

FIVE NEW SPECIES OF *PERITTOPUS* FIEBER, 1861 (HEMIPTERA: VELIIDAE) FROM SOUTHEAST ASIA

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ABSTRACT. – Five species of *Perittopus* Fieber, 1861, are newly described: *Perittopus asiaticus*, new species, from West Malaysia, Thailand, and China (Yunnan); *P. borneensis*, new species, from Borneo; *P. schuhi*, new species, from West Java; *P. sumatrensis*, new species, from Sumatra; and *P. webbi*, new species, from West Malaysia. Notes on *P. breddini* Kirkaldy, 1901, and *P. vicarians* Breddin, 1905, are given. A key to the species of the Malay Peninsula and the Sunda Islands is presented.

KEY WORDS. – Heteroptera, Veliidae, Perittopinae, *Perittopus*, new species, key, China, Thailand, Malaysia, Indonesia, Sumatra, Java, Borneo.

INTRODUCTION

The present study has been carried out in preparation of the "Guide to the aquatic Heteroptera of Singapore and Peninsular Malaysia" edited by Lanna Cheng, Peter Ng, and Chang Man Yang, as well as the taxonomic revision of the species of *Perittopus* Fieber, 1861, presently worked out by the author. It presents descriptions of five undescribed species from the Southeast Asian mainland, Sumatra, Java, and Borneo. A key to all species presently described from the Malesian Region is also given.

Perittopus, the single genus of the Oriental subfamily Perittopinae, is distributed from southern India to Bali and Borneo. It has been revised by Lundblad (1933), who treated all but one of the species known at that time. Since then, no further species has been described. Andersen (1982) presents numerous morphological details of the genus and discusses its phylogenetic position. *Perittopus* can be easily recognized within Veliidae by the orange to reddish colouration of the dorsum (in winged specimens with black wings), the tarsal formula 2-3-3, and the thickened corium of the hemelytron bearing two closed cells. In contrast to formerly published information, the genus *Perittopus* is highly diverse in South India, Southeast Asia, and the western areas of the Malay Archipelago. Approximately 12 species - all except three still undescribed - are presently recognized from the eastern range (from Northeast India to Indonesia). Identification of species is complicated by the fact that diagnostic characteristics are confined to one sex or one morph, whereas such features found in all specimens of one species are mostly uniform among many species of the genus, too. Distinction

is mainly based on primary or secondary sexual characteristics. Usually apterous females have the best sets of characteristics, and therefore in the present study holotypes are chosen from this morph.

Three species of *Perittopus* have previously been recorded from the Southeast Asian mainland (see Lundblad, 1933; Fernando & Cheng, 1974; Yang & Kovac, 1995; Yang et al., 1999). However, "*P. rufus*" is an unavailable name, and *P. breddini* and *P. vicarians* seem to have very restricted distributions in Indonesia: *Perittopus breddini* in Bali, Central and East Java, and *P. vicarians* in West Java. Both species occurring on the Malay Peninsula have been undescribed so far. Several more undescribed species are known from Thailand, Vietnam, and South China.

Observations made by the author on species from Thailand and Borneo indicate different habitat requirements of *Perittopus* species: Some species prefer large, quiet bays of streams, but others (especially *P. borneensis* n.sp.) prefer remnant pools of small streamlets. The habitats of *P. asiaticus*, new species ("*P. breddini*") on Tioman Island have been described as "sheltered puddles, side pools and rock pools along forest streams and waterfalls" (Yang et al., 1999). The ratio of winged specimens, which varies strongly between species, is probably related with these habitat preferences.

MATERIAL AND METHODS

Material studied consists of dry mounted (e.g., all specimens

from BMNH, RMNH, most from NHMW) as well as alcohol preserved specimens (most from ZRC). They are deposited in the following institutions or private collections:

Acronyms of repositories.

