

THE WATER BUGS (HEMIPTERA: NEPOMORPHA AND GERROMORPHA) OF VANUATU

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The water bugs of Vanuatu are summarized, based on material collected by H. Smit and literature records. One new species is described from Vanuatu: *Microvelia (Pacifcovelia) trichota* sp.n. Keys to the 14 species known from Vanuatu are presented.

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Key words. – Nepomorpha, Gerromorpha, new species, Vanuatu, keys.

During his field survey in Vanuatu in 2003, H. Smit (Dept. of Entomology, Zoological Museum, University of Amsterdam) collected some aquatic macrofauna on request of the Department of Natural Resources at Port-Vila. The samples of aquatic bugs were forwarded for identification. In the samples, six families, eight genera and nine species are recognized. Among them, one species is new to science, viz. *Microvelia trichota* sp. n. (Veliidae).

Most of the waterbugs treated here have previously been reported from Vanuatu when it still went under the name New Hebrides. Apart from the outdated survey of Laird (1956), the records are scattered throughout the specialised literature, which could be the reason that the local people know little about them. Therefore we consider it useful to present all the known species of aquatic bugs from the islands in order to enable an easier identification.

The keys are presented below as an introductory guide, and take into account adults of the known Vanuatuan bugs only. However, as these islands have been sampled superficially only, additional collecting, especially at higher elevations, will probably produce additional species. Thus, some genera which are almost certainly occurring in the island have been added in the keys. For more complete keys to generic level one is referred to Andersen & Weir (2004) or Chen et al. (in press). Material can be sent to the authors for verification.

Measurements are in mm, based on five specimens. Size is given as range with mean underlined and the

value of the holotype between braces {}. Other measurements are given as the mean only. Descriptions and measurements follow the formats of Andersen & Weir (2003a). References to family- and genus-group names are omitted; they can be found in Stys & Jansson (1988) for Nepomorpha and in Andersen (1982) for Gerromorpha. An introduction to the water bugs of Malesia can be found in the forthcoming publication of the authors (Chen et al. 2005).

Most specimens have been deposited in the Department of Entomology of the Zoological Museum of the University of Amsterdam (ZMAN), some reference specimens are in the Nieser collection (NCTN).

ACKNOWLEDGEMENTS

The authors sincerely thank H. Smit (ZMAN) for collecting and making the material available for study, W. Hogenes and G. Tweehuizen (ZMAN) for providing important literature, and Dr. H. Zettel (Natural History Museum, Vienna, Austria) for critical reading and suggesting some improvements to the manuscript.

SYSTEMATIC PART

Nepomorpha

Nepomorpha are essentially the Heteroptera living in water. A few species live in damp situations at the edge of water. The species which are likely to occur in

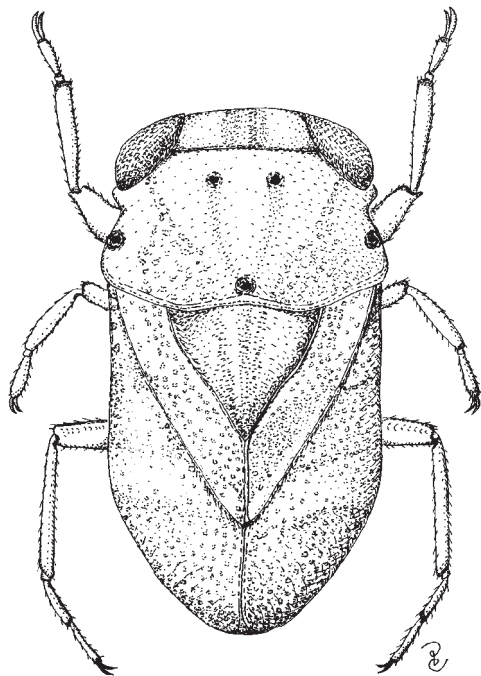


Fig. 1. *Paraplea lituralis*, male, length 1.6 mm (reproduced from Chen et al. 2005).

Vanuatu can all be recognized by having the antennae shorter than the head and not visible from above.

Key to Vanuatuan families and genera of *Nepomorpha*

1. Rostrum narrow, tube-shaped, and consisting of 4 well defined segments (fig. 5) 2
 - Rostrum wide, triangular, not segmented but provided with transverse grooves (fig. 7) 5
2. Fore femur strongly thickened and with a groove, in which tibia and tarsus fit, semiterrestrial species, (fig. 35) (Gelastocoridae) *Nerthra*
 - Fore femur not strongly thickened, truly aquatic species 3
3. Small species, length about 1.5 mm (fig. 1) (Pleidae) *Paraplea liturata*
 - Larger species, length over 3 mm (figs. 2, 3) (Notonectidae) 4
4. Lateral margins of pronotum smooth, hemielytral commissure with a hair-lined pit at its base (fig. 2) *Anisops*
 - Lateral margins of pronotum with large pits (foveae), hemielytral commissure without a pit at

- its base (fig. 3) *Enithares bebridensis*
- 5. Larger species, length over 3 mm, scutellum covered by pronotum, at most its tip visible (fig. 4) (Corixidae) *Sigara*
 - Small species length about 2 mm, scutellum fully exposed (fig. 12) (Micronectidae) *Micronecta*

FAMILY GELASTOCORIDAE (fig. 35)

No species of this family has been recorded from Vanuatu so far. A species which could be found is *Nerthra macrothorax* (Montrouzier, 1855). This species is widespread from Tonga and North Australia through New Guinea and the Malay Archipelago to Japan, Taiwan and the Comores. *N. macrothorax* is an 8-9 mm long bug which can be separated from other species of *Nerthra* (which is the only genus of Gelastocoridae occurring in Asia) by the combination of the following characteristics: ocelli absent, hemielytra entirely coriaceous (i.e. membrane totally absent), fused together, and with at least one pair of submarginal carinae running from base to at least halfway the hemielytron; front of head with distinct round tufts of scales. As far as known *Nerthra* species are active at night, several species have been found remote from water. At day time they hide in wet mud or sand or under stones or plant debris (Chen et al. 2005). *N. macrothorax* has been found on beaches under and burrowing in decaying plant debris, notably leaves and logs of *Pandanus*, e.g. burrowing in the sand on a beach in the south of Taiwan Island (personal observation). In view of its inability to fly, its wide distribution is attributed to dispersion by drift on plant debris (Todd 1959, 1960).

FAMILY CORIXIDAE

The only record from Vanuatu is an unidentified species of the genus *Sigara* Fabricius, 1775 by Laird (1956). It may concern either *S. tadeuszi* Lundblad, 1933 or *S. truncatipala* (Hale, 1922) which are both known from Australia and New Caledonia (Polhemus & Herring 1970). For identification of *Sigara* species, see Lansbury (1970) and Andersen & Weir (2004).

FAMILY MICRONECTIDAE

This family has not been recorded from Vanuatu yet. Two species of the genus *Micronecta* Kirkaldy, 1897 are known from the Solomon Islands (Wróblewski 1962). As these small bugs escape easily from the attention of collectors, a species of this genus might still be found in Vanuatu.

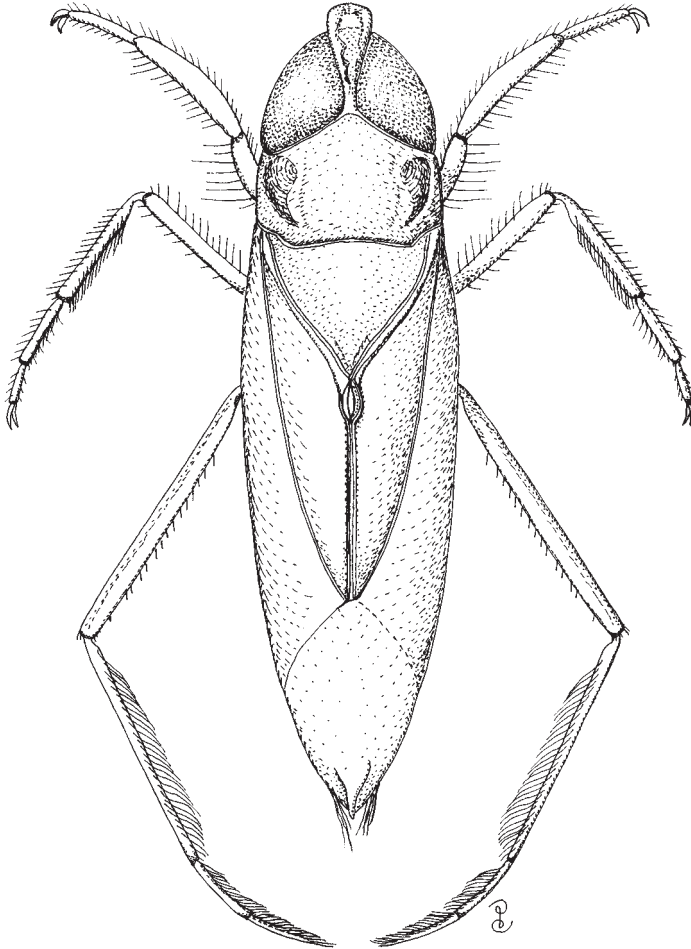


Fig. 2.
Anisops nasutus, male, length
7.2 mm (reproduced from
Chen et al. 2005).

