

GUIDE TO THE AQUATIC HETEROPTERA OF SINGAPORE AND PENINSULAR MALAYSIA. 6. MESOVELIIDAE, WITH DESCRIPTION OF A NEW *NEREIVELIA* SPECIES FROM SINGAPORE

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ABSTRACT. – This is the sixth part of a series of guide to the aquatic Heteroptera of Singapore and Peninsular Malaysia. A key to three genera and five species of the family Mesoveliidae of Southeast Asia is provided. A new species of *Nereivelia* is described from Singapore mangroves.

KEY WORDS. – Mesoveliidae, *Mesovelvia*, *Nereivelia*, new species, Singapore, Peninsular Malaysia, key.

INTRODUCTION

The family Mesoveliidae are small semi-aquatic bugs (1.0–3.5 mm body length) commonly known as water treaders or pondweed bugs. They usually live on marginal floating vegetation amid stagnant water, slow flowing streams of both freshwater and brackish water, or in moist secretive habitats (e.g. soil or leaf litter of wet forest, under decayed logs on the intertidal mangroves).

The head is usually distinctly prolonged and deflected in front of the eyes, and the eyes are usually large, with 20 to 30 ommatidia in each eye. The eyes of *Cryptovelvia* are vestigial, with only 3–4 ommatidia each. The antennae are long and flagelliform, with segments III and IV longer and thinner than segments I and II. The head bears 3 pairs of cephalic trichobothria dorsally, and the rostrum is long, usually reaching to the metacoxa. A pair of longitudinal ridges is present ventrally on the head of *Cryptovelvia* and *Nereivelia* (Fig. 11). The macropterous form is known only in the genus *Mesovelvia*, and has a pair of ocelli on the posterior part of the head, three closed cells in the forewing, and the scutellum elevated. There are no ocelli in apterous forms. The thoracic segments vary in mid-length among different genera and species. The legs are slender, with the hind leg longest, and the tarsi are three segmented with two apical claws. The abdomen has 7 mediotergites and 5 laterotergites in the male, versus 8 and 6–7 respectively in female. The scent gland orifice is distinct and situated in different positions on mediotergite IV in different genera

and species. The male genital segments are relatively large. Females are larger in size than males, with a well developed ovipositor and serrated gonapophyses (Fig. 16).

The family Mesoveliidae currently contains 12 genera and 46 known species belonging to two subfamilies: Madeoveliinae and Mesoveliinae (Andersen, 1982; Andersen & Polhemus, 2003; Andersen & Weir, 2004). The genus *Mesovelvia* is widely distributed with 27 species, while the other genera are rare, scattered and have restricted ranges of distribution (Andersen & Polhemus, 1980; Andersen, 1999; Andersen & Polhemus, 2003). There are five mesoveliid species in three genera (*Mesovelvia*, *Nereivelia*, *Cryptovelvia*) recorded from Southeast Asia (Fernando & Cheng, 1974; Polhemus & Polhemus, 1989; Murphy, 1990; Yang et al., 1997, 1999; Andersen, 1999).

Mesovelvia is yellowish green in colour with some brownish patterns. They are very common and widespread in fresh water habitats, rarely in estuarine waters. They are frequently found running on the floating leaves of water plants, such as *Lemna*, *Nymphea* and *Pistia*. There are two known species, *Mesovelvia horvathi* Lundblad, 1933 and *M. vittigera* Horváth, 1895 (= *orientalis* Kirkaldy, 1901) (Figs. 1–3) in Southeast Asia. *Mesovelvia vittigera* is an old world species, extremely common and very widespread in Europe, Africa, and Asia to Australia. *Mesovelvia horvathi* is common in south Asia, Japan, the Philippines to New Guinea and Australia (Polhemus & Polhemus, 2000; Andersen & Weir, 2004). Macropterous and apterous forms are known in both

species, but the macropterous form is not common. The macropterous form is larger in size, and often collected by light traps. Zettel and Tran (2009) recorded a possible new species closely related to *M. horvathi* from Pulau Langkawi (northwest coast of Peninsular Malaysia).

Nereivelia is a group of very small bugs (1.70–2.20 mm), dark brown in colour, flightless and living under decayed logs in the intertidal zone of mangrove swamps. *Nereivelia murphyi* Polhemus & Polhemus, 1989 (Figs. 6–9) is so far only recorded from southern Thailand and Singapore. A second species, *N. polhemorum*, new species from the same habitats in Singapore is described here.

A key to the genera and species of Mesoveliidae is provided, including the genus *Cryptovelia* which is so far only recorded from the moist soil-litter of a rainforest in Sarawak, East Malaysia (Andersen, 1999), but further exploration may prove it to have a wider distribution in the region.