BMNH	The Natural History Museum, London, United Kingdom [= former British Museum (Natural History)]
CHI	Coll. E. Heiss, Innsbruck, Austria
CKB	Coll. J. Kodada, Bratislava, Slovakia
CSS	Coll. W.D. Shepard, Sacramento, California, U.S.A.
CZW	Coll. H. & S.V. Zettel, Vienna, Austria
JTPC	Colorado Entomological Museum [= Coll. J.T. Polhemus], Englewood, Colorado, U.S.A.
KKUA	Khon Kaen University, Faculty of Agriculture, Department of Entomology, Khon Kaen, Thailand
NCTN	Coll. N. Nieser, Tiel, The Netherlands
NHMW	Naturhistorisches Museum Wien, Vienna, Austria
PPCC	Coll. P.P. Chen, Beijing, China
RMNH	Nationaal Natuurhistorisch Museum [formerly Rijksmuseum van Natuurlijk Historie], Leiden, The Netherlands
SPC	Sabah Parks, Entomological Collection, Sabah, Malaysia
UMS	Universiti Malaysia Sabah, Kota Kinabalu, Malaysia
ZIAs	Zoological Institute, Academy of Sciences, St. Petersburg, Russia
ZMUC	Zoological Museum, University of Copenhagen, Copenhagen, Denmark
ZRC	Zoological Reference Collection, Raffles Museum, Singapore

Material was studied with a Leica Wild M10 binocular microscope; studies on parameres were made with an Olympus BX40 microscope. Preparation of drawings has been done with the help of a camera lucida fixed to these microscopes. Measurements (either in millimetres or as the ratio of two lengths) refer to the holotype, or to a randomly selected specimen of the other morphs, respectively. Range of body length refers either to all specimens available or to a minimum of ten randomly selected specimens. Body length of apterous and macropterous specimens is measured from apex of head to apex of abdomen. The following abbreviations of leg segments are used: FL - foreleg, ML - middle leg, HL - hind leg; Fe - femur, Ti - tibia, Ta - tarsus. Measurements of lengths of antennal and leg segments refer to the holotype and are given relative to length of antennal segment 2 or the metatibia, respectively (the length of which is stated in millimetres). The term "connexivum" is used for the, sometimes flattened, edge (or "connection") of sternites and laterotergites, and not for the combination of the laterotergites.

TAXONOMY

Perittopus asiaticus, new species

(Figs. 2, 6, 14, 15, 22, 25)

Perittopus vicarians: Yang & Kovac, 1995: 290.

Perittopus breddini: Yang et al., 1999: 282.

Holotype – (apterous female): **MALAYSIA: Pahang:** Pulau Tioman, road Kampong Tekek - K. Juara, 0 - 100 m, 2.48°N,

104.11°E, L. Dembicky & P. Pacholatko leg. (NHMW), 4 - 6 Mar.1997.