FAMILY NOTONECTIDAE

Genus *Anisops* Spinola, 1837

In *Anisops* males are recognizable by having one-segmented fore tarsi, whereas females have two-segmented fore tarsi. In addition, the third rostral segment of the male has lateral outgrowths, the rostral prongs (fig. 5, p) and the fore tibia has a proximal row of teeth located on an elevation, the stridulatory comb (fig. 8, s).

Key to males of *Anisops* recorded from Vanuatu

- 1. In dorsal view head with a distinct projection in front of eyes *A. nasutus*
- In dorsal view head rounded or truncate anteriorly,

- not projecting in front of eyes 2
- 2. Small species, length 5.1-5.5 mm, tylus laterally compressed to form a median carina which proceeds on the basal two thirds of the frons (fig. 5) *A. tabitiensis*
- Larger species, length 5.5-7.5 mm, tylus flat, without carina 3
- 3. Length 6.9-7.6 mm, maximum width 1.5-2.3 mm; fore tibia wide, length about four times its width (fig. 8); stridulatory comb with about 25 teeth in an uninterrupted row (fig. 9) *A. leucotheca*
- Length 5.5-6 mm, maximum width 1.0-1.75 mm; length of fore tibia about five times its width (fig. 10); stridulatory comb with about 25 teeth in a broken row (fig. 11) *A. cheesmanae*

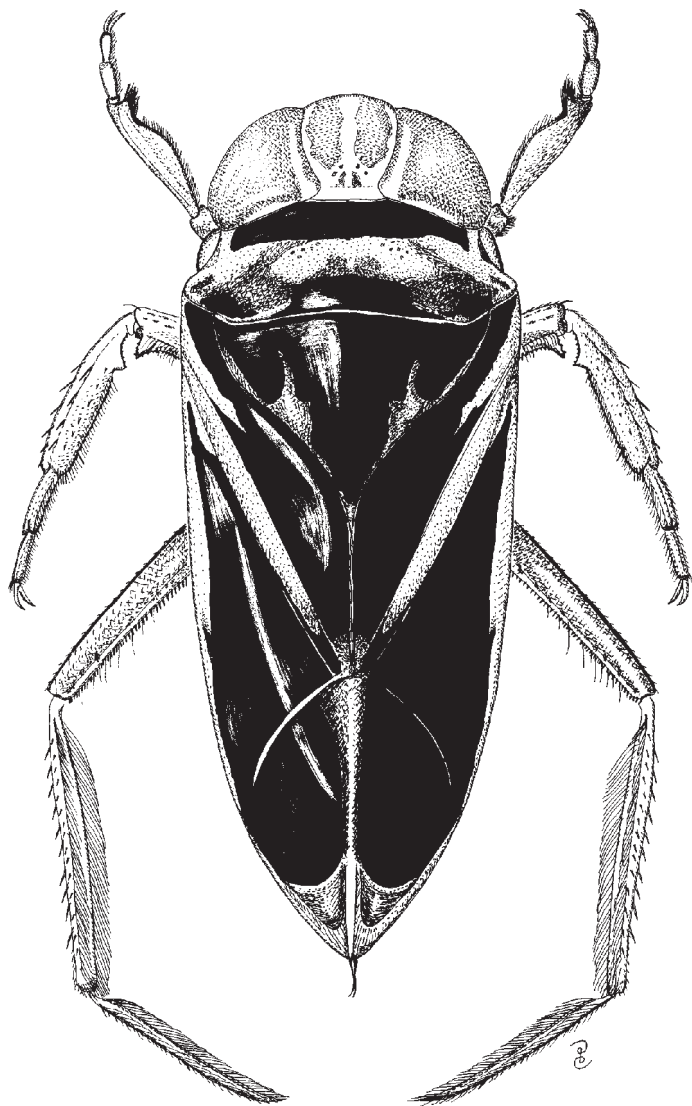


Fig. 3. *Enithares* sp., habitus (reproduced from Chen et al. 2005).

Anisops leucotheca Esaki new record
(figs. 8-9)

Anisops leucotheca Esaki, 1928: 76-80.

Anisops leucotheca; Brooks 1951: 394-395 (redescription).

Material examined. – VANUATU: Efate, cattle pond S of Rentapao Bridge, 17°48.440S, 168°26.917E, 26.x.2003, leg. H. Smit. 1 ♂ 2 ♀. New record for Vanuatu.

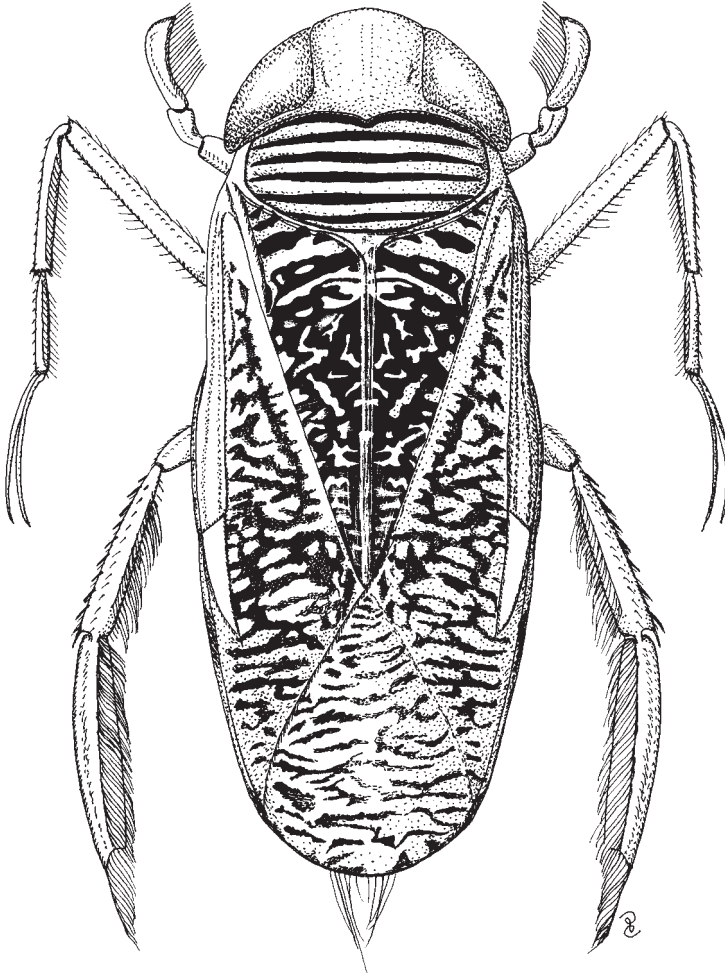
Distribution

Samoa, Vanuatu, Solomon Islands, East New Guinea (Wallis Island) (Brooks 1951, Lansbury 1965, Chen et al. 2005).

Remarks

Lansbury (1965) suggests that *A. leucotheca* may be the flightless form of *A. occipitalis* Breddin. The indirect flight muscles checked in the studied male were

Fig. 4.
Sigara sp., habitus (reproduced from Chen et al. 2005).



not developed, whereas the indirect flight muscles of specimens of *A. occipitalis* from West Malaysia (Nieser 2004) were well developed, which is supporting Lansbury's hypothesis.

Anisops tabitiensis Lundblad
(fig. 5)

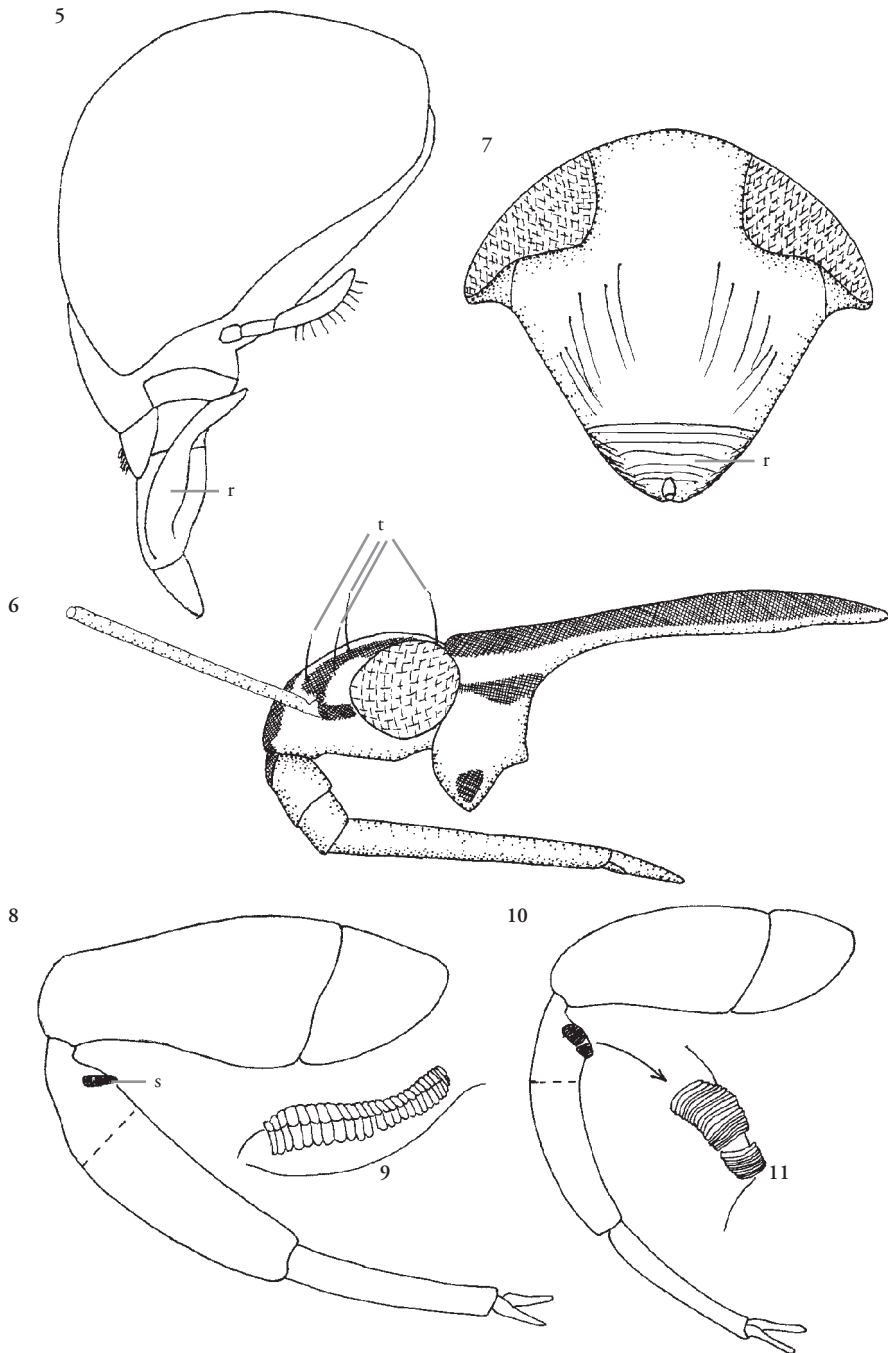
Anisops tabitiensis Lundblad, 1934: 121-123
Anisops tabitiensis; Brooks 1951: 376-278 (redescription)
Anisops tabitiensis; Lansbury 1963: 5-6.