The material used for this study consists primarily of alcohol-preserved specimens and some dry-mounted specimens in the Zoological Reference Collection (ZRC), National University of Singapore. Specimens of *Austrovelia queenslandica* Malipatil & Monteith, 1983 were loaned from the CSIRO (Australia). All measurements are given in millimetres. Measurements of the new species refer to the holotype and allotype. The holotype and paratypes are deposited in ZRC, with additional paratypes in the Natural History Museum of Vienna, Austria (NHMW) and the Bernice P. Bishop Museum, Honolulu (BPBM).

KEY TO GENERA AND SPECIES OF MESOVELIIDAE

1. Body slender, size 2.0–3.5 mm in male. Head length distinctly less than thorax length. Pronotum mid-length shorter or subequal to mesonotum in apterous form. Stout spines on antennae and legs. Apterous and macropterous 3 *Mesovelia*
 - Body shorter or suboval in shape, size about or less than 2 mm. Head prolonged, subequal length to thorax. Pronotum longer than mesonotum. Spines absent on antennae and legs. Only apterous form known 2
2. Eyes vestigial with 3–4 ommatidia. Mesonotum about 2 times the length of metanotum (Fig. 5); size small, 1.0–1.5 mm *Cryptovelia* (one species, *stysi* Andersen, recorded from Sarawak).
 - Eyes large with 24–30 ommatidia. Mesonotum subequal to length of metanotum, size larger, 1.70–2.20 mm 4 *Nereivelia*
3. Posterior margin of middle femur with only 1–2 black spines distally in both sexes, male abdominal sternum VIII without middle black hairs, anteriorly with a pair of black tuft of hairs (Figs. 1, 2) *M. horvathi* Lundblad
 - Posterior margin of middle femur armed with row of black spines (10–17) in both sexes. Male abdominal sternum VIII with a tuft of stout black hairs on the middle and one paired patch of pale hairs laterally (Fig. 3) *M. vittigera* Horváth

4. Mid-length of pronotum subequal to combined length of meso- and metanotum. Scent gland orifice before middle of mediotergite IV. Male posterior margin of abdominal tergite VIII simple (Figs. 6–9) .. *N. murphyi* Polhemus & Polhemus
 - Mid-length of pronotum greater than combined length of meso- and metanotum. Scent gland orifice behind middle of mediotergite IV. Male posterior margin of abdominal tergite VIII concave (Figs. 10–16) *N. polhemorum*, new species

FAMILY MESOVELIIDAE Douglas & Scott

Mesovelia Mulsant & Ray

Mesovelia horvathi Lundblad

(Figs. 1, 2)

Mesovelia horvathi Lundblad, 1933: 190 (type locality, Sumatra).

Mesovelia japonica Miyamoto, 1964: 199 (Synonymised by Polhemus & Polhemus 2000:208).

Material examined. – SINGAPORE: numerous apterus males, females and a few macropterous forms collected from different locations in vegetated pools, ponds, reservoirs, sides of streams, 1980 – 2002.

W. MALAYSIA (all apterus form unless stated): **Johore:** 10 males, 6 females, Pontain, coll. C.M. Yang, 4 Mar. 1992; 1 female, Gunong Pulau, 20 May 1993; 4 males, 1 female, Endau Rompin, Sungei