Paratypes – **MALAYSIA: Kedah:** 2 males, 1 female macropterous, Gg. Jerai, H.K. Lua leg., LHK328 (ZRC), 19 Feb.1997; 1 female macropterous, Kedah Peak, 1000 ft., H.M. Pendlebury leg. (BMNH), 7 Mar.1928; 1 male, 1 female macropterous, Perlis - Langkawi, Datai env., E. Heiss & Perner leg. (CHI), 12 Mar.1995; **Penang:** 2 males, 8 females apterous, 3 males, 6 females macropterous, Pulau Penang, Penang Hill, Jalang Waterfall, 560 m, P. Schwendinger leg. (NHMW), 10 Jan.1996; 6 males, 5 females macropterous, Penang Isalnd, Penang Hill, P. Nielsen leg. (ZMUC), 23 Nov.1979; 11 males, 8 females apterous, 1 female macropterous, hills, stream, near Tanjong Bunga, C. Dover leg. (BMNH, 1 male, 1 female NHMW), 4 Mar.1927; **Trengganu:** 3 males apterous, 2 males, 3 females macropterous, Pulau Perhentian, Besar, M. Madl leg. (NHMW), 6 - 13 Feb.1993; 1 female apterous, 5 males, 3 females macropterous, Pulau Redang, near Tg. Dalam, H.K. Lua leg., LHK191 (ZRC, 1 male NHMW), 23 Jun.1992; 1 male apterous, 10 males, 9 females macropterous, Pulau Redang, H.K. Lua leg., LHK190 (ZRC, 1 male, 1 female NHMW), 23 Jun.1992; 1 male apterous, 7 males, 10 females macropterous, Pulau Redang, Pasir Panjang, H.K. Lua & D.F. Suwa leg., LHK194 (ZRC), 25 Jun.1992; **Johor:** 2 males, 2 females apterous, 2 males, 2 females macropterous, Gg. Bekok, Sg. Bantang, K.L. Yeo leg., YKL9016 (ZRC, 1 female NHMW), 10 Apr.1997; **Perak:** 1 female apterous, 1 male, 1 female macropterous, Belum, Remei Trail, K.L. Yeo et al. leg., YKL856 (ZRC), 2 Nov.1993; 2 females apterous, 4 males macropterous, Belum, Tasek Temengor, outside base camp, K.L. Yeo et al. leg., YKL853 (ZRC, 1 male NHMW), 1 Nov.1993; 4 males, 1 female apterous, Maxwell Hill (Bukit Larut), Taiping, 1200 m, P. Schwendinger leg. (NHMW), 7 Jan.1996; 1 male, 1 female apterous, 3 males, 7 females macropterous, Taiping, hill stream near reservoir, C. Dover leg. (BMNH, 2 females NHMW), 9 Mar.1927; 1 female macropterous, Taiping, in lake, hill, C. Dover leg. (BMNH), 9 Mar.1927; 2 males, 1 female apterous, 1 female macropterous, Taiping, waterfall, in still sandy pool, C. Dover leg. (BMNH), 7 Mar.1927; **Selangor:** 8 males, 5 females macropterous, Ulu Gombak, C.M. Yang et al. leg., YCM61 (ZRC, 1 male NHMW), 13 Nov.1995; 2 males apterous, 3 males, 2 females macropterous, Ulu Gombak, C.M. Yang et al. leg., YCM68 (ZRC), 14 Nov.1995; **Pahang:** 11 males, 10 females apterous, 20 males, 20 females macropterous, Pulau Tioman, Sg. Ayer Besar, tributary, waterfall, Juara trek, H.K. Lua et al. leg., YCM104 (ZRC, 2 males, 2 females NHMW), 26 Jun.1996; 1 female apterous, same locality, 270 m, L. Hendrich leg. (NHMW), 10 - 12 Sep.; 12 males, 10 females apterous, 12 males, 7 females macropterous, Pulau Tioman, Mukut waterfall, C.M. Yang et al. leg., YCM122 (ZRC), 26 Jun.1996; 2 males, 1 female apterous, 2 males, 1 female macropterous, Pulau Tioman, upstream of Paya, Y.Y. Goh et al. leg., YCM146 (ZRC), 28 Jun.1996; 9 males, 4 females apterous, 2 males, 1 female macropterous, Pulau Tioman, Sg. Keliling, upstream, H.K. Lua et al. leg., LHK343A (ZRC), 26 Jun.1997; 19 males, 8 females apterous, 4 males, 6 females macropterous, Pulau Tioman, Sg. Asah, K.K.P. Lim leg., LHK339 (ZRC, 1 male, 1 female NHMW), 24 Jun.1997; 3 males, 6 females apterous, 12 males, 15 females macropterous, Pulau Tioman, Kg. Paya, Sg. Durian, Kallang, P.K.L. Ng leg. (ZRC), 16 Sep.1995; 1 male, 1 female apterous, 1 female macropterous, Pulau Tioman, Kg. Tekek env., R. Schuh leg. (14) (NHMW), 15 - 26 Jul.1992; 2 males macropterous, same locality, R. Schuh leg. (NHMW), 16 Jul.1993; 1 male macropterous, same locality, E. Heiss leg. (CHI), 16 - 22 Jul.1992; 33 males, 39 females apterous, 147 males, 128 females macropterous, same locality data as holotype (NHMW, BMNH, JTPC, NCTN, PPCC, RMNH, ZIAs, ZMUC); **THAILAND: Mae Hong Son:** 7 males, 5 females macropterous, S Mae Hong Son, C.M. Yang & T.B. Lim leg., YCM217 (ZRC, 1 male NHMW), 10 Sep.1998; **Chiang Mai:** 2 males, 2 females macropterous, stream off Pai River, C.M. Yang & T.B. Lim leg., YCM207 (ZRC), 8 Sep.1998; 5 males, 7 females macropterous, Doi Suthep NP, near Wat Doi Suthep, 900 m, H. Zettel leg. (3) (NHMW), 1 Nov.1995;