Material examined. – VANUATU: Efate, lake Enam Lep, 17°48.568S, 168°29.269E, 25.x.2003, leg. H. Smit, 1 ♂;

Efate, pond along the road to White Sands, 17°47.180S, 168°29.921E, 26.x.2003, leg. H. Smit, 1 ♂; Efate, cattle pond S of Rentapao Bridge, 17°48.440S, 168°26.917E, 26.x.2003, leg. H. Smit, 1 ♂ 1 ♀.

Distribution

Tahiti, Vanuatu, Solomon Islands, Australia, East New Guinea, Philippines (Mindanao), West Malaysia, Vietnam. In Vanuatu the species was recorded by Lansbury (1963) from Espiritu Santo and Malekula, and by Brooks (1951) from 'New Hebrides: Oman'.



Figs. 5-10. Nepomorpha structure. – 5, *Anisops tabitiensis*, head in lateral view; p = rostral prong r = rostrum; 6, *Limnogonus* sp., head and pronotum, lateral view, only first antennal segment shown, t = trichobothria; 7, *Sigara* sp., head in frontal view, r = rostrum; 8-9, *Anisops leucothecus*, male, fore leg, stippled line indicates measurement of width of tibia, s = stridulatory comb (detail in 9); 10-11, *A. cheesmanae*, male (adapted from Lansbury 1963), fore leg, stippled line indicates measurement of width of tibia; (11 detail of stridulatory comb). (7 reproduced from Chen et al. 2005).

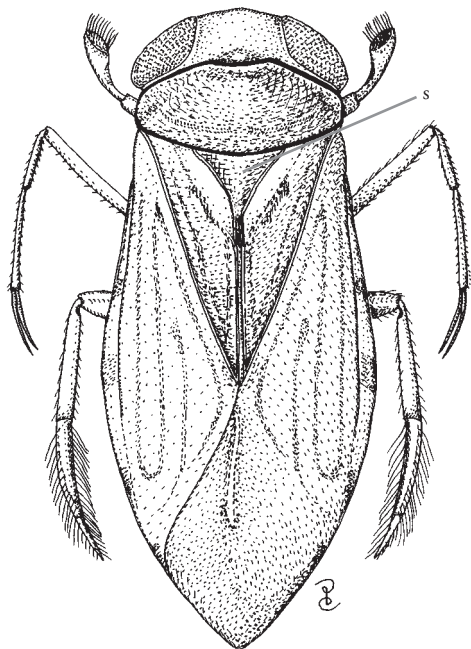


Fig. 12. *Micronecta* sp., habitus, s = scutellum (reproduced from Chen et al. 2005).

Anisops cheesmanae Lansbury
(figs. 10-11)

Anisops cheesmanae Lansbury, 1963: 6-9.

Not represented in the material studied.

Distribution

This species was described from Vanuatu: Erromanga and Malekula, not recorded since its description.

Anisops nasutus Fieber
(fig. 2)

Anisops nasuta Fieber, 1851: 60-61.
Anisops nasuta; Lansbury 1963: 6.

Not represented in the material studied.

Distribution

E. India through continental SE Asia, China, Philippines and Indonesia to New Guinea and Australia, also widespread in Pacific Islands (Nieser & Chen 1999). In Vanuatu recorded from Dolphin Island near Espiritu Santo and Gaua by Lansbury (1963).

Genus *Enithares* Spinola, 1837

Only one species has been recorded from Vanuatu (Lansbury, 1968).

Enithares hebridensis Lansbury

Enithares bergrothi Laird, 1956: 74 (non Montandon).
Enithares hebridensis Lansbury, 1968: 383-384.

Material examined. – VANUATU: Espiritu Santo, Butmas stream, 15°20.605S, 166°58.553E, 29.x.2003, leg. H. Smit, 4 larvae.

Distribution

Endemic in Vanuatu, recorded from Aneityum, Efate, Erromanga, Espiritu Santo, Gaua and Tanna (Lansbury 1968).

FAMILY PLEIDAE

Only one genus *Paraplea* Esaki & China, 1928, with one species, has been recorded from Vanuatu.

Paraplea liturata (Fieber)
(fig. 1)

Plea liturata Fieber, 1844: 297.
Plea rufonotata; Laird 1956: 74.

Material examined. – VANUATU: Efate, lake Enam Lep, 17°48.568S, 168°29.269E, 25.x.2003, leg. H. Smit, 1♂ 3♀; Efate, pond along the road to White Sands, 17°47.180S, 168°29.921E, 26.x.2003, leg. H. Smit, 2♂ 4♀; Espiritu Santo, pool in Sakepe village, 15°18.873S, 167°09.996E, 31.x.2003, leg. H. Smit, 1♂ 3♀.

Distribution

From India through continental South-East Asia, Indonesia, Philippines (Mindanao) and North Australia to New Caledonia and Vanuatu (Laird 1956, Chen et al. 2005).

GERROMORPHA

Gerromorpha are semiaquatic bugs. Their habitat varies from humid margins of water bodies to the surface of the water, a few species even living on the open ocean. They can be separated from other Heteroptera by the presence of three or four pairs of trichobothria on the head (fig. 6). Trichobothria are large sensory bristles, distinctly longer and tapering more gradually than the surrounding hairs. The seta or 'trich' (from Greek tricha = hair) is placed on a basal dome-like elevation of the cuticula, the bothrium. In adults the bothrium is located at the bottom of a depression, in

