateral spots on metanotum, abdominal mediotergite 7, and all of connexiva are yellowish. Head length about 0.6x width across eyes (0.34: 0.54); eye width about 0.35x width of head between eyes (0.11: 0.32). Antennae about 0.7x total length of insect (1.21: 1.79), with the same kind of pilosity as in male; length of antennal segments 1-4: 0.34, 0.23, 0.35, and 0.30. Thorax slightly convex above, with relatively short pilosity on sides. Lengths of leg segments (femur: tibia: tarsus): fore leg: 0.55, 0.45, and 0.20; middle leg: 1.08, 1.01, and 0.60; hind leg: 0.70, 0.56, and 0.23; middle femur 0.6x total length; hind femur more slender than in male. Abdomen broad at base, distinctly tapering towards abdominal end (Fig. 19; connexiva relatively broad, obliquely raised anteriorly, more steeply raised and furnished with masses of long

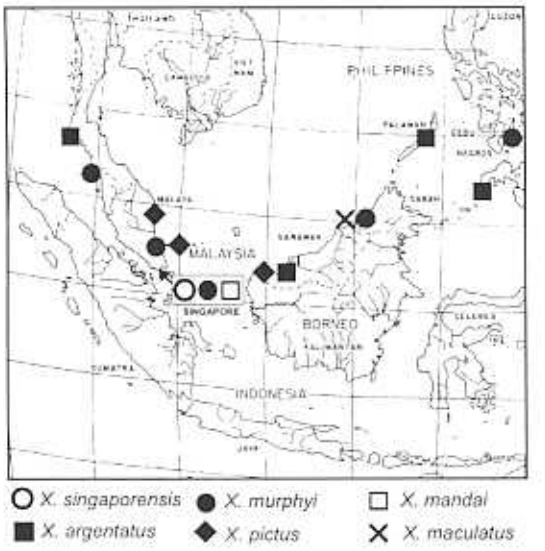


Fig. 21. Map showing distribution of *Xenobates* species in Singapore, Malaysia, and Thailand (including records from the Philippines).

hairs in posterior parts; sternum 7 distinctly longer than preceding two sterna together (0.21: 0.18), posterior margin almost straight. Tergum 8 relatively narrow; proctiger button-shaped, slightly deflected.

Other paratypes examined: Apterous males, length 1.45-1.55 mm, width 0.75-0.80 mm; apterous females, length 1.65-1.80 mm, width 0.85-0.90 mm. Colouration and pilosity similar to holotype; pale markings on thorax and abdomen variable in shape and size.

Distribution. - Malaysia (Sabah) (see map, Fig. 21).

Remarks. - Named for the pale spots on thorax, especially in females. *X. maculatus*, new species, can be separated from the previous species by its smaller size, relatively longer antennae, less extensively pale markings on thorax (especially in females), and the female abdomen being more distinctly narrowed posteriorly with more steeply inclined connexiva.

Haloveloides Andersen

Haloveloides Andersen, 1992: 391-392. Type-species: *Halovelia papuensis* Esaki, 1926, by original designation.

Diagnosis. - Small or very small water striders, adults always apterous (wingless). Body chiefly dark, usually without definite spots of silvery hairs on thorax and

abdominal dorsum. Head largely pale between eyes. Antennae slender, 0.5-0.8x total length of insect. Pronotum very short, with transverse pale marking in middle. Fore trochanter of male usually with a tubercle or spine (Fig. 23); tibia without grasping comb. Middle femur very long, usually more than 0.8x total length of insect, distinctly thickened proximally (Fig. 22); femur with short pubescence along anterior margin. Hind femur relatively short, more or less thickened proximally in male. Connexiva of female usually vertically raised or posteriorly inflexed upon dorsum (Fig. 25). Abdominal venter of male simple or modified; male genital segments conspicuous and distinctly protruding from pregenital abdomen (Fig. 22); pygophore (segment 9) usually modified distally; parameres relatively large, symmetrically developed, usually falciform (Fig. 24). Hind margin of sternum 7 of female usually straight; proctiger usually less deflected, covering gonocoxa. (Generic description, see Andersen, 1992).

Distribution. - Southeast Asia, New Guinea, Solomon Islands.

Remarks. - This genus was described by Andersen (1992) with the type species *Halovelia papuensis* Esaki (1926). The genus is separated from *Halovelia* and *Xenobates* by the characters given in the key (see above). The absence of a grasping comb on the male fore tibia and the protruding male genital segments are characters shared with the latter genus. However, species of *Haloveloides* have relatively longer middle legs without a mesofemoral hair fringe; the dorsal surface of the body is covered by a thick greyish pubescence, but rarely by silvery hairs forming definite spots.

Andersen (1992) described 7 species of *Haloveloides* from Thailand, Malaysia, Indonesia, Philippines, New Guinea, and Solomon Islands. More recently, Zettel (1998) added two new species from the Philippines. Only a single species is recorded from the geographical area covered by the present paper.