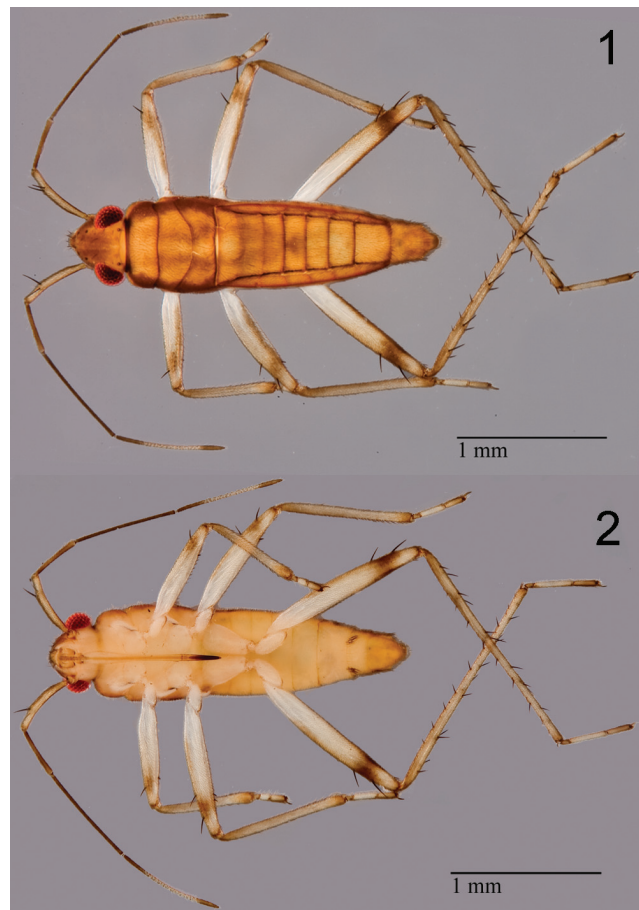


Fig. 1–2. *Mesovelia horvathi* Lundblad. 1. apterous male, dorsal view; 2. apterous male, ventral view.

Pantai Burung, coll. C.M. Yang, 13 Jul. 2001; 1 male, Sungei Temantang, Mawai, coll. H.K. Lua, 24 Feb. 1995; **Selangor**: 1 macropterous male, Templer Park, coll. C.M. Yang, 15 Nov. 1995; 10 males, 6 females, Ulu Gombak, coll. H.K. Lua, 6 May 1996; 2 males, North Selangor peat swamp, Coll. H.K. Lua, 17 Jun. 1991; **Pahang**: 12 males, 13 females, Pulau Tioman (Sungei Keliling, Sungei Paya, Sungei Dungun), Jun. 1997; 1 macropterous male, Lake Chini, coll. M. Balke, 17 Apr. 1997; 1 male, 4 females, Sungei Belat, coll. B. Tan & G. Sumita, 15 May 1995; **Parak**: 4 females, Sungei Kenderong, Grik, coll. H.K. Lua, 21 Feb. 1997; 1 male, 2 females, Sungei Lebey, coll. H.K. Lua, 17 Feb. 1997; **Perlis**: 1 macropterous male, 4 females, Sintok Padang, coll. H.K. Lua, 19 Feb. 1997; **Trengganu**: 1 male, 2 females, coll. H.K. Lua, 28 Oct. 1998; 1 male, Sekayu, coll. B. Tan & G. Sumita, 16 May 1995; 2 males, Pulau Redang, coll. H.K. Lua, 25 Jun. 1992.

Remarks. – This species is very common in Singapore and Malaysia, also collected from brackish water. Widespread from China, Japan to Australia (Polhemus & Polhemus, 2000; Andersen & Weir, 2004).

***Mesovelgia vittigera* Horváth**
(Fig. 3)

Mesovelgia vittigera Horváth, 1895: 160 (type locality Egypt).

Mesovelgia orientalis Kirkaldy, 1901: 808 (described from Sumatra; synonymised by Horváth, 1915).



Fig. 3. *Mesovelgia vittigera* Horváth, apterous male, ventral view.



Fig. 4. *Nereivelia polhemorum*, new species, apterous female, dorsal view.

Material examined. – SINGAPORE: numerous apterus males, females and a few macropterous forms collected from different locations of Singapore, both freshwater and brackish water habitats, 1980 – 2002.

W. MALAYSIA (all apterus form unless stated): **Johore**: 5 macropterous males, 21 males, 27 females, Pontain, coll. K.L. Yeo, 14 May 1992; 3 males, 1 macropterous male, 5 females, Layang Layang, coll. C.M. Yang, 4 Mar. 1991; 1 female, Tg. Sedili, Mawai, coll. K.L. Yeo, 15 Jul. 1992; **Malacca**: 1 macropterous female, Alor Gajah, 28 Oct. 1963; **Selangor**: 2 macropterous males, 1 macropterous female, Kuala Selangor, coll. K.L. Yeo, 15 May 1991; 1 female, Ulu Gombok, 22 Nov. 1995; **Pahang**: 13 males, 20 females from Pulau Tioman (Sungei Raya, Sungei Genting, Sungei Paya, Sungei Keliling, Sungei Kelepak), Jun. 1997; 1 female, Lake Chini, Coll. K.L. Yeo, 16 Apr. 1997; **Kelantan**: 4 macropterous males, 2 males, 6 macropterous females, 1 female, Sungei Hulu Besut, coll. H.K. Lua, 20 Mar. 1992; **Trengganu**: 2 males, 9 females, North Rantau, Abang, swamp, coll. H.K. Lua, 18 Mar. 1992.

Remarks. – This species is less common than *Mesovelgia horvathi* in our collections from Singapore and Malaysia. Widespread in warm area in Europe, North Africa, and Asia to Australia (Polhemus & Polhemus, 2000). Both species also recorded from Pulau Langkawi (Zettel & Tran, 2009).