18 males, 18 females macropterous, Doi Inthanon NP, Huai Sai Luang Waterfall, 1150 m, P. Mazzoldi leg. (11) (CZW), 28 Dec.1998; 5 males, 5 females macropterous, Doi Inthanon NP, Mae Pan Waterfall, 1000 m, P. Mazzoldi leg. (12) (CZW), 28 Dec.1998; **Phrae**: 1 male, 2 females macropterous, 15 km E Phrae, Mae Khaem, 350 m, H. Zettel leg. (16b) (NHMW), 16 Nov.1995; **Loei**: 1 male, 3 females macropterous, W Loei, Phu Rua NP, Huai Phai Waterfall, 1000 m, P. Mazzoldi leg. (8) (CZW), 26 Dec.1999; **Chayaphum**: 1 male macropterous, Phu Keio NP, tributary to Nam Phrom, W.D. Shepard leg. (WDS-A-1038) (NHMW), 12 Mar.1994; **Phetchabun**: 5 males, 4 females macropterous, Nam Nao NP, Huai Ya Krua, near headquarter, H. Zettel leg. (23) (NHMW, 1 male, 1 female KKUA), 24 Nov.1995; 6 males apterous, 32 males, 34 females macropterous, same locality, leg. W.D. Shepard (WDS-A-1039) (CSS, 3 males, 1 female NHMW), 14 Mar.1994; **Krabi**: 1 female macropterous, env. Leem Plong, M. Madl leg. (NHMW), 23 Mar.1993; **Satun**: 4 males, 1 female macropterous, Thale Ban NP, Ya Roi Waterfall, stream, M. Madl leg. (NHMW), 3 Mar.1994; **Phuket**: 3 males, 2 females apterous, 3 males, 2 females macropterous, Surin env., E. Heiss leg. (CHI, 1 male, 1 female in CZW and NHMW), 5 - 10 Oct.1987; **CHINA**: **Yunnan**: 1 male, 1 female macropterous, Xishuangbanna, Mengyang, D. Li leg., DLI0001 (ZRC), 10 Dec.1999; 1 male, 2 females macropterous, km 13 on road Menglun - Mengyang, L. Cheng leg., LC18 (ZRC, 1 female NHMW), 22 May 2000.

Description of apterous female. – Size. – Body length 2.9 (2.7 - 3.1) mm; pronotal width 1.12 mm; length of second antennal segment 0.28 mm; length of metatibia 1.24 mm.

Colour. – Dorsally bright orange, on abdomen duller, brownish yellow; venter yellow; antenna black; legs yellow, apex of profemur, distal half of meso- and metafemur, apex of protibia, meso- and metatibia, and all tarsi blackish; metatibia at most at inner surface yellowish brown.

Structural characteristics. – Hind margin of head laterally and ventrally with some black spiculae; relative lengths of antennal segments as 1.1 : 1 : 1.0 : 1.3; pronotum long,