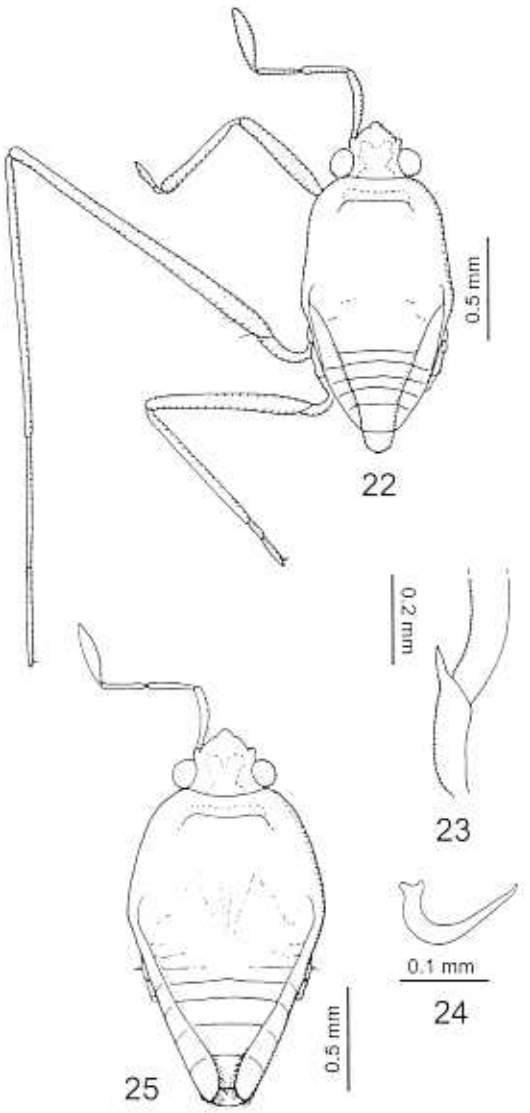
Haloveloides sundaensis Andersen
(Figs. 22-25, 44).

Haloveloides sundaensis Andersen, 1992: 398-399. Holotype, apterous male: Phang Nga, Phang Nga Province, Thailand (ZMUC).

Halovelia malaya Dover [sic!]; Polhemus, 1982: 8 (misidentification).

Material examined. - THAILAND: Holotype male, 25 males, 5 females (paratypes), Phang Nga Province, Phang Nga, 6 Mar.1982, Claus Nielsen (ZMUC). 2 males, Phuket Island, Phuket Marine Biol. Center, reef-flat pools at low tides, 26-28 Jan.1987, N.M. Andersen (ZMUC). 2 males, Koh Chang, Strait at Koh Chang, 3-5 fathoms, muddy bottom, 1900, Th. Mortensen (ZMUC). MALAYSIA: 145 males, 59 females, and many nymphs, Johor, rocky coast at Mersing, CL 2057, 13 Aug.1985, J.T. & D.A. Polhemus (JTPC, ZMUC). 1 male, Langkawi Is., 6 Apr.1934, R. Birch (JTPC). 2 males, 2 females, Penang, Batu Muang, bay near shore, 23 Apr.1965, Univ. Singapore (JTPC). 33 males, 92 females, Sarawak, Bako National Park, 27 Sep.1966, J.F.G. & Thelma M. Clarke (JTPC, USNM). 4 males, 4 females, Sarawak, coast of Telok Pandan Besar, low tide, 28 Jun.1994, K.L. Yeo (ZRC).

Description. - Apterous male: Length 1.71 mm, width 0.80 mm; body fusiform (Fig. 22), length about 2.1x greatest width across thorax. Ground colour dark brown or blackish; a large, V-shaped spot at the base of head and median area of pronotum except anterior margin, yellowish brown. Body with a thick greyish or pale brownish pubescence. Antennae and legs brownish. Ventral surface of body chiefly dark brown. Head length about 0.7x width across eyes (0.34: 0.50); eye width about 0.4x width of head between eyes (0.11: 0.28). Antennae about 0.75x total length of insect (1.25: 1.71); lengths of antennal segments 1-4: 0.39, 0.25, 0.28, and 0.34; segment 2 slightly shorter than segment 3; segment 4 distinctly fusiform, about twice as thick as segment 1 (0.09: 0.05). Lengths of leg segments (femur: tibia: tarsus): fore leg: 0.64, 0.54, and 0.21; middle leg: 1.81, 1.43, and 1.19; hind leg: 0.96, 0.76, and 0.28; fore trochanter distally with a long spine (Fig. 23); fore tibia before apex with 6-8 stout, erect hairs on inner margin; middle femur about 1.05x total length of insect, proximally thickened, with pilosity of short, pale hairs along anterior margin; lengths of middle tarsal segments 1 and 2: 0.68 and 0.51; hind femur not as thick as middle femur (0.09: 0.11). Abdominal venter with a narrow, basal tumescence which continues as a sharp, median keel on sterna 5 and 6; tumescence with short, erect pubescence. Genital segments relatively small, segment 8 flattened ventrally, pygophore posteriorly widened; parameres relatively short, falciform (Fig. 24); blade of each paramere almost straight, apex blunt. Apterous female: Length 2.04 mm, width 1.04 mm; body rhomboidal in outline (Fig. 25), length about 2.0x greatest width across thorax. Colour and pilosity as in



Figs. 22-25. *Haloveloides sundaensis* Andersen. 22. Apterous male, dorsal habitus, antennae and legs of right side omitted. 23. Male right fore trochanter and base of femur. 24. Male left paramere. 25. Apterous female, dorsal habitus, legs omitted. (Figs. 22-25 redrawn from Andersen 1992).

male. Head structure as in male. Antennae 0.55x total length of insect (1.14: 2.04); length of antennal segments 1-4: 0.34, 0.23, 0.26, and 0.31. Thorax only slightly convex dorsally, mesonotum with a large posterior depression margined by long pubescence and notched on each side of midline. Lengths of leg segments (femur: tibia: tarsus): fore leg: 0.66, 0.54, and 0.24; middle leg: 2.21, 1.44, and 1.26; hind leg: 0.93, 0.71, and 0.29; fore trochanter without spine; middle femur about 1.1x total length. Abdomen broad at base, distinctly tapering in width towards abdominal end; connexiva vertically raised anteriorly, inflexed upon abdominal dorsum posteriorly; connexiva with scattered, short suberect pubescence, genital segments with long suberect hairs; sternum 7 slightly produced in middle. Tergum 8 and proctiger strongly deflected, covering gonocoxae.