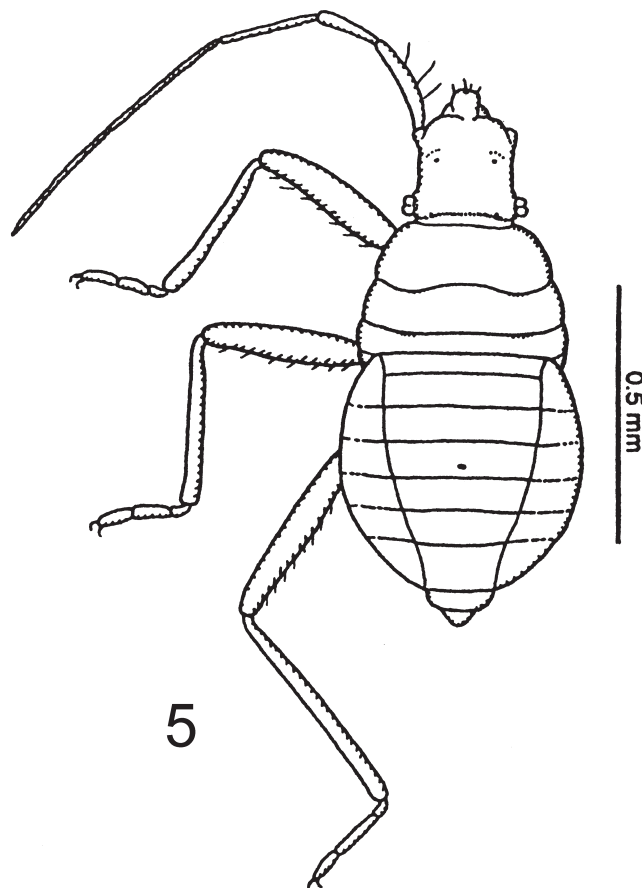


Fig. 5. *Cryptovelgia stysi* Andersen, apterous male, dorsal view (after Andersen, 1999).

Nereivelia Polhemus & Polhemus

Nereivelia murphyi Polhemus & Polhemus

(Figs. 6–9)

Nereivelia murphyi Polhemus & Polhemus, 1989: 73–82 (type locality Thailand).

Material examined. – SINGAPORE: 1 apterus male, Sungei Buloh East, mangrove, coll. D.H. Murphy, 22 Mar. 1992; 2 apterus females, Sungei Buloh East, mangrove, coll. D.H. Murphy, 21 Jul. 1987 and 8 Apr. 1992.

Remarks. – This species is very rare and only known from mangroves of Thailand and Singapore. Living in cavities of decayed logs in intertidal mangrove swamps.

Nereivelia polhemorum, new species

(Figs. 4, 10–16)

Material examined. – All specimens apterous. Holotype and allotype: Singapore, Mandai mangroves, under wet wood on intertidal muddy ground at 2.3 m above chart datum. 20 Mar. 1992, coll. D. H. Murphy (ZRC).

Paratypes: SINGAPORE: 4 males, same data as holotype; 2 males, 1 female, Sungei Buloh East mangroves, under imbedded timber on very wet muddy ground 2.4m above marine datum (above mean HWN) in air filled cavities, along with abundant Collembola (*Axelsonia* and *Dicranocentrus*), 22 Mar. 1992, coll. D.H. Murphy; 1 female, Sungei Buloh East mangroves, on lobster mound surface, 2.6m above marine datum, 1 Mar. 1991, coll. D. H. Murphy; 1 female, Sungei Buloh mangroves, on lobster mound surface, 22