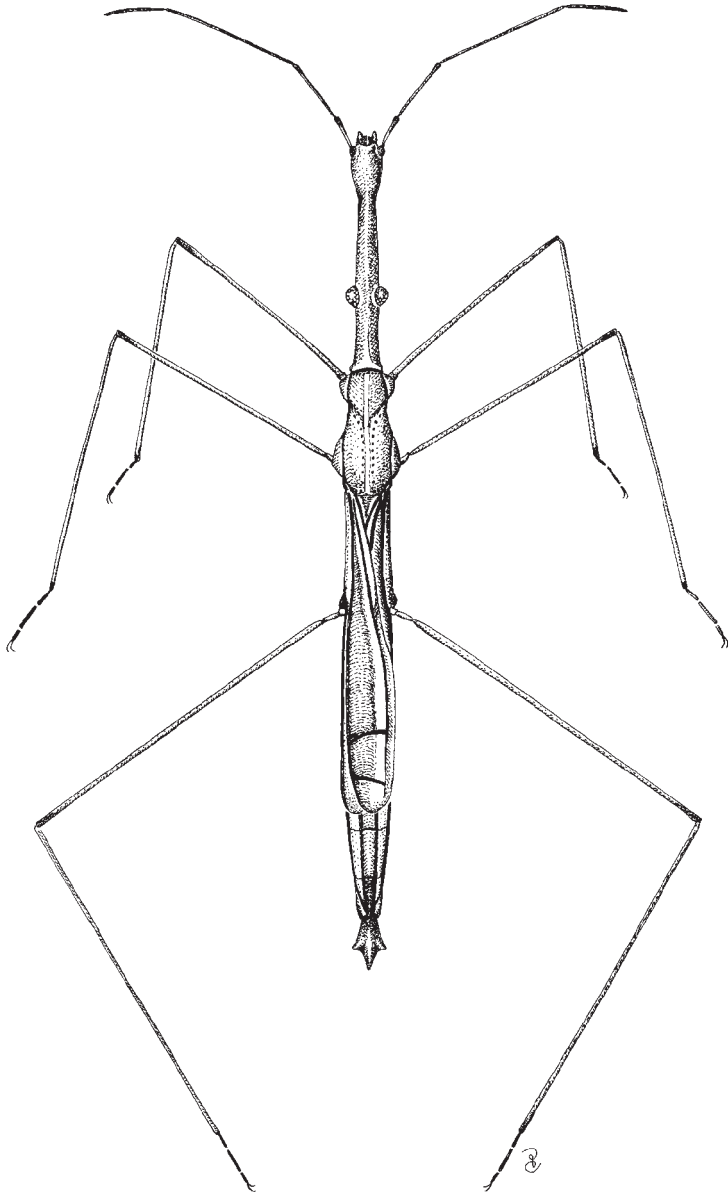
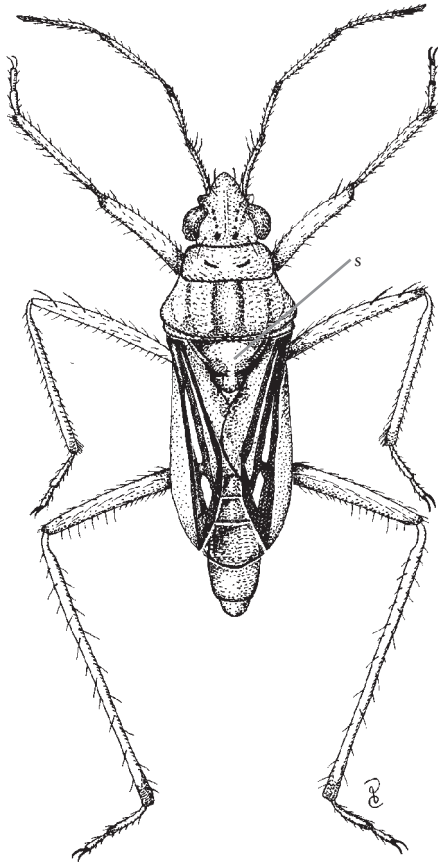
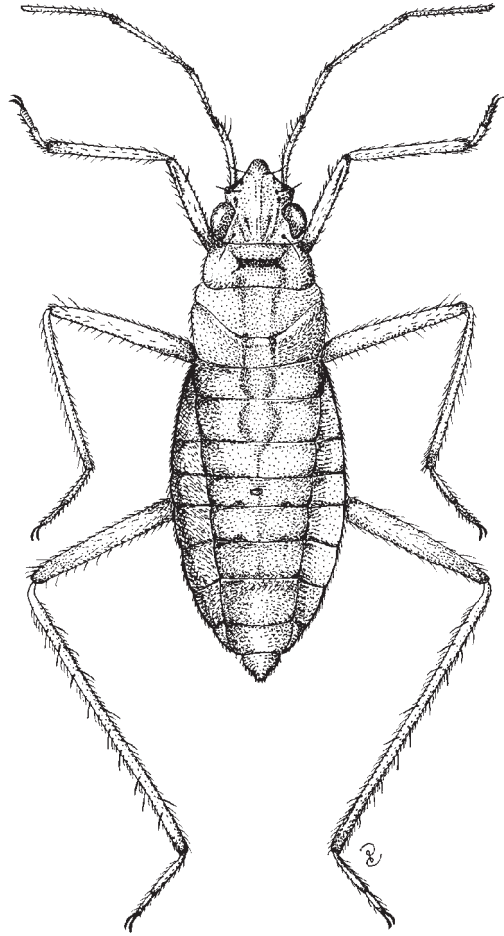


Fig. 13. *Hydrometra* sp., macropterous male (reproduced from Chen et al. 2005).

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15



Figs. 14-15. *Mesovelia vittigera*. – 14, macropterous male, length 2.8 mm, s = scutellum; 15, apterous female, length 3.3 mm (reproduced from Chen et al. 2005).

larvae it is on the surface of the cuticula. In most adults of the family Gerridae, there is a fourth pair of trichobothria which has the structure of larval trichobothria.

Key to Vanuatuan families and genera of *Gerromorpha*

- 1. Macropterous (wings fully developed, however, the apical part can be torn off (fig. 14) 2
- Apterous (wingless) or meiopterous (wings reduced) 3
- 2. Scutellum exposed, forming a subtriangular plate behind the pronotum; ocelli present (fig. 14) (*Mesoveliidae*) *Mesovelia vittigera*
- Scutellum not exposed, covered by the posteriorly extended pronotal lobe 3
- 3. Head very slender, over five times as long as wide; eyes far from posterior margin of head (fig. 13) (*Hydrometridae*) *Hydrometra strigosa*
- Head at most three times as long as wide; eyes close to or at posterior margin of head 4
- 4. Pronotum short, exposing both meso- and metanotum 6
- Pronotum longer, covering at least most of mesonotum 5
- 5. Head with distinct longitudinal median impressed line on dorsal surface (fig. 23). Hind femora stouter than middle femora. Anterior tibia of male with a grasping comb of short spines along inner margin (fig. 20) (*Veliidae*) *Microvelia trichota* sp.n.
- Head without a median impressed line on dorsal surface. Hind femora more slender than middle

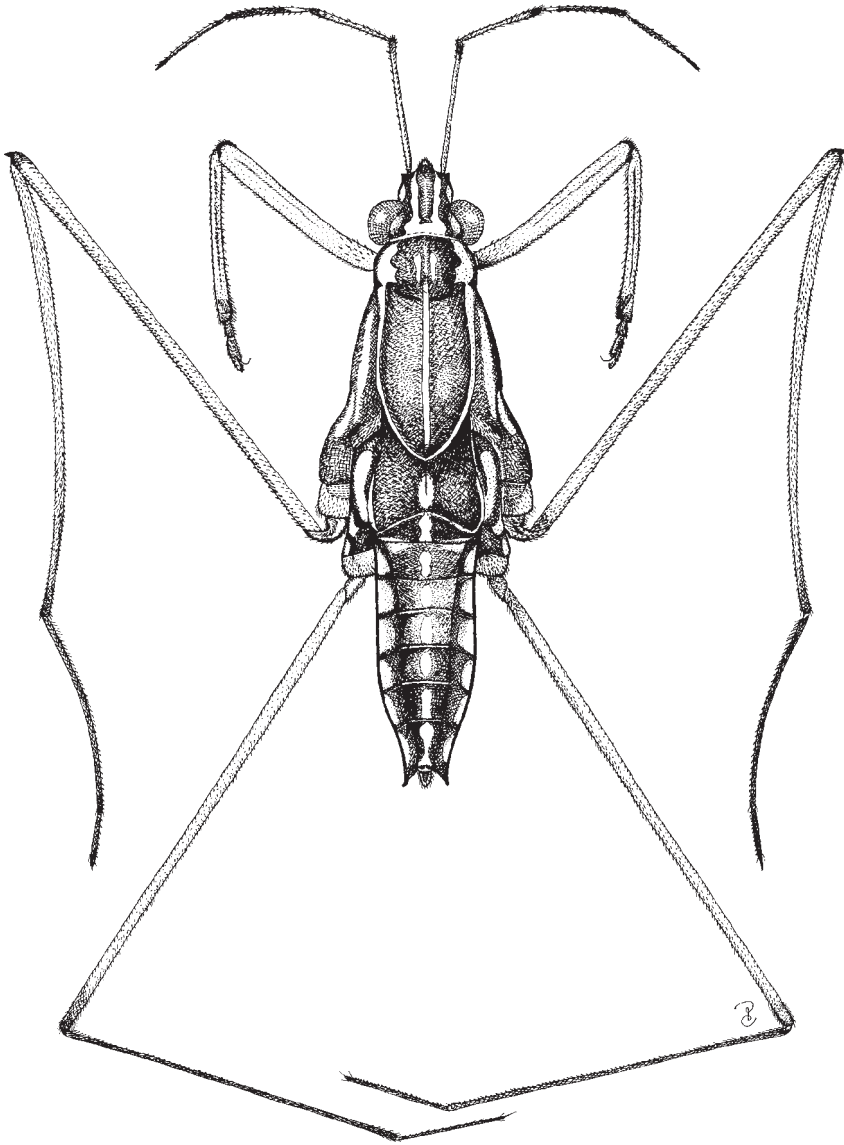
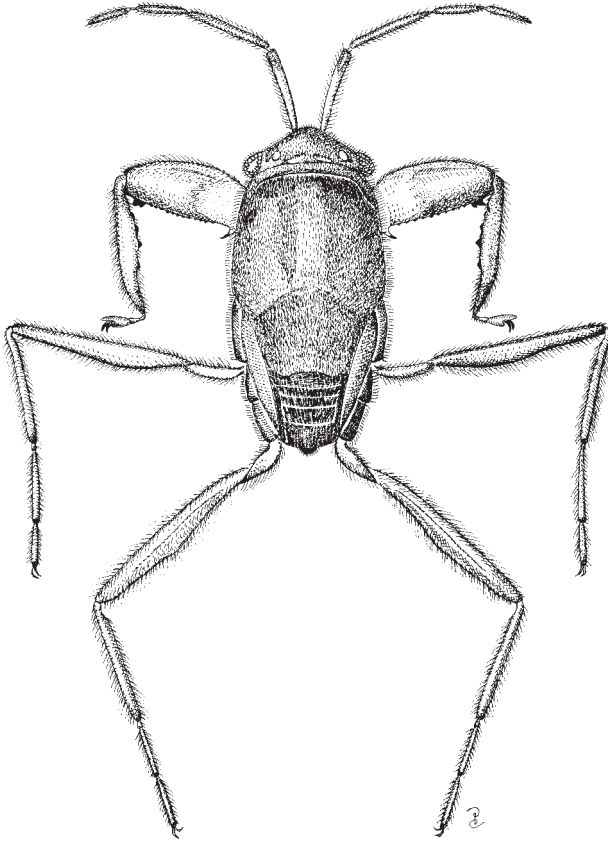


Fig. 16. *Limnogonus fossarum gilguy*, apterous female, length 8.9 mm (reproduced from Chen et al. 2005).