Other specimens examined: Apterous males, length 1.65-1.75 mm, width 0.8-0.85 mm; apterous females, length 1.95-2.2 mm, width 1.0-1.1 mm.

Distribution. - Thailand (Phang Nga, Phuket, Koh Chang), Malaysia (Langkawi Is., Penang, Johor), Indonesia (Java) (see map, Fig. 44).

Remarks. - Separated from other marine haloveliines of Southeast Asia by the relatively longer middle legs, distinctly fusiform antennal segment 4 (both sexes), and by the long spine on the male fore trochanter. Recorded from coastal areas (both mangroves and coral reef flats). In Java collected at light on sea surface together with species of *Halovelia*, *Halobates* (Gerridae, Halobatiae), and *Hermatobates* (Hermatobatiae). Expected also to occur in Singapore.

Halovelia Bergroth

Halovelia Bergroth, 1893: 277. Type-species: *Halovelia maritima* Bergroth, 1893, designation by monotypy.

Diagnosis. - Small or very small water striders, adults always apterous. Body dark, covered by a thick pilosity which is more or less greyish, especially on abdomen; usually without definite spots of silvery hairs on thorax and abdominal dorsum. Head at base with irregular, yellowish brown spot. Antennae slender, 0.6-0.8x total length of insect. Pronotum very short (Fig. 26, pn), without pale markings. Fore trochanter of male simple; tibia with grasping comb composed of a compact row of short spines along the inner margin (Fig. 29, gr). Middle femur very long, usually more than 0.5-0.6x total length of insect, slightly thickened proximally; femur with short pubescence along anterior margin. Hind femur relatively short, usually thickened proximally. Connexiva of female usually vertically raised, sometimes posteriorly inflexed upon dorsum. Abdominal venter of male usually simple; male genital segments relatively large but withdrawn into pregenital abdomen, only slightly protruding from abdominal end

(Fig. 26); pygophore (segment 9) usually simple; parameres large, symmetrically developed, usually falciform (Figs. 30-31, pa). Hind margin of sternum 7 of female usually produced in middle; proctiger cone- or button-shaped, usually concealed beneath tergum 8. (Generic description, see Andersen, 1989a).

Distribution. - Indo-West Pacific, from the East coast of Africa to the islands of the West Pacific Ocean.

Remarks. - The genus *Halovelia* was described by Bergroth (1893) for a single species, *H. maritima*. Esaki (1926), Hale (1926) and China (1957) added useful diagnostic characters. These were summarised by Andersen (1989a) in his redescription of the genus. *Halovelia* is separated from *Haloveloides* and *Xenobates* by the characters given in the key (see above). The presence of a grasping comb on the male fore tibia and the concealed male genital segments are good diagnostic characters. In addition, most *Halovelia* species have almost uniformly dark head and pronotum, without extensive pale markings. The body is covered by a dense clothing of short pubescence (which may appear greyish in some parts), but never by silvery pubescence forming definite spots. The middle femora and tibiae are covered by short pubescence, but only rarely have a hair fringe.

In his monographic revision of the genus *Halovelia*, Andersen (1989a, 1989b) described a total of 30 species. More recently, Lansbury (1996) and Zettel (1998) added new species from Papua New Guinea and the Philippines, respectively. Four species have been recorded from the geographical area covered by the present paper.

Key to species of Halovelia of Singapore, Malaysia and Thailand

1. Antennal segment 3 distinctly longer than segment 2 (ratio 1.2: 1 or more). Middle femora relatively short, only 0.4-0.5x total length of insect (Fig. 40). ..... *halophila* Andersen
- Antennal segment 3 subequal to or only slightly longer than segment 2 (ratio less than 1.2: 1). Middle femora longer, more than 0.6x total length of insect. 2

2. Grasping comb of male fore tibia less than 1/3 of tibial length (Fig. 37). Female abdomen almost parallel-sided; connexiva suberect, not thickened basally (Fig. 35). Length 1.8-1.9 mm (males), 2.2-2.4 mm (females). ..... *lannae* Andersen
- Grasping comb of male fore tibia about 2/5 of tibial length (Fig. 29). Female abdomen basally constricted, distinctly tapering towards abdominal end; connexiva erect and basally thickened (Figs. 27 and 32). 3

3. Female abdomen long and very narrow (Fig. 32); connexiva inflexed upon abdominal dorsum, meeting each other along the midline. Length 1.7-1.85 mm (males), 2.4-2.5 mm (females). .... *abdominalis* Andersen
- Female abdomen shorter and broader (Fig. 27); connexiva inflexed upon abdominal dorsum, but not meeting each other along midline. Length 1.8-1.95 mm (males), 2.3-2.55 mm (females). .... *malaya* Esaki

Halovelia malaya Esaki
(Figs. 26-31, 44)

Halovelia malaya Esaki, 1930: 18-20. Holotype, apterous female: Pulau Angsa, western Malaysia (BMNH).