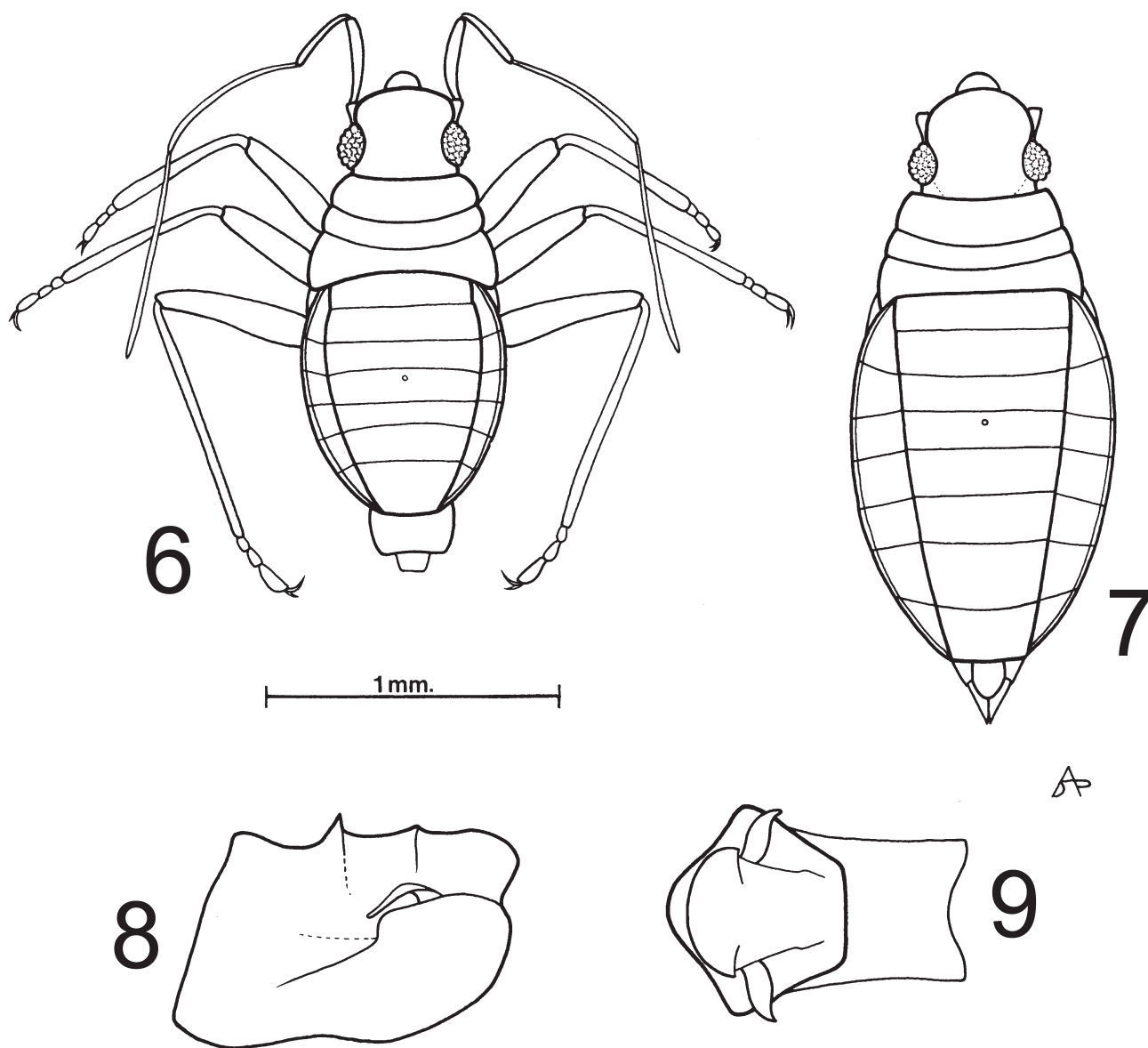


Fig. 6–9. *Nereivelia murphyi* Polhemus & Polhemus (after Polhemus & Polhemus, 1989). 6. apterous male, dorsal view; 7. apterous female, dorsal view; 8–9. male abdominal terminalia; 8. lateral view; 9. dorsal view.

Mar. 1992, coll. D. H. Murphy; 1 male, 1 female, Sungei Buloh mangroves, 12 Apr. 1999, coll. D. H. Murphy (ZRC, NHMW, BPBM).

Size. – males 1.70–1.85 (holotype 1.80, width 0.69); females 1.90–2.09 (allotype 2.03, width 0.81).

Description of holotype. – Body dark brown, lighter brown on legs and antenna, darker on thorax. Body elongate oval, covered with fine and coarse semi-erect hairs, denser on abdomen (Fig. 10).

Head moderately sub-quadrate; matte, broadly rounded anterior and strongly deflected. Head almost as long as width across eyes (0.39:0.38). Interocular space 0.21. Three equally spaced trichobothria present. A longitudinal row of pits present on vertex, diverging dorsally and meeting at posterior margin of head; some small shining disc-like plates present near interocular space. Eye normal, large, spherical with about 24 ommatidia, and two long and curved ocular setae. Ocelli absent. Venter of head with a broad, raised, ridged plate, widening posteriorly, demarcated by a very low longitudinal carina on each side (Fig. 11). Rostrum

extending beyond hind coxa, length of segments III:IV, 0.67:0.18. Antenna long, slender and flagelliform, slightly shorter than body length (1.71:1.80). Segments I and II thick, without spines, III and IV much longer, flagelliform with long setae; segment II shortest. Length of antenna segments I–IV, 0.32:0.18:0.58:0.63.