- femora. Anterior tibia of male without grasping comb (fig. 16, Gerridae) 6
- 6. Pronotum dark with a yellow median line *Limnogonus*
- Pronotum yellowish or rufous with a blackish median line *Limnometra* & *Tenagobius*
- 7. Head about as long as wide; meso- and metan-

- otum clearly separate (fig. 15). All claws apical (Mesoveliidae) *Mesovelia vittigera*
- Head at least about twice as wide as long; meso- and metanotum fused. At least claws of fore legs subapical 8
- 8. Head about twice as wide as its median length; posterior margin of pronotum more or less

Fig. 17.
Hermatobates sp., male,
length 3.5 mm (reproduced
from Chen et al. 2005).



- straight (fig. 26). All claws subapical 9
- Head three times or more as wide as its median length; posterior margin of pronotum strongly curved (fig. 17). Claws of fore leg subapical, claws of middle and hind legs apical Hermatobatidae
- 9. Body length of male 3.4 mm or more, of female over 4 mm, male genital segments strongly modified (figs. 25-28) (Gerridae) *Halobates*
- Body length of male 2 mm or less, of female 2.6 mm or less, male genital segments not strongly modified (fig. 33) (Veliidae) *Halovelina*

FAMILY MESOVELIIDAE

Only one genus *Mesovelina* Mulsant & Rey, 1852 and one species recorded from Vanuatu.

***Mesovelina vittigera* Horváth, new record**
(figs. 14-15)

Mesovelina vittigera Horváth, 1895: 160.

?*Mesovelina* spp. Laird, 1956: 74.

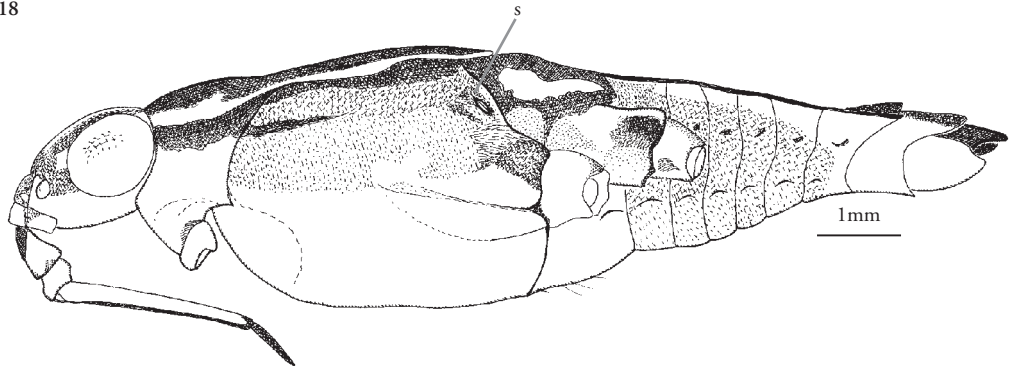
Mesovelina vittigera; Polhemus & Polhemus 2000: 226-229 (redescription, synonymy).

Material examined. – VANUATU: Efate, lake Enam Lep, 17°48.568S, 168°29.269E, 25.x.2003, leg. H. Smit, 2 ♀ apterous; Efate, lake Enam Lep, 17°48.568S, 168°29.269E, 25.x.2003, leg. H. Smit, 1 ♀ apterous; Efate, lake Enam Lep, 17°48.568S, 168°29.269E, 25.x.2003, leg. H. Smit, 1 ♀ dealate; Espiritu Santo, pool in Sakepe village, 15°18.873S, 167°09.996E, 31.x.2003, leg. H. Smit, 2 ♂ 2 ♀ apterous, 1 larva. First record for Vanuatu.

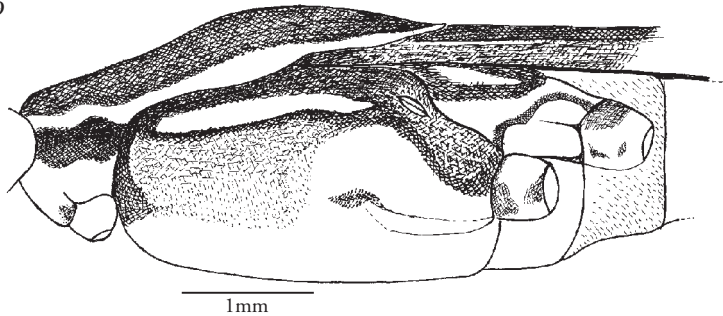
Distribution

‘Occurring in all warm regions of the Old World except some isolated Pacific Islands’ (Polhemus & Polhemus 2000).

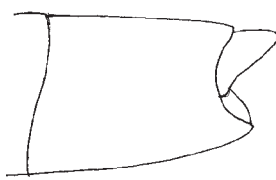
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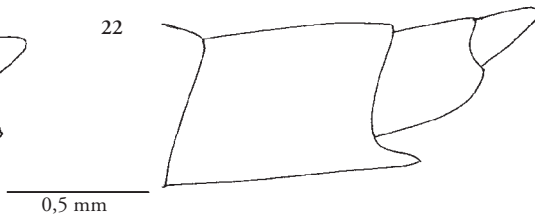
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Figs. 18-19. Thorax of *Limnogonus* in lateral view, scale 1 mm, s = metathoracic spiracle. – 18, *L. fossarum gilguy*; 19, *L. luctuosus*. Fig 20: see page 319. Figs. 21-22. Seventh abdominal segment of female *Limnogonus*, lateral view, scale 0.5 mm. – 21, *L. fossarum gilguy*, 22, *L. luctuosus*.

FAMILY HYDROMETRIDAE

Only one genus *Hydrometra* Latreille, 1796 and one species recorded from Vanuatu.

Hydrometra strigosa (Skuse)

Limnobates strigosa Skuse, 1893: 43.

Hydrometra strigosa; Polhemus & Lansbury 1997: 29-32 (redescription, synonymy, distribution).

Material examined. – VANUATU: Efate, lake Enam Lep, 17°48.568S, 168°29.269E, 25.x.2003, leg. H. Smit, 2♂ 2♀ micropterous; Espiritu Santo, pool in Sakepe village, 15°18.873S, 167°09.996E, 31.x.2003, leg. H. Smit, 1♂ macropterous, 5♂ 1♀ micropterous.

Distribution

Australia, New Caledonia, Vanuatu, New Zealand and Tahiti. In Vanuatu recorded from Espiritu Santo and Malekula (Polhemus & Lansbury 1997).

FAMILY HERMATOBATIDAE

This family contains only the genus *Hermatobates* Carpenter, 1892, which is exclusively marine. So far no species of this family has been collected in Vanuatu. However, *H. marchei* (Coutière & Martin, 1901, fig. 17) occurs in Japan, Indonesia, Philippines, northern part of Australia, New Caledonia, Fiji and Tonga (Andersen & Weir 2000), and it may well occur in Vanuatu. Foster (1989) studied this species in Fiji and Tonga, and found that they are a regular

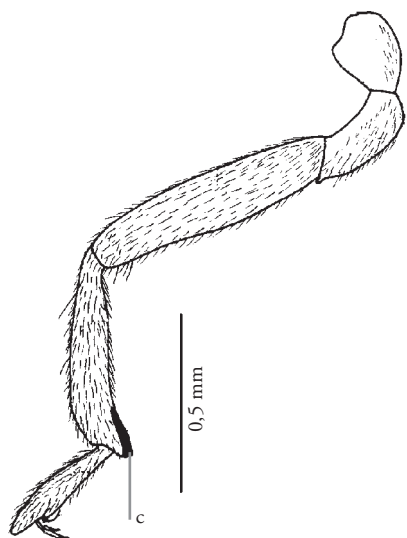


Fig. 20. *Microvelia* sp., male, foreleg, scale 0.5 mm. c = grasping comb.

component of the intertidal fauna of tropical rocky and coral shores. They are active in the day time, roughly from one hour before to one hour after low tide in a narrow zone of about 20 cm around the mean low tide line. Andersen & Weir (2000) presented a revised key to all species of *Hermatobates*.

FAMILY VELIIDAE

Only one genus *Microvelia* Westwood, 1834 with one species recorded from Vanuatu.

Microvelia (Pacifovelina) trichota sp. n. (figs. 23-25)

? *Microvelia* spp. Laird, 1956: 74.

Type material. – Holotype (ZMAN): apterous female, VANUATU: Espiritu Santo, Butmas stream, 15°20.605S, 166°58.553E, 29.x.2003, leg. H. Smit. – Paratypes, same data as holotype, 3 ♀ apterous (2 NCTN, 1 ZMAN); VANUATU: Efate, pond along the road to White Sands, 17°47.180S, 168°29.921E, 26.x.2003, leg. H. Smit, 1 ♀ apterous (ZMAN).

Description

Apterous female (fig. 23). Size 1.65 – 1.69 – 1.75 {1.68}; width 0.59 – 0.66 – 0.68 {0.68}.