Material examined. - MALAYSIA: Holotype female, 1 female (paratype), 10 males, 7 females, 1 nymph, Pulau Angsa, West Coast of Malay Peninsula, 10 Oct.1926, E. Seimund, F.M.S. Mus. (BMNH). 17 males, 57 females, Negeri Sembilan, 12 km S. of Port Dickson, in lagoon pools at low tide, 16 Mar.1983, Schuh & Massee (AMNH). 29 males, 19 females, Negeri Sembilan, 10 km S. of Port Dickson, CL 2060, 15 Aug.1985, J.T. & D.A. Polhemus (JTPC). THAILAND: 1 male, 2 females, Phang Nga Province, Phang Nga, 6 Feb.1982, Claus Nielsen (ZMUC). Many males, females, and nymphs, Phuket Island, Phuket Marine Biol. Center, reef-flat pools at low tides, 15-28 Jan.1987, N.M. Andersen (ZMUC). Many males and females, Thailand, Phuket, PMBC pier, night light, 20-21 Oct.1987, L. Cheng & R. Lewin (ZMUC).

Description. - Apterous male: Length 1.84 mm, width 0.93 mm; body elongate ovate (Fig. 26), length about 2.0x greatest width across thorax. Ground colour dark brown or blackish; a large yellowish brown spot at base of head. Body with greyish pubescence which is longer and more dense on posterior thoracic and entire abdominal dorsum. Antennae and legs dark brownish. Ventral surface of body chiefly dark brown. Head length about 0.6x width across eyes (0.38: 0.63); eye width about 0.25x width of head between eyes (0.11: 0.41). Antennae about 0.65x total length of insect (1.21: 1.84); lengths of antennal segments 1-4: 0.39, 0.24, 0.25, and 0.34; segment 1 distinctly thicker than segment 4 (0.09: 0.06); segment 2 subequal in length to segment 3. Hind margin of pronotum indistinct in

lateral parts. Lengths of leg segments (femur: tibia: tarsus): fore leg: 0.61, 0.51, and 0.21; middle leg: 1.48, 1.36, and 1.10; hind leg: 0.74, 0.58, and 0.26; grasping comb of fore tibia (Fig. 29) about 0.4x length of tibia (0.21); middle femur 0.8x total length of insect; lengths of middle tarsal segments 1 and 2: 0.65 and 0.45; hind femur slightly thicker than middle femur (0.11: 0.10). Abdominal venter not modified. Genital segments relatively small; parameres relatively short, falciform, barely crossing each other above proctiger (Fig. 30); blade of each paramere (Fig. 31) slender and regularly curved dorsad and mesad, apex pointed.

Apterous female: Length 2.41 mm, width 1.05 mm; body fusiform (Fig. 27), length about 2.3x greatest width across thorax. Colour and vestiture as in male except that the greyish pubescence is restricted to anterior and lateral parts of abdominal dorsum; connexiva terminated by long, whitish hairs. Head structure as in male. Antennae about 0.55x total length of insect (1.28: 2.41); lengths of antennal segments 1-4: 0.38, 0.25, 0.29, and 0.36; antennal segment 1 more slender than in male. Thoracic dorsum moderately raised in middle of mesonotum (Fig. 28), pubescence distinctly longer on metanotum and medially on basal abdominal terga. Lengths of leg segments (femur: tibia: tarsus): fore leg: 0.66, 0.54, and 0.26; middle leg: 1.60, 1.41, and 1.16; hind leg: 0.75, 0.63, and 0.31; middle femur about 0.65x total length; hind femur only slightly thicker than middle femur. Abdomen broad at base, distinctly tapering in width towards abdominal end; abdominal terga slightly depressed laterally, but not forming a median tumescence; pleura with shallow, lateral impressions which originate on metapleura; connexiva basally thickened and vertically raised, posteriorly inflexed upon abdominal dorsum, converging but not meeting each other; tergum 8 produced and distally deflected, concealing proctiger.

Other specimens examined: Apterous males, length 1.75-1.95 mm, width 0.9-1.0 mm; apterous females, length 2.3-2.55 mm, width 1.0-1.05 mm.

Distribution. - Thailand (Phang Nga, Phuket), Malaysia (Negeri Sembilan) (see map, Fig. 44). The record from Singapore by Murphy (1990a) needs verification.

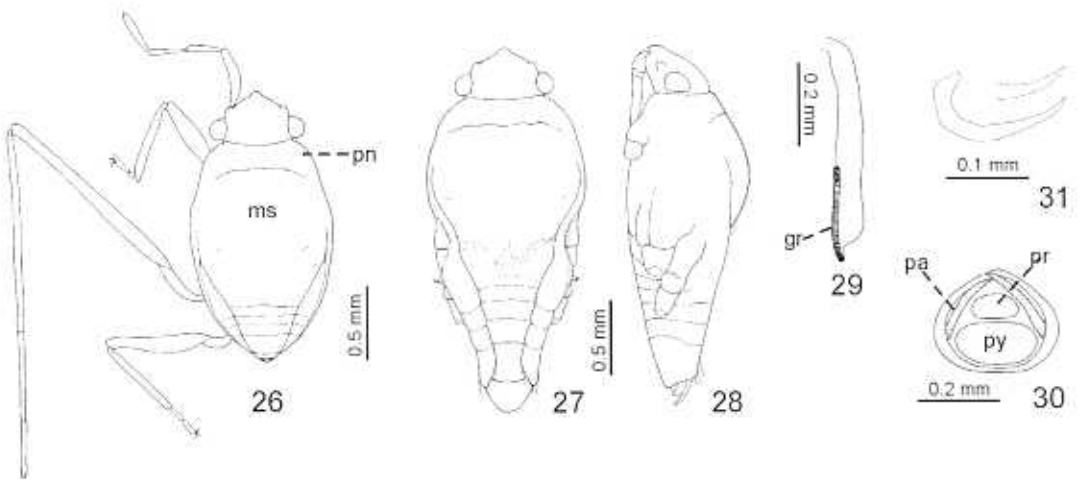
Remarks. - Recognised by the structure of the female abdomen, especially the medial, pilose area on basal abdominal terga and the connexiva which are basally erect and thickened, distally inflexed upon abdominal dorsum. Andersen (1989b) gives a detailed account of the biology and ecology of this species based on personal observations on populations found on intertidal reef flats at Phuket Marine Biology Center, southern Thailand.