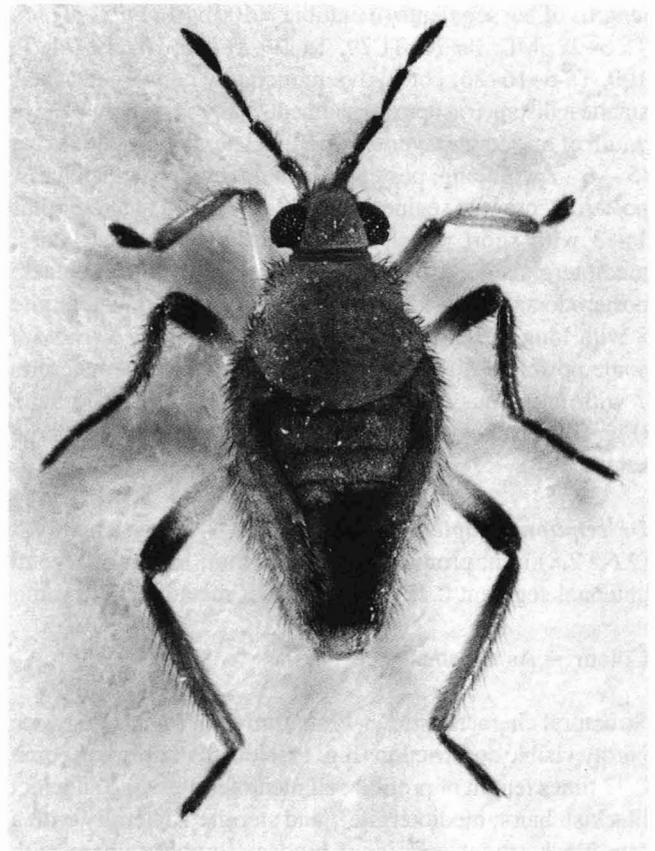
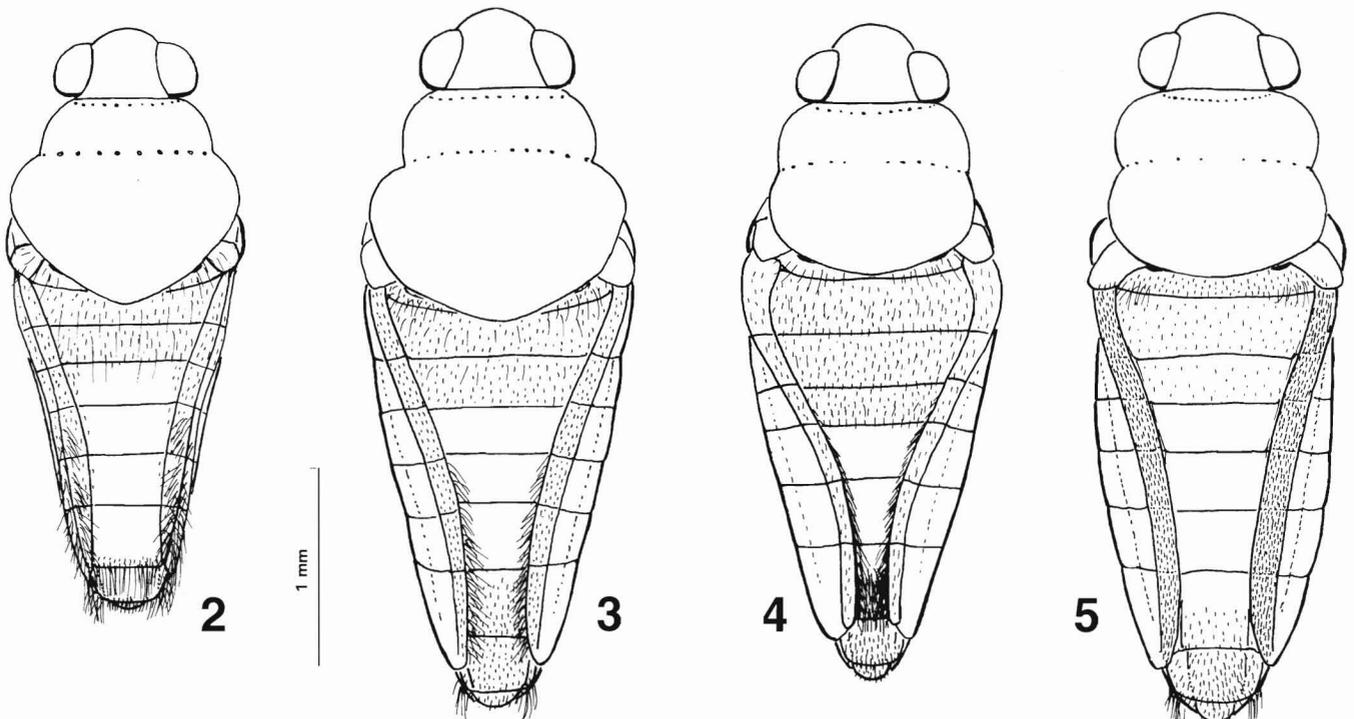