Thorax length along midline subequal to head length (0.41:0.39), matte, lateral margins rounded. Dorsal margins with groups of small shining disc-like plates (Figs. 12, 13). Pronotum longest on midline, slightly longer than combined length of meso- and metanotum which are almost subequal in length (0.22:0.10:0.09). Posterior margins of pro- and mesonotum straight, that of metanotum curved in middle. Greatest width of thorax (metanotum) slightly narrower than greatest abdomen width (0.65:0.69). Legs slender, covered with setae, without spines. Hind leg longest. Fore femur slightly more incrassate than other femora. Tibiae slender, equal or subequal length to fore- and mid-femur. Hind tibia longest. Tarsi with three segments, tarsal III almost 2 times the length of tarsal I; all tarsi bearing two equal terminal claws.

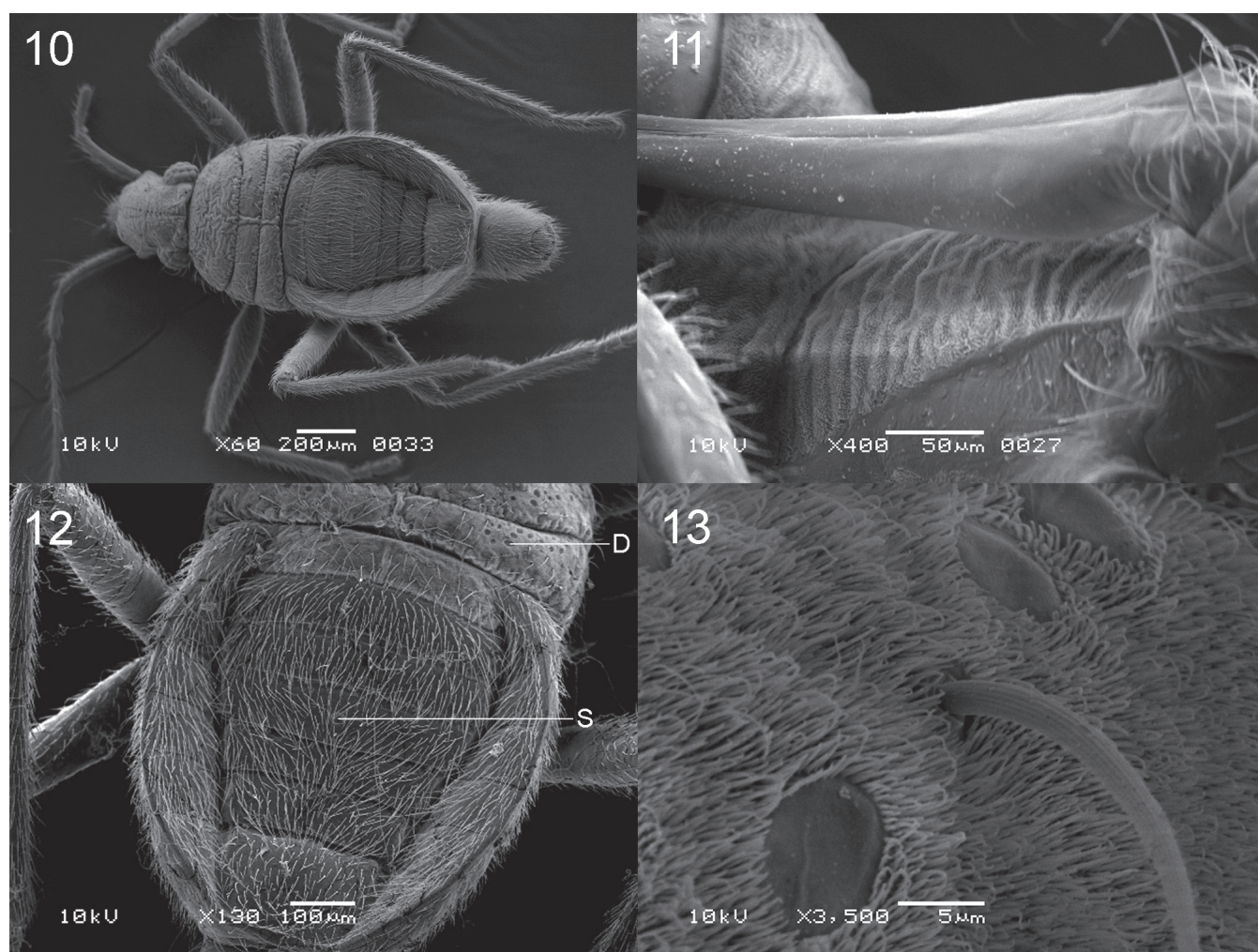


Fig. 10–13. *Nereivelia polhemorum*, new species. 10. apterous male, dorsal view; 11. lateroventral view of head showing the longitudinal carina and the raised ridged plate; 12. dorsal view of abdomen and thorax, showing disk-like plates (D) and the scent orifice (S); 13. surface of thorax showing disc-like plates.