Halovelia abdominalis Andersen

(Figs. 32-33, 44)

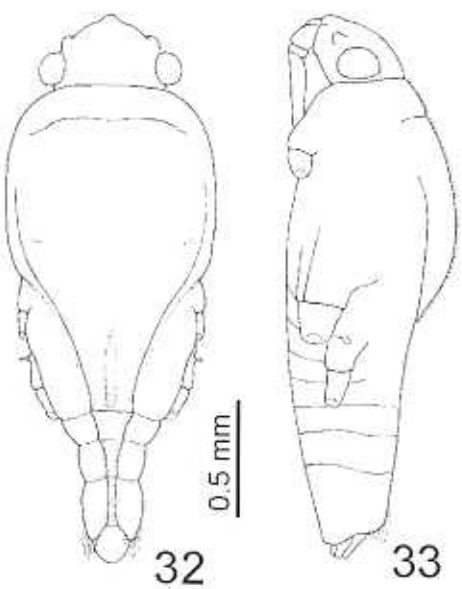
Halovelia abdominalis Andersen, 1989b: 184-186. Holotype, apterous female: Onrust Island off Djakarta, Java, Indonesia (ZMUC).

Material examined. - MALAYSIA: 9 males, 7 females (paratypes), Pahang, Pulau Tioman, rockpools at low tide, 19 Oct.1985, L. Cheng (ZMUC).



Figs. 26-31. *Halovelia malaya* Esaki. 26 Apterous male, dorsal view, antennae and legs of right side omitted. 27. Apterous female, dorsal view, antennae and legs omitted. 28. Apterous female, lateral view, antennae and legs omitted. 29. Male left fore tibia with grasping comb. 30. Male abdominal end, caudal view. 31. Male left paramere, dorsal aspect of blade above. Abbreviations: gr, grasping comb; ms, mesonotum; pa, paramere; pn, pronotum; pr, proctiger; py, pygophore (abdominal segment 9).

Description. - Apterous male: Length 1.85 mm, width 0.91 mm; body elongate ovate, length about 2.0x greatest width across thorax. Ground colour dark brown or blackish; a large obscure, yellowish brown spot at base of head. Body with greyish pubescence which is longer and more dense on posterior thoracic and entire abdominal dorsum. Antennae and legs brownish. Ventral surface of body chiefly dark brown. Head length about 0.6x width across eyes (0.36: 0.59); eye width about 0.25x width of head between eyes (0.10: 0.40). Antennae about 0.6x total length of insect (1.14: 1.85); lengths of antennal segments 1-4: 0.38, 0.23, 0.24, and 0.30; segment 1 slightly thicker than segment 4 (0.08: 0.06); segment 2 subequal in length to segment 3. Hind margin of pronotum indistinct in lateral parts. Lengths of leg segments (femur: tibia: tarsus): fore leg: 0.64, 0.53, and 0.21; middle leg: 1.53, 1.34, and 1.08; hind leg: 0.71, 0.58, and 0.26; grasping comb of fore tibia about 0.4x length of tibia (0.20); middle femur about 0.8x total length of insect; lengths of middle tarsal segments 1 and 2: 0.63 and 0.45; hind femur as thick as middle femur (0.10: 0.10). Abdominal venter not modified. Genital segments relatively small; parameres relatively long, falciform, crossing each other above proctiger; blade of each paramere slender and regularly curved both dorsad and mesad, apex pointed.



Figs. 32-33. *Halovelia abdominalis* Andersen. 32. Apterous female, dorsal view, antennae and legs omitted. 33. Apterous female, lateral habitus, antennae and legs omitted. (Figs. 26-33 redrawn from Andersen 1989b).

Apterous female: Length 2.39 mm, width 0.93 mm; body elongate ovate, length about 2.6x greatest width across thorax. Colour and vestiture as in male except that the greyish pubescence is restricted to first three abdominal terga; connexiva terminated by long, whitish hairs. Head structure as in male. Antennae about 0.5x total length of insect (1.14: 2.41); lengths of antennal segments 1-4: 0.36, 0.23, 0.24, and 0.31; antennal segment 1 more slender than in male. Thoracic dorsum slightly raised in middle of mesonotum (Fig. 33), pubescence longer on lateral and posterior parts of mesonotum, metanotum, and basal abdominal terga. Lengths of leg segments (femur: tibia: tarsus): fore leg: 0.64, 0.50, and 0.24; middle leg: 1.51, 1.33, and 1.05; hind leg: 0.71, 0.59, and 0.28; middle femur about 0.65x total length. Abdomen narrow, distinctly tapering in width towards abdominal end; basal four abdominal terga with a longitudinal, median groove; pleura with rather deep, lateral impressions which originate posteriorly on metapleura; connexiva basally thickened, inflexed upon abdominal dorsum, converging throughout and meeting each other above terga 5-7; tergum 8 produced and distally deflected, concealing proctiger.

Other specimens examined: Apterous males, length 1.7-1.85 mm, width 0.85-0.9 mm; apterous females, length 2.35-2.55 mm, width 0.9-1.0 mm.

Distribution. - Malaysia (Pahang: Pulau Tioman), Indonesia (Java) (see map, Fig. 44).