Fig. 1. Habitus of the apterous female of *Perittopus borneensis*, new species.

medially reaching basal third of mediotergite 2, 1.15 times as wide as long, anterior third with lateral constriction, posterior part distinctly wider than anterior (Fig. 2), anteriorly and laterally with long black bristles; prosternum anteromedially with one row of black spiculae; relative



Figs. 2-5. Dorsal view of apterous females (legs and antennae omitted; only diagnostic pilosity drawn): (2) *Perittopus asiaticus*, new species, (3) *P. webbi*, new species, (4) *P. sumatrensis*, new species, (5) *P. schuhi*, new species.

lengths of leg segments (metatibia = 100): FL: Fe 51, Ti 50, Ta 3+22; ML: Fe 70, Ti 79, Ta 19+21+26; HL: Fe 74, Ti 100, Ta 6+16+26; connexiva moderately convergent, their smallest distance at apex of segment 7 approximately 8 times width of one connexivum (Fig. 2); in lateral view connexiva (5 -) 6 - 7 with long, posterodorsad directed, blackish hairs, posterior corner of segment 7 rounded (Fig. 6); mediotergites 1 - 3 with short pilosity and some long blackish hairs; mediotergites 4 - 6 bare; mediotergite 7 with long, black, posterodorsad directed hairs along hind margin; mediotergite 8 with long, black hairs laterally; laterotergites 5 - 6 with some posteriad directed, long blackish hairs; laterosternite 7 with numerous, very long, posterodorsad directed hairs (Fig. 2); gonocoxa with short pilosity and a few scattered setae.

Description of apterous male. – Size. – Body length 2.7 (2.6 - 2.8) mm; pronotal width 1.04 mm; length of second antennal segment 0.28 mm; length of metatibia 1.22 mm.

Colour. – As in female.

Structural characteristics. – Pronotum as in female, but with hardly visible constriction (Fig. 15); length of grasping comb 0.37 times length of protibia; all mediotergites with suberect blackish hairs; mediotergite 7 and sternite 7 laterally with a few black spiculae at inner hind margin; paramere with relatively slender basal part and elongate, narrow distal part, apically rounded (Fig. 25).