Colour. Dorsally blackish grey with orange-brown

markings. Head blackish grey with pale bluish grey pruinose stripes along inner margins of eyes. Pronotum dark brown to blackish grey; anteriorly with a transverse orange-brown band, reaching posteriorly to the transverse row of pits, laterally to inner posterior angles of eyes; posterior margin orange-brown. Abdomen dorsally blackish grey, dull, except for shiny spots medially on abdominal tergites 5 and 6. Tergites 2 and 3 with pale bluish grey pruinose marks which vary from covering lateral third to virtually the entire tergites. In addition, a pruinose mark on connexivum of segment 6 and in some specimens small pruinose marks on connexiva of segments 2 and 3 and anterolaterally on tergite 4; connexiva both dorsally and ventrally orange-brown. Antennae brownish, basal half of segment 1 lighter than remainder. Legs brownish with coxae, trochanters and basal parts of femora yellow. Venter and sides blackish grey with a pruinose hue.

Structural characteristics. Body elongate suboval, total length 2.5-2.8 times greatest width across thorax. Most of body covered with short, appressed pilosity; sides of thorax and abdomen with longer semi-erect hairs. Width of head across eyes 1.2 times the length of head (0.46/0.39). Antenna almost half as long as body (0.80/1.69); length of antennal segments 1-4: 0.18, 0.14, 0.16, 0.32. length of pronotum 0.27, distinctly shorter than head. Measurements of leg segments (femur, tibia, tarsal 1, tarsal 2, fore tarsus one-segmented): fore leg: 0.42, 0.31, 0.20; middle leg: 0.48, 0.40, 0.11, 0.13; hind leg: 0.52, 0.58, 0.12, 0.15. Abdominal dorsum in lateral view curved downwards toward abdominal end (fig. 24). Connexiva vertically raised throughout, converging posteriorly but not touching caudally; connexival margins not modified; posterior corners of laterotergites 7 at right angles. Posterior margin of tergite 6 with a small and posterior margin of tergite 7 with a larger tuft of long bristles (figs. 24, 25). Sternum 7 slightly longer than sternum 5 and 6 combined (0.30/0.27), posterior margin straight. In lateral view genital segments concealed; proctiger semicircular, vertical.

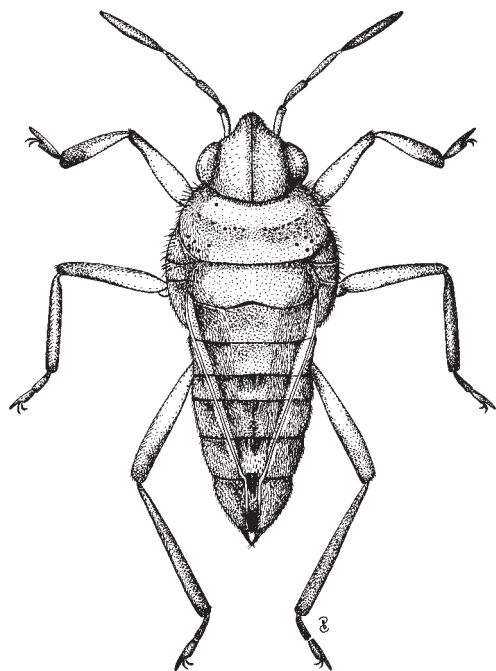
Etymology

Trichota (feminine form of Greek adjective *trichotos*, meaning 'hairy') refers to the characteristic tufts of bristles caudally on the abdomen of the female.

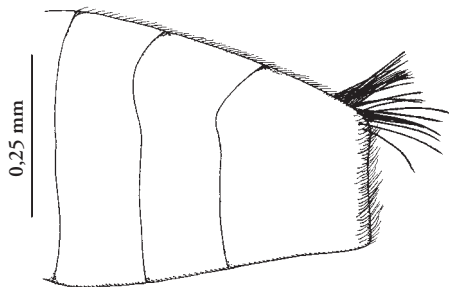
Comparative notes

This species has tufts of bristles caudally on abdomen in common with *M. (Pacifovelina) starmuehlneri* Polhemus & Herring, 1970 from New Caledonia and *M. (Pacifovelina) macgregori* (Kirkaldy, 1899) from New Zealand and Norfolk

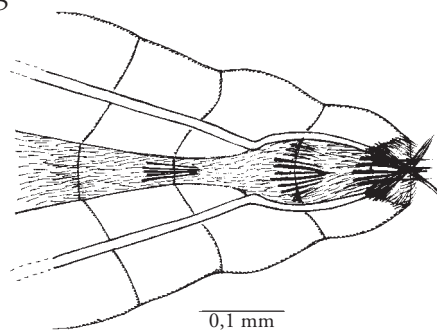
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Figs. 23-25. *Microvelia trichota* sp. n. female. – 23, habitus of holotype, body length 1.68 mm; 24-25, Posterior part of abdomen; 24, lateral view, scale 0.25 mm; 25, dorsal view, scale 0.1 mm.

Island (Andersen & Weir 2003a). However, in these species the tufts of bristles on the abdomen are placed on the connexivum, not on the tergites. In addition, females of both these species are larger, length over 1.9, and have the connexiva folded over the abdomen, at least posteriorly. In addition, *M. starmueblneri* has an additional small tuft of bristles on segment 2 of the connexival margins. *M. macgregori* has an additional small tuft of bristles posteriorly on segment 6 of the connexival margins. *M. pacifica* Kirkaldy, 1908 from Fiji is larger, length over 2 mm and lacks the abdominal hair tufts in the female.

Genus *Halovelina* Bergroth, 1893 (fig. 34)

Species of *Halovelina* or ‘coral bugs’ are small (length up to 2.5 mm, but usually about 2 mm or less) marine Veliidae, living in the tidal zone. They have been found both in open exposed habitats and in

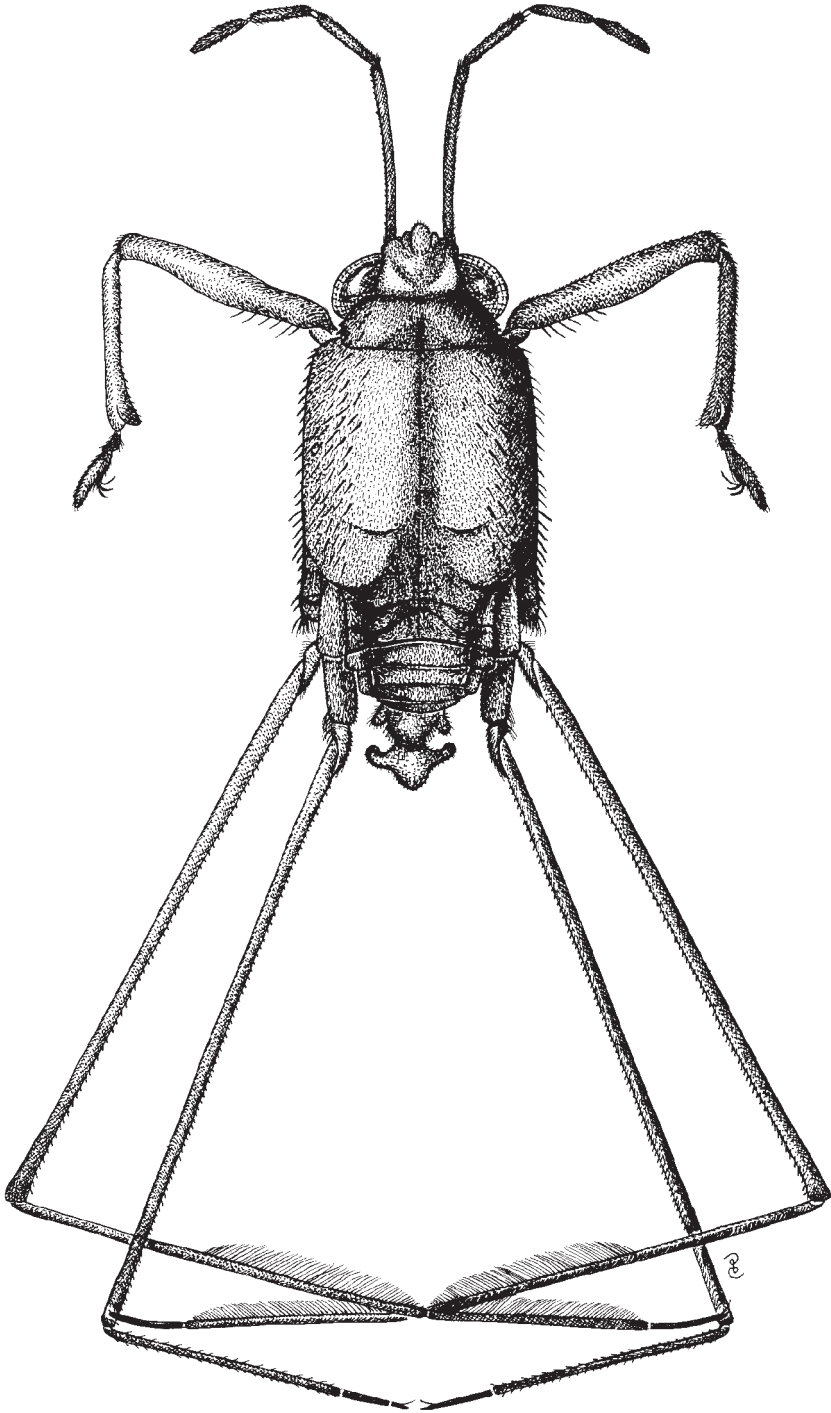
mangroves. No species has so far been recorded from Vanuatu, but several species have been recorded from neighbouring islands. There is little doubt that one or more species will occur in the intertidal zones of the islands of Vanuatu. A reliable prediction which species will occur is, however, not feasible. The genus has been revised by Andersen (1989). A key to the related genera *Haloveloides* Andersen, 1992 and *Xenobates* Esaki, 1927 which might also occur in Vanuatu can be found in Andersen (1992).