Remarks. - Allied to, but separated from *H. malaya* by the long and very narrow female abdomen, with connexiva inflexed upon abdominal dorsum throughout their length, and medially grooved basal abdominal terga. In Java collected at light on sea surface together with *Halovelia lannae* and species of *Halobates* (Gerridae, Halobatinae), and *Hermatobates* (Hermatobatidae).

Halovelia lannae Andersen
(Figs. 34-39, 44)

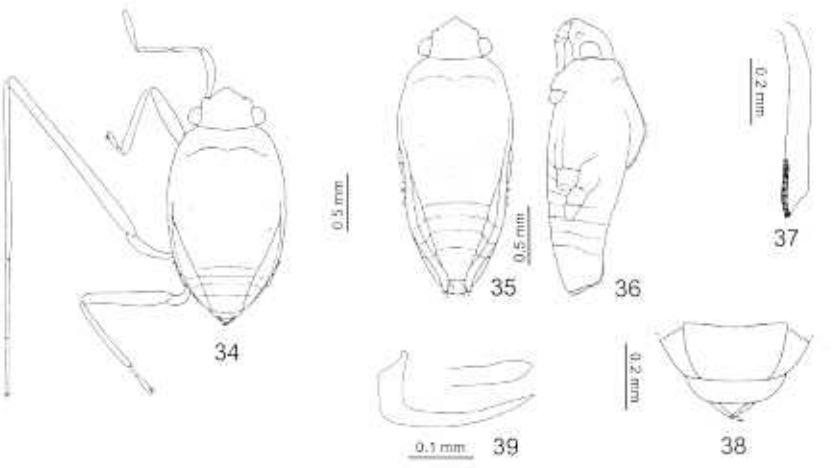
Halovelia lannae Andersen, 1989a: 116-118. Holotype, apterous male: Onrust Island off Djakarta, Java, Indonesia (ZMUC).

Material examined. - SINGAPORE: 14 males, 9 females, Pulau Hamtu, Lagoon, 10 Mar.1985, D.H. Murphy (JTPC). 1 female, Pulau Pawaii off Singapore, Aug.1965, RMQ (JTPC). 1 female, Belakang Mati Reef, 1 Jul.1965, Zoological Dept., Univ. Singapore

(JTPC). 14 males, 4 females, Pulau Salu, 10 Aug.1976, Lanna Cheng (JTPC). 6 males, 1 females, Pulau Salu, intertidal rocks, 31 Jul.1976, Lanna Cheng (JTPC). 7 males, 10 females, Pulau Salu, Apr.1977, Lanna Cheng (ZMUC). 8 males, 10 females, Pulau Salu, 4 Apr.1977, Lanna Cheng (ZMUC). 10 males, 10 females, Pulau Salu, 14 Apr.1977, Lanna Cheng (ZMUC). 1 male, Pulau Salu, 19 May 1980, R.A. Lewin (ZMUC). MALAYSIA: 1 male, 1 female, Johor, rocky coast at Mersing, CL 2057, 13 Aug.1985, J.T. & D.A. Polhemus (JTPC). 19 males, 6 females, Sabah, beaches 2 km NW of Kuala Penyu, 10 Aug.1983, G.F. Hevel & W.E. Steiner (USNM). All paratypes.

Description. - Apterous male: Length 1.86 mm, width 0.95 mm; body subovate (Fig. 34), length about 1.95x greatest width across thorax. Ground colour dark brown or blackish; a large, obscure yellowish brown spot at base of head. Body with greyish pubescence which is longer and more dense on abdominal dorsum. Antennae and legs dark brown or blackish. Ventral surface of body chiefly dark brown. Head length about 0.6x width across eyes (0.39: 0.64); eye width about 0.3x width of head between eyes (0.13: 0.40). Antennae about 0.65x total length of insect (1.20: 1.86); lengths of antennal segments 1-4: 0.36, 0.24, 0.25, and 0.35; segment 1 slightly thicker than segment 4 (0.06: 0.05); segment 2 subequal in length to segment 3. Hind margin of pronotum indistinct in lateral parts. Lengths of leg segments (femur: tibia: tarsus): fore leg: 0.63, 0.56, and 0.25; middle leg: 1.59, 1.36, and 1.16; hind leg: 0.78, 0.64, and 0.31; grasping comb of fore tibia (Fig. 37) less than 0.3x length of tibia (0.16); middle femur 0.85x total length of insect; lengths of middle tarsal segments 1 and 2: 0.66 and 0.50; hind femur slightly thicker than middle femur (0.13: 0.11). Abdominal venter not modified. Genital segments relatively small; parameres relatively long and stout, falciform, crossing each other above proctiger (Fig. 38); blade of each paramere (Fig. 39) slightly curved dorsad, dorso-ventrally flattened, with more or less distinctly spatulate apical part.