Measurements of legs of holotype

	Femur	Tibia	Tarsal I	Tarsal II	Tarsal III
Fore leg	0.52	0.52	0.048	0.048	0.085
Middle leg	0.52	0.54	0.048	0.054	0.097
Hind leg	0.69	0.78	0.061	0.073	0.115

Abdomen broad, shining, covered with dense and long semi-erect setae. Mediotergites tapering in width towards the abdominal apex. Tergite I more shining and with less setae. Tergites II–IV same length, tergite V shortest, tergite VII longest. Length of tergites I–VII, 0.07:0.09:0.09:0.09:0.06:0.08:0.23. Scent orifice distinct, located slightly behind

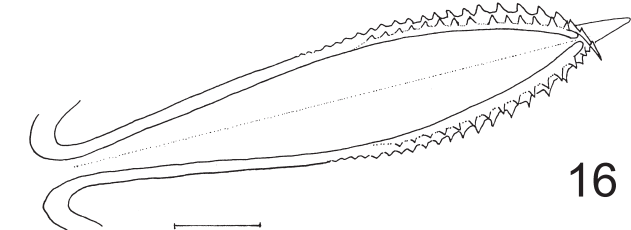
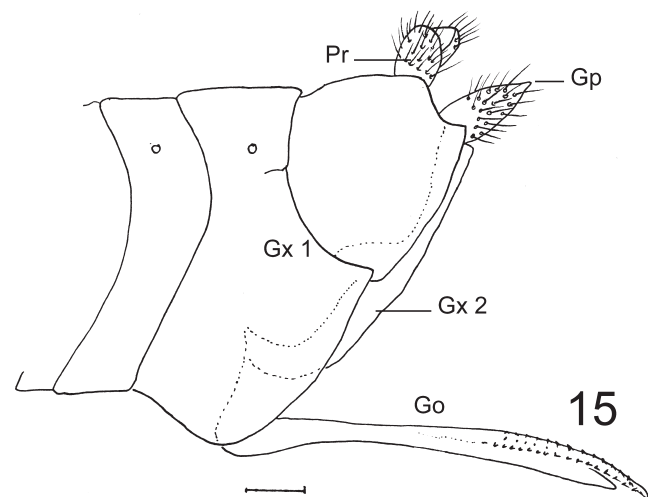
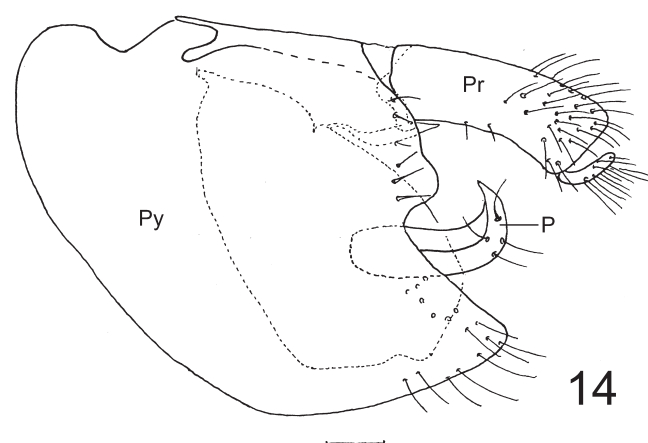


Fig. 14–16. *Nereivelia polhemorum*, new species. 14. male abdominal terminalia, lateral view showing paramere (P), proctiger (Pr), pygophore (Py); 15. Female abdominal terminalia, lateral view showing gonocoxa 1 (Gx1), gonocoxa 2 (Gx2), gonoplac (Gp), proctiger (Pr) and gonapophyses (Go); 16. Ovipositor. Scale bars: 0.1 mm.

middle on tergite IV (Fig. 12). Laterotergites broad and slightly raised. Laterotergite IV broadest (0.13).

Genital segments relatively large and distinctly protruding from the pregenital abdomen. Longer than width (0.30:0.27). Posterior margin of segment VIII concave. Pygophore subovate, proctiger rectangular. Paramere small and symmetrical curved dorsally with pointed apex (Fig. 14).