FAMILY GERRIDAE

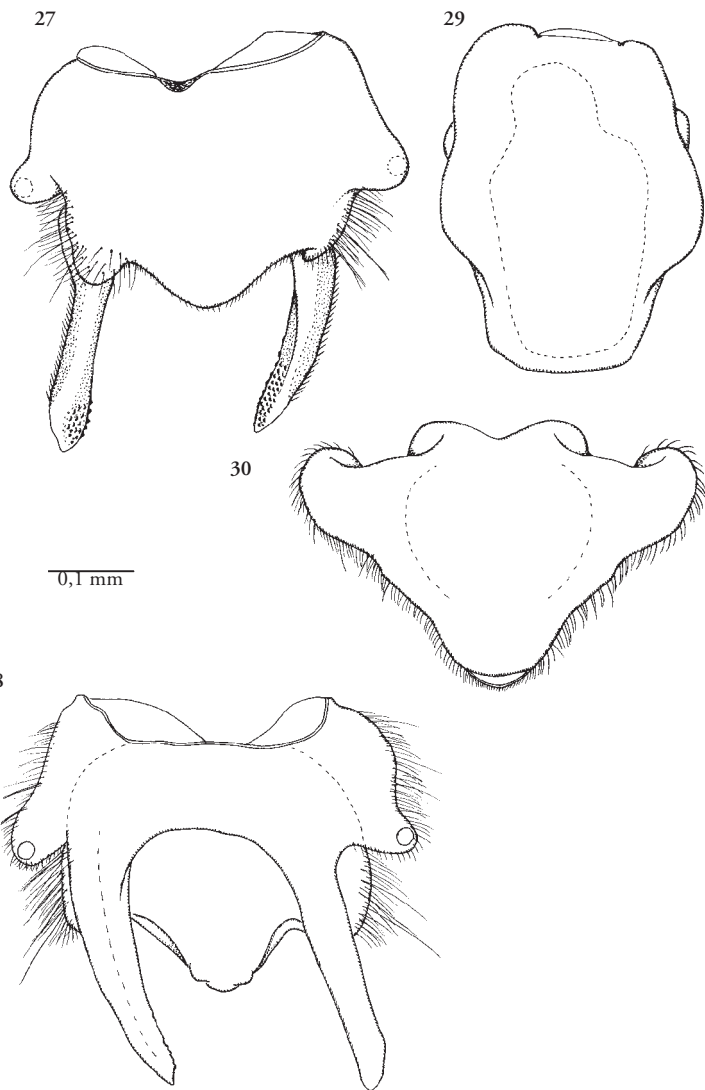
Genus *Limnogonus* Stål, 1868

Key to Vanuatuan species of *Limnogonus* (adapted from Andersen & Weir, 1997).

1. Pale stripe on upper part of mesopleuron tapering in width posteriorly (fig. 19), ending in front of and below the metathoracic spiracle. Hind margin of seventh abdominal sternite of female with



Figs. 26. *Halobates proavus*, male, body length 3.44 mm.



Figs. 27-30.
Halobates proavus, male, scale 0.1 mm. – 27, abdominal segment 8, dorsal view; 28, same as above, ventral view; 29, pygophore (segment 9), ventral view; 30, proctiger, dorsal view.

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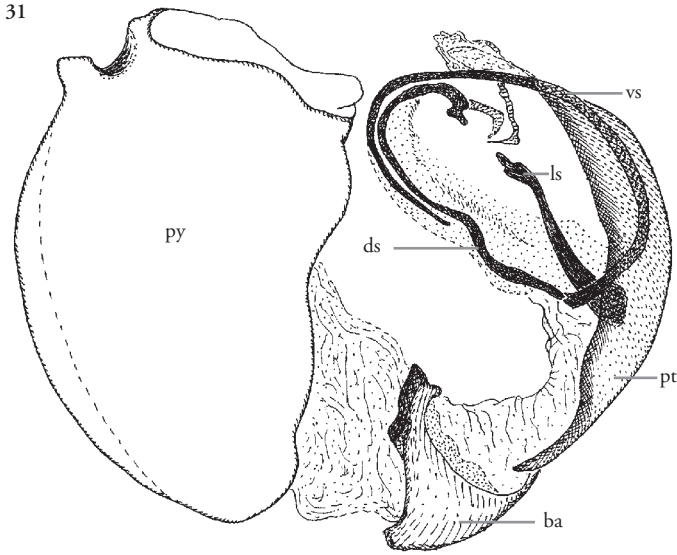
- a prominent tooth in middle (fig. 21) *L. fossarum gilguy*
- Pale stripe on upper part of mesopleuron widening posteriorly (fig. 18), ending in front of the metathoracic spiracle or encircling the spiracle. Hind margin of seventh abdominal sternum of female produced in middle but without a prominent tooth in middle (fig. 22) *L. luctuosus*

Limnogonus fossarum gilguy Andersen & Weir (fig. 17, 19, 21)

Limnogonus fossarum skusei; Andersen 1975: 36-39 (description, synonymy, distribution).

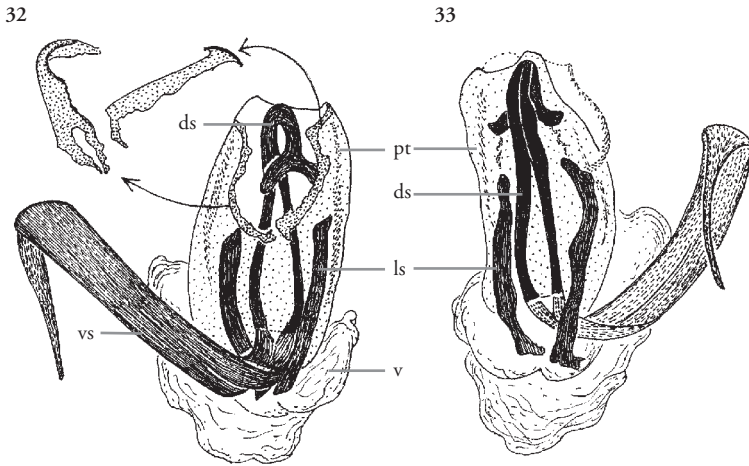
Limnogonus fossarum gilguy Andersen & Weir, 1997: 255-263 (redescription, synonymical note).

Material examined. – VANUATU: Efate, lake Enam Lep, 17°48.568S, 168°29.269E, 25.x.2003, leg. H. Smit, 1 ♀ macropterous.



Figs. 31-33.

Halobates proavus, scale (0.1 mm). - 31, structure of genitalia, lateral view; 32, sclerites of vesica, ventrolateral view; 33, sclerites of vesica, dorso-lateral view. Abbreviations: ba = basal apparatus of phallus, ds = dorsal sclerites of vesica, ls = lateral sclerite of vesica, pt = phallosome, py = pygophore, v = ventral lobe, vs = ventral sclerite of vesica.



Distribution

From Java, the southern half of Borneo, Sulawesi and the Mariana Islands eastward to Samoa and Cook Islands. In Vanuatu recorded from Espiritu Santo and Malekula (Andersen 1975).

Limnogonus luctuosus (Montrouzier) (figs. 18, 22)

Gerris luctuosa Montrouzier, 1865: 242.
Limnogonus luctuosus; Andersen 1975: 40-46 (redescription, synonymy, distribution).

Limnogonus luctuosus, Andersen & Weir 1997: (redescription, synonymy).

Material examined. - VANUATU: Efate, Ewor River, 17°42.869S, 168°34.132E, 25.x.2003, leg H. Smit, 1 ♂ 2 ♀, 1 larva; Van-3 1 ♀, 1 larva; Van-6 2 ♀. All apterous.

Distribution

From the northern part of Australia to Samoa and the Society Islands. In Vanuatu recorded from Aneityum, Erromanga, Espiritu Santo, Gaua and Malekula (Andersen 1975).

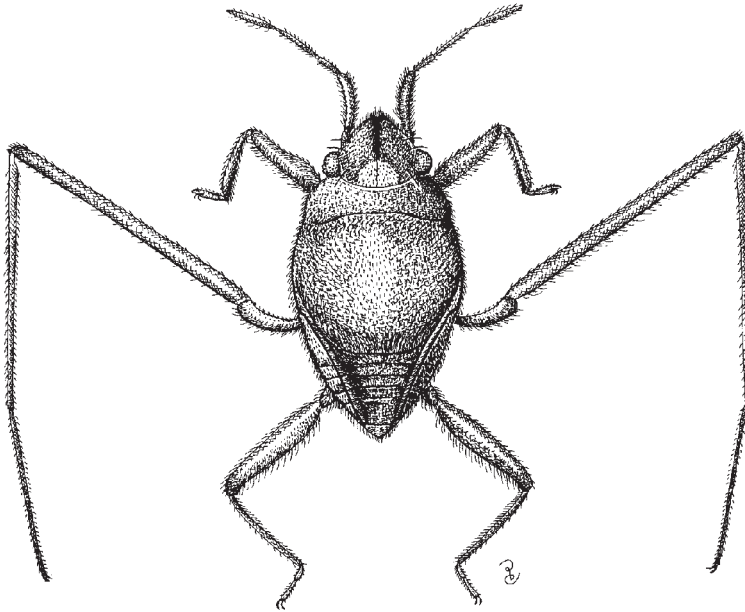


Fig. 34.
Halovelia sp., male, length 1.9 mm (reproduced from Chen et al. 2005).