Apterous female: Length 2.40 mm, width 1.04 mm; body elongate, side of body almost parallel (Fig. 35), length about 2.3x greatest width across thorax. Colour and vestiture as in male except that the greyish pubescence is restricted to posterior parts of abdominal dorsum; connexiva terminated by long, whitish hairs. Head structure as in male. Antennae about 0.5x total length of insect (1.25: 2.40); lengths of antennal segments 1-4: 0.38, 0.25, 0.26, and 0.36; antennal segment 1 more slender than in male. Thoracic dorsum distinctly raised, greatest height slightly behind middle of mesonotum (Fig. 36), with erect pubescence which is longer in posterior parts of mesonotum and on metanotum and basal abdominal terga. Meso- and metapleura distinctly impressed. Lengths of leg segments (femur: tibia: tarsus): fore leg: 0.70, 0.56, and 0.26; middle leg: 1.63, 1.49, and 1.20; hind leg: 0.84, 0.70, and 0.29; middle femur about 0.65x total length; hind femur only slightly thicker than middle femur. Abdomen in dorsal view almost parallel-sided in anterior two thirds, distinctly narrowing towards abdominal end; basal abdominal terga with a large depression on each side of median tumescence;



Figs. 34-39. *Halovelia lannae* Andersen. 34 Apterous male, dorsal view, antennae and legs of right side omitted. 35. Apterous female, dorsal view, antennae and legs omitted. 36. Apterous female, lateral view, antennae and legs omitted. 37. Male left fore tibia with grasping comb. 38. Male abdominal end, dorsal view. 39. Male left paramere, dorsal aspect of blade above. (Figs. 34-39 redrawn from Andersen 1989a).

connexiva erect throughout their length; tergum 8 large and more or less deflected, concealing proctiger.

Other specimens examined: Apterous males, length 1.75-1.95 mm, width 0.95-1.05 mm; apterous females, length 2.2-2.4 mm, width 0.95-1.05 mm.

Distribution. - Singapore, Malaysia (Johor, Sabah), Indonesia (Java), Philippines (Mindanao, Palawan) (see map, Fig. 44).

Remarks. - Recognised by the relatively short grasping comb of male fore tibia (less than one third of tibial length), long and stout male parameres, and the almost parallel-sided female abdomen with median tumescence on basal abdominal terga and suberect connexiva. In Java collected at light on sea surface together with *Halovelia abdominalis* and species of *Halobates* (Gerridae, Halobatinae), and *Hermatobates* (Hermatobatidae).

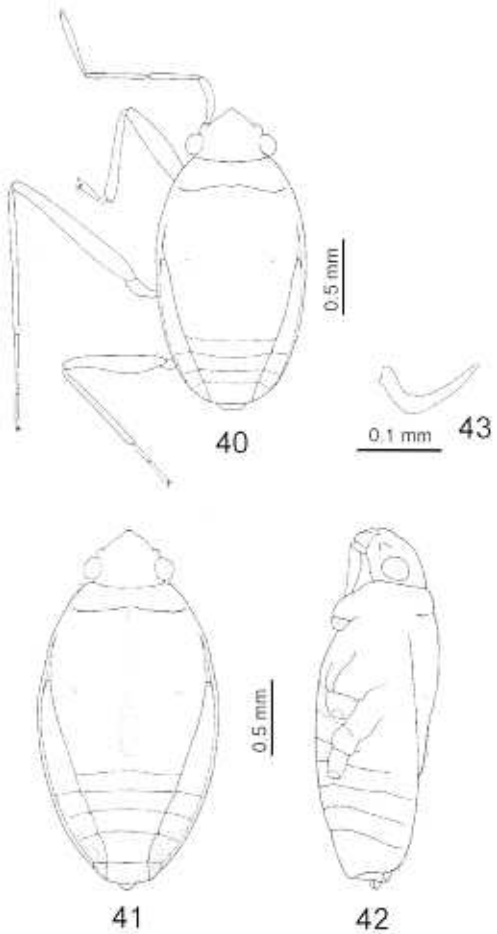
Halovelia halophila Andersen
(Figs. 40-44)

Halovelia halophila Andersen, 1989a: 92-93. Holotype, apterous male: Sumbawa, Indonesia (JTPC, LIPI).

Material examined. - MALAYSIA: 1 male, 1 female (paratypes), Sabah, beaches 2 km NW of Kuala Penyu, 10 Aug.1983, G.F. Hevel & W.E. Steiner (USNM).

Description. - Apterous male: Length 2.00 mm, width 0.96 mm; body broadly ovate (Fig. 40), length about 2.1x greatest width across thorax. Ground colour dark brown or blackish; base of head and posterior pronotum brownish. Body with greyish pubescence which is longer and more dense on abdominal dorsum. Antennae and legs brownish. Ventral surface of body chiefly dark brown. Head length about 0.75x width across eyes (0.41: 0.55); eye width about 0.25x width of head between eyes (0.09: 0.36). Antennae relatively long, about 0.75x total length of insect (1.51: 2.00); lengths of antennal segments 1-4: 0.33, 0.33, 0.40, and 0.46; segment 1 not thicker than segment 4 (0.06: 0.06); segment 2 distinctly shorter than segment 3. Hind margin of pronotum distinct throughout. Lengths of leg segments (femur: tibia: tarsus): fore leg: 0.65, 0.61, and 0.34; middle leg: 1.03, 0.96, and 0.61; hind leg: 0.72, 0.70, and 0.34; grasping comb of fore tibia short, slightly less than 0.2x length of tibia (0.11); middle femur about 0.5x total length of insect; lengths of middle tarsal segments 1 and 2: 0.36 and 0.25; hind femur slightly thicker than middle femur (0.13: 0.11). Abdominal venter not modified. Genital segments relatively small; parameres relatively short, falciform, barely reaching each other above proctiger; blade of each paramere (Fig. 43) slender and nearly straight, apex pointed.