Description of allotype. – Similar in structure to male. Head length, 0.46; width across eyes, 0.43; Length of antenna segments I–IV, 0.30:0.18:0.60:0.64. Thorax shorter in length to head (0.38:0.46). Pronotum length greater than combined length of meso- and metanotum, 0.21:0.090:0.083. Body width gradually increase from thorax (max. width: 0.72) to abdomen tergite V (width 0.81) and tapering toward the tip of abdomen (Fig. 4).

Measurements of legs of allotype

	Femur	Tibia	Tarsal I	Tarsal II	Tarsal III
Fore leg	0.55	0.55	0.048	0.048	0.097
Middle leg	0.56	0.56	0.048	0.050	0.097
Hind leg	0.73	0.78	0.061	0.073	0.109

Abdomen broad, length 1.18, tergite I shortest, tergite II equal in length to tergite VI, tergites III–V same length, tergite VIII longest. Length of tergites I–VIII, 0.09:0.12:0.10:0.10:0.10:0.12:0.15:0.19. Laterotergites broad, slightly raised. Genital segments relatively large. First gonocoxa large, gonoplac and proctiger small (Fig. 15). Ovipositor large, gonapophyses elongate with strongly serrated teeth (Fig. 16).

Macropterous form unknown.

Distribution. – Currently known only from the mangroves in Sungei Buloh and Mandai in Singapore.

Etymology. – The specific epithet dedicates this species jointly to father and son, John T. and Dan A. Polhemus whose generous guidance have been invaluable in our work with the aquatic Heteroptera.

Ecology. – *Nereivelia polhemorum* was found in the same habitat as the *N. murphyi* Polhemus & Polhemus, mostly under decayed logs on the intertidal zone of mangroves. They shelter in the air filled cavities of the dead wood during high tide and emerge during low tide to feed on small arthropods (Murphy pers. obs.). *Nereivelia* is now very rare in Singapore; several efforts have been made to obtain more material but failed. This is because of the “International Coastal Cleanup Program” of clearing “unsightly” timber and polyethylene bags from the mangroves since 1997 (Ng & Sivasothi, 1999), which effectively removed the air filled cavities which are inhabited by many enigmatic arthropods.

Remarks. – *Nereivelia polhemorum* shares the same characters with *Austrovelia queenslandica* Malipatil & Monteith, by having the scent orifice opening behind

Table 1. Differences between *Austrovelia queenslandica*, *Nereivelia murphyi* and *N. polhemorum*, new species.

	<i>Austrovelia queenslandica</i>	<i>Nereivelia murphyi</i>	<i>Nereivelia polhemorum</i>
Size (mm.); Shape	0.95–1.50; broad oval	1.70–2.20; elongate oval	1.70–2.09; elongate oval
Ventral Head	plate-like raised with distinct ridges; strongly carinate	plate-like raised, weak ridges; weakly carinate	plate-like raised, weak ridges, weakly carinate
Eyes	normal or reduced, ca 20 ommatidia	normal, ca 30 ommatidia	normal, ca 24 ommatidia
Thorax	Surface normal	surface with low tubercles	surface with disc-like plates on dorsal margins
mid-length of segments I:II:III	TI = TII + TIII (0.10 : 0.05 : 0.05)	TI = TII + TIII (0.15 : 0.07 : 0.07)	TI > TII+ TIII (0.22 : 0.10 : 0.09)
Posterior margin of metanotum	curved	straight or slightly curved	slightly curved
Abdomen	swollen, dorsal strongly convex	normal	normal
Mediotergite I : II	MI < 1/2 as long as MII	MI subequal length to MII	MI subequal length to MII
Scent orifice of mediotergite IV	behind middle	before middle	slightly behind middle
Lateral abdominal pleura	simple	with longitudinal sulcus	simple
Laterotergites	narrow	broad and slightly raised	broad and slightly raised
Posterior margin of male abdomen 8	concave	simple	concave

the middle of mediotergite IV, and by the absence of a longitudinal sulcus on the abdominal pleura (see tables by Polhemus & Polhemus, 1989 and Andersen & Polhemus, 2003). However, *Austrovelia* differs from the former in the distinctive dorsally swollen abdomen and the body size. We have examined paratypes of *A. queenslandica* and listed their characters for separating the two genera in Table 1. Our new species of *Nereivelia* resembles the type species, *N. murphyi*, by its body size and shape. It can be distinguished by the thorax having lesser and shorter setae and shining disc-like plates, by the scent gland orifice situated slightly behind middle of mediotergite IV, and by the concave posterior margin of male abdominal segment VIII. Other differences between the two species are summarised in Table 1.

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