Genera *Limnometra* Mayr, 1965 and *Tenagogonus* Stal, 1853

These genera have not been recorded from Vanuatu. They are, however, widespread in tropical Asia and New Guinea, including the Solomon Islands. One species of *Limnometra* and two of *Tenagogonus* are known from Fiji (Andersen 1995), therefore it is possible that species belonging to this complex may be found in Vanuatu. *Limnometra* and *Tenagogonus* are closely related genera and have been regarded as a single genus by several authors. The main difference is that *Limnometra* species have a well developed abdomen with strongly developed connexival spines, whereas *Tenagogonus* species have a shorter abdomen and males lack connexival spines. Most species live on quiet parts of streams in forests. For further information see Hungerford & Matsuda (1958, 1961) and Polhemus & Polhemus (1997).

Genus *Halobates* Eschscholtz, 1822

The genus *Halobates* or sea-skaters contains ca. 46 species, of which only two are found on fresh water, the remaining species are marine (Andersen & Cheng 2004). Most species live in sheltered coastal waters but five species live on the open oceans, and are usually only found near land or even stranded on beaches after high winds. Two species of this group live on

the ocean around Vanuatu: *H. germanus* White, 1883 and *H. micans* Eschscholtz, 1822. For identification see Andersen & Cheng (2004) or Herring (1961). Three coastal species have been recorded from Vanuatu.

Key to Vanuatuan species of *Halobates*.

1. First segment of fore tarsus subequal or longer than second segment. Lateral margins of proctiger convex, total shape suboval, without lateral projections. Mean length, male 6.5, female 5.0 mm *H. katherinae*
- First segment of fore tarsus distinctly shorter than second segment. Proctiger with lateral projections, total shape subtriangular (fig. 29) or rhomboid. Length 5.0 mm or less 2
2. First segment of fore tarsus very short, about 0.3 times the length of second segment in males, slightly less 0.5 times second segment in females. Ventral side of middle acetabula only narrowly yellow at edges. Male styliform processes of subequal length, not widened apically (fig. 26, 27). Length 3.4 – 4.1 mm *H. proavus*
- First segment of fore tarsus about 0.8 times the length of second segment in both sexes. Ventral side of middle acetabula with a wide yellow band. Left styliform process of male more than twice as long as right process, apically widened, shoe-shaped. Length 4.2-5.0 mm *H. flaviventris*

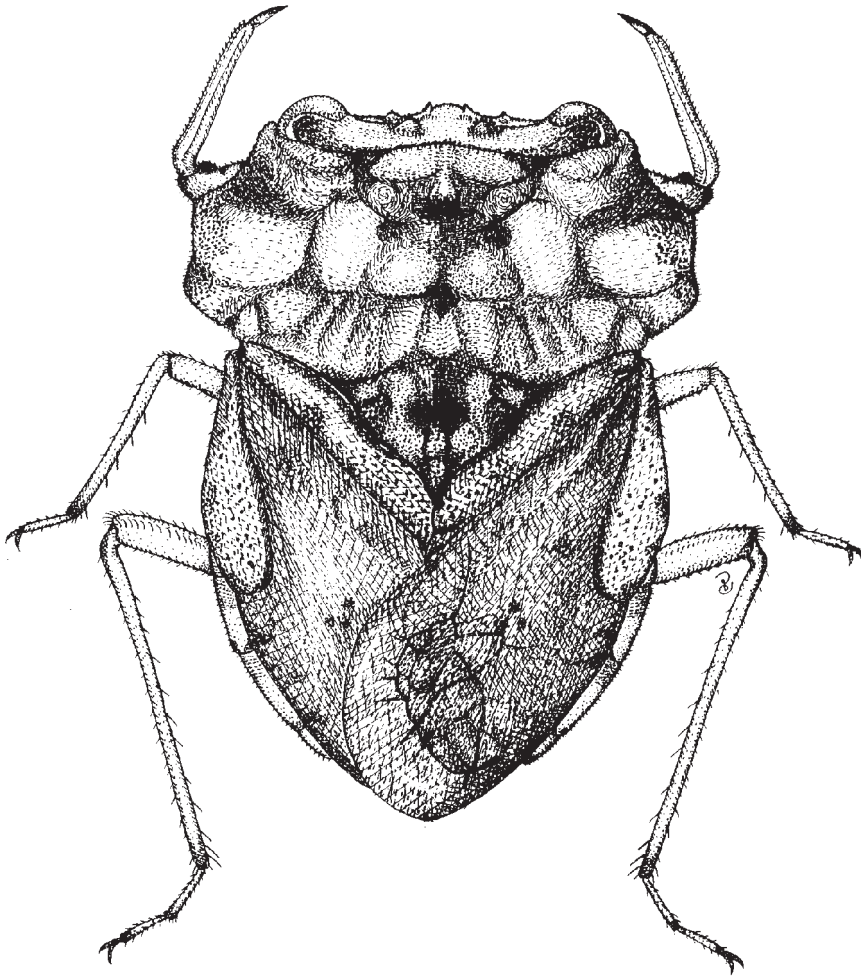


Fig. 35. *Nerthra* sp., length 10.3 mm (reproduced from Chen et al. 2005).

***Halobates (Halobates) flaviventris* Eschscholtz**

Halobates flaviventris Eschscholtz, 1822: 109.
Halobates flaviventris; Herring 1961: 290-293.
Halobates flaviventris; Andersen & Cheng 2004: 174-175, 177.

This species is not represented in the material studied. It has been recorded from Vanuatu: Aurora, Banks and Santa Maria Islands by Herring (1961).

Distribution

East coast of Africa, southern coast of Asia to Vietnam, through Indonesia (Java, Moluccas) and Christmas island to Vanuatu (Andersen & Cheng, 2004).

Remarks

Its close relative, *H. hawaiiensis* Usinger, 1938, which has a similar left styliform process in males, occurs farther North into the Pacific. *H. hawaiiensis* differs from *H. flaviventris* by lacking the yellow band ventrally on middle acetabula and in possessing dense, stiff black bristles on hind acetabula, which are lacking in *H. flaviventris* (Andersen & Cheng 2004).

***Halobates (Halobates) katherinae* Herring**

Halobates katherinae Herring, 1958: 8-10.
Halobates katherinae; Herring 1961: 255-257.
Halobates katherinae; Andersen 1991: 45, 46.
Halobates katherinae; Andersen & Cheng 2004: 163-164, 178.

We have not seen this species, its occurrence in Vanuatu, without further specification, is cited in the checklist by Andersen & Cheng (2004).

Distribution

New Caledonia, Loyalty Islands and Vanuatu.

Remarks

Herring (1961) included in his *H. katherinae* group two more species: *H. fijiensis* Herring, 1958 and *H. salotae* Herring, 1961. Andersen (1991) after cladistic analysis, combined this group with *H. kelleni* Herring, 1961 and *H. mariannarum* Esaki, 1937, naming it the *H. mariannarum* group. The five species of the *H. mariannarum* group are apparently restricted to various Pacific Islands groups. Males of *H. kelleni* from Samoa, *H. mariannarum* from Caroline Islands and *H. salotae* from Tonga have the lateral margins of the proctiger straight to slightly concave. *H. fijiensis* from Fiji is slightly smaller (mean length male 5.8, female 4.5 mm) than *H. katherinae* (mean length male 6.5, female 5.0 mm). For further details see Andersen & Cheng (2004).

Halobates (Halobates) proavus White (figs. 26-33)

Halobates proavus White, 1883: 54.
Halobates proavus; Herring 1961: 279-280.
Halobates proavus; Andersen 1991: 43, 50.

Material examined. – VANUATU: Espiritu Santo, Palekulo Bay (marine), 15°29.714S, 167°15.102E, 2.xi.2003, leg. H. Smit, 6♂ 4♀, 1 larvaV.

Distribution

A widespread species: Nicobars, Thailand (Phuket), Indonesia (Java, Moluccas), Philippines (Mindanao), Solomon Islands and Vanuatu. In Vanuatu recorded from Espiritu Santo (Herring, 1961; Andersen, 1991).

Remarks

Herring (1961) included this species in his *H. proavus* species group which contained seven species. Andersen (1991) restricted the *H. proavus* group to two species: *H. proavus* and *H. maculatus* Schadow, 1922. Andersen's (1991) *H. proavus* group is characterized as follows: 'Small species (especially males) with short first segment of fore tarsus. Styliform processes of male relatively short and robust, slightly asymmetrical. Vesical armature asymmetrical, with elongate hole in dorsal sclerite and two pairs of lateral sclerites (figs. 30-32).'

H. maculatus, which occurs in New Guinea, Bismarck Archipelago, the Solomon Islands and Rennell Island (Herring 1961), may be found in

Vanuatu. This species differs from *H. proavus* in having a smaller size (average length in *H. maculatus* males 3.0, females 3.8; in *H. proavus* males 3.4, females 4.1 mm) and lacking the black bristles laterally on thorax (fig. 25). In addition, males can be recognized by the styliform processes (figs. 26, 27) which in *H. maculatus* are distinctly stouter.

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