Apterous female: Length 2.36 mm, width 1.18 mm; body broadly ovate (Fig. 41), length 2.0x greatest width across basal abdomen. Colour and vestiture as in male except for a median stripe of silvery hairs on metanotum and basal abdominal terga; connexiva terminated by dense, but rather short, greyish pubescence. Head structure as in male. Antennae about 0.6x total length of insect (1.45: 2.36); lengths of antennal segments 1-4: 0.29, 0.33, 0.39, and 0.45. Thoracic dorsum in lateral view almost flattened (Fig. 42), with short, suberect pubescence which is longer in middle of metanotum and on basal abdominal terga. Lengths of leg segments (femur: tibia: tarsus): fore leg:



Figs. 40-43. *Halovelia halophila* Andersen. 40 Apterous male, dorsal view, antennae and legs of right side omitted. 41. Apterous female, dorsal view, antennae and legs omitted. 42. Apterous female, lateral view, antennae and legs omitted. 43. Male left paramere (Figs. 40-43 redrawn from Andersen 1989a).

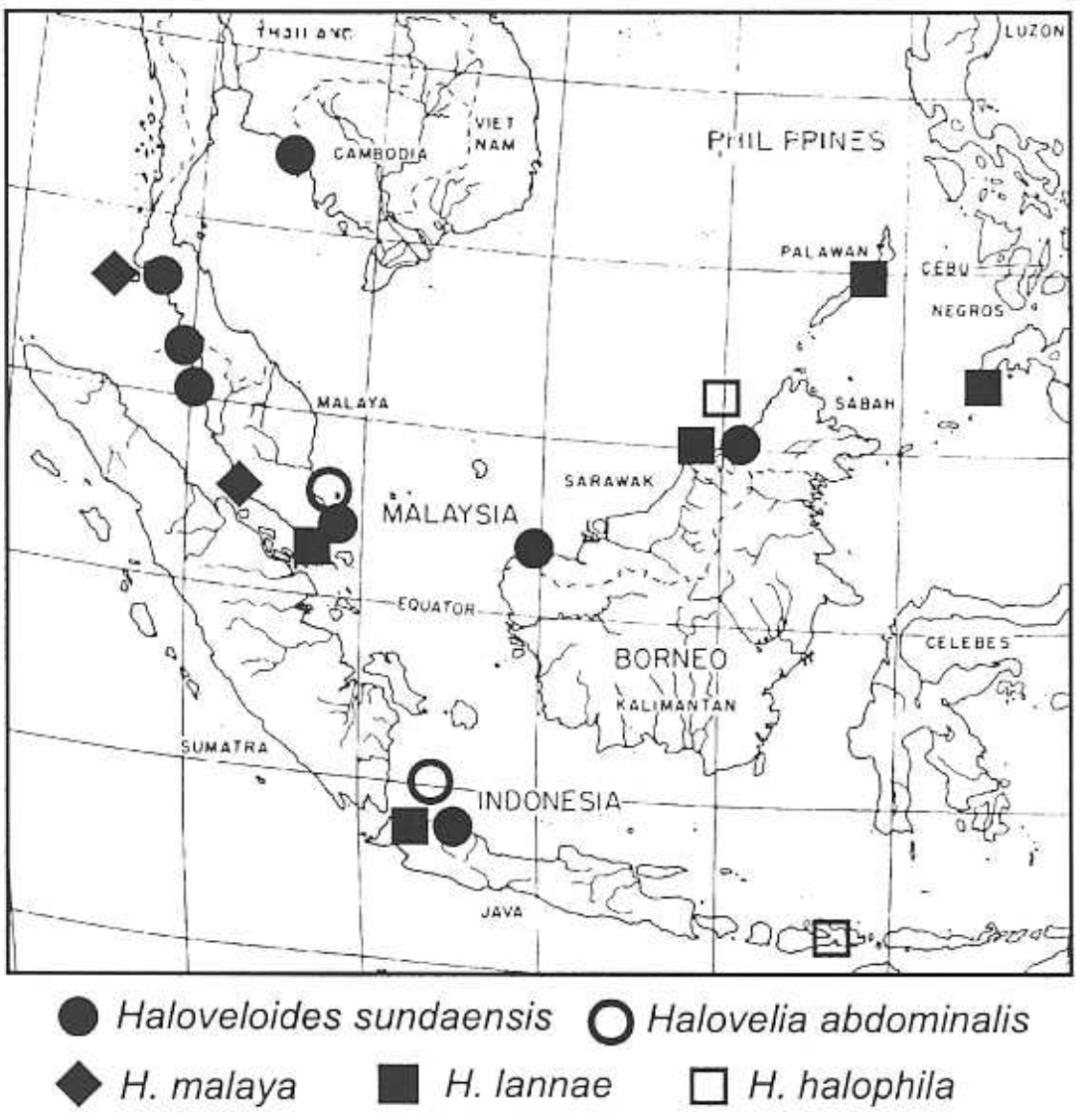


Fig. 44. Map showing distribution of *Haloveloides sundaensis* and four *Halovelia* species in Singapore, Malaysia, and Thailand (including records from Indonesia and the Philippines).

0.65, 0.59, and 0.25; middle leg: 0.95, 0.96, and 0.64; hind leg: 0.73, 0.71, and 0.35; middle femur about 0.4x total length. Abdomen in lateral view relatively high (Fig. 42), in dorsal view (Fig. 41) with broadly rounded sides; connexiva obliquely raised throughout; tergum 8 relatively short, exposing proctiger behind.

Other specimens examined: Apterous male, length 2.0 mm, width 0.95 mm; apterous females, length 2.3-2.4 mm, width 1.15-1.2 mm.

Distribution. - Malaysia (Sabah), Indonesia (Sumbawa) (see map, Fig. 44).

Remarks. - Separated from the previously described *Halovelia* species by the relatively short femora of both sexes, the long antennal segment 3 which is distinctly longer than segment 2, and the structure and vestiture of the female dorsum. Collected together with *Halovelia lannae* at Kuala Penyu, Sabah.

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