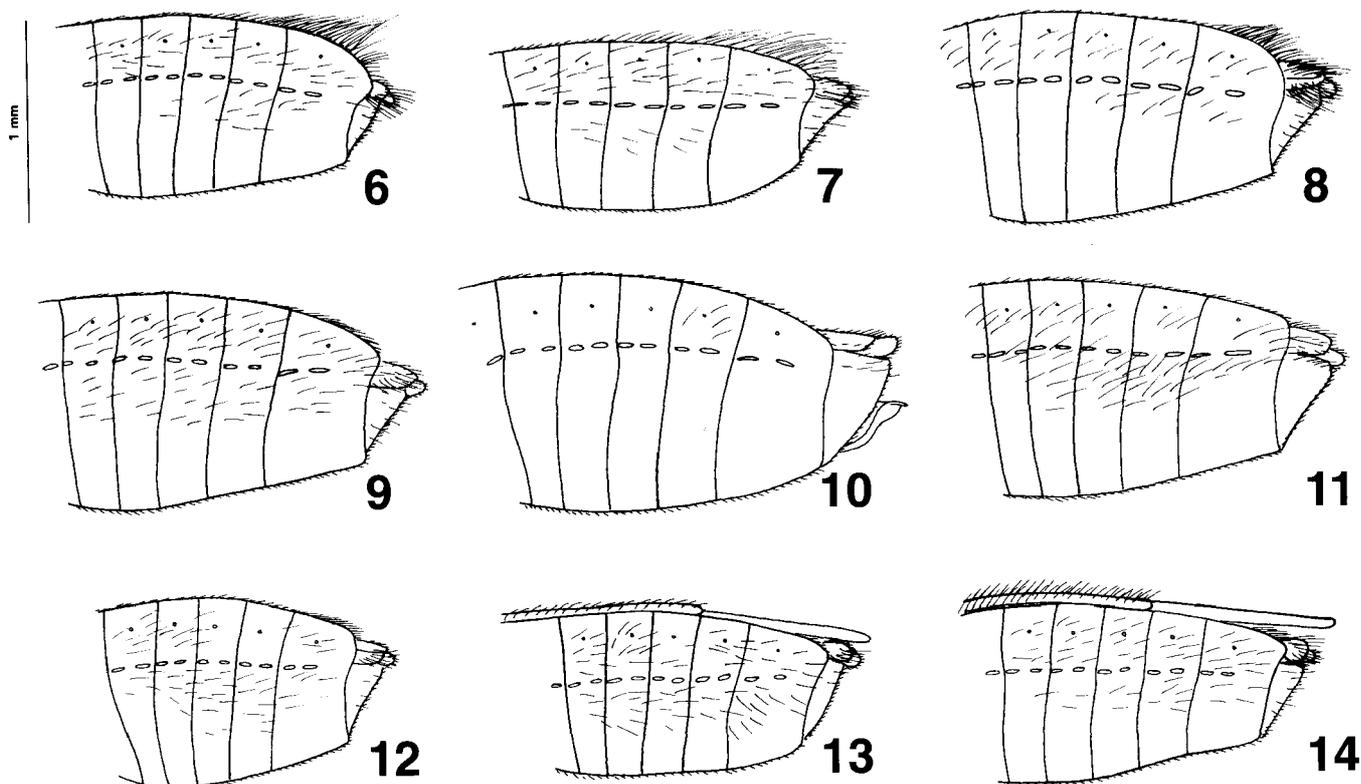
Description of macropterous female. – Size. – Body length 3.1 (3.0 - 3.4) mm; pronotal width 1.46 mm; length of second antennal segment 0.28 mm; length of metatibia 1.34 mm.

Colour. – Dorsally bright orange, connexiva yellow, hemelytra blackish.

Structural characteristics. – Pronotum 1.05 times as wide as long, with weak constriction in front of humeral corners (Fig. 22); hemelytron with numerous long, black, (sub-)erect hairs on veins (Fig. 14); connexivum 7 with some relatively short, posteriad directed, black hairs; mediotergite 8 with long black hairs laterally.

Description of macropterous male. – Size. – Body length 2.9 (2.7 - 3.3) mm; pronotal width 1.39 mm; length of second antennal segment 0.29 mm; length of metatibia 1.26 mm. – Other characteristics as in apterous male or macropterous female, respectively.

Comparative notes. – The male of this species can be easily distinguished from all described species of *Perittopus* by the characteristic shape of the paramere (Fig. 25); however, an undescribed species with a very similar paramere has been collected in Thailand and Vietnam; it can be distinguished by more or less prominent dark marks on the pronotal lobe. The apterous females differs from all other species except *P. breddini* by the dense and long pilosity on connexiva (5 -) 6 - 7 (in lateral view, Fig. 6) and on the hind margin of



Figs. 6-14. Lateral view of female abdomina (sternites 3-7): (6) *Perittopus asiaticus*, new species, (7) *P. breddini* (Gunung Murjo), (8) *P. vicarians*, (9) *P. webbi*, new species, (10) *P. schuhi*, new species, (11) *P. sumatrensis*, new species, (12, 13) *P. borneensis*, new species, and (14) *P. asiaticus*, new species (6-12: apterous morph; 13, 14: macropterous morph).

mediotergite 7. Females of *P. breddini*, however, have very broad abdomina and infuscated mediotergites.

Distribution. – Malaysia, Thailand, China. This is the first record of the subfamily Perittopinae for China.

Etymology. – Named for its wide distribution in the Southeast Asian mainland.

***Perittopus webbi*, new species**

(Figs. 3, 9, 16, 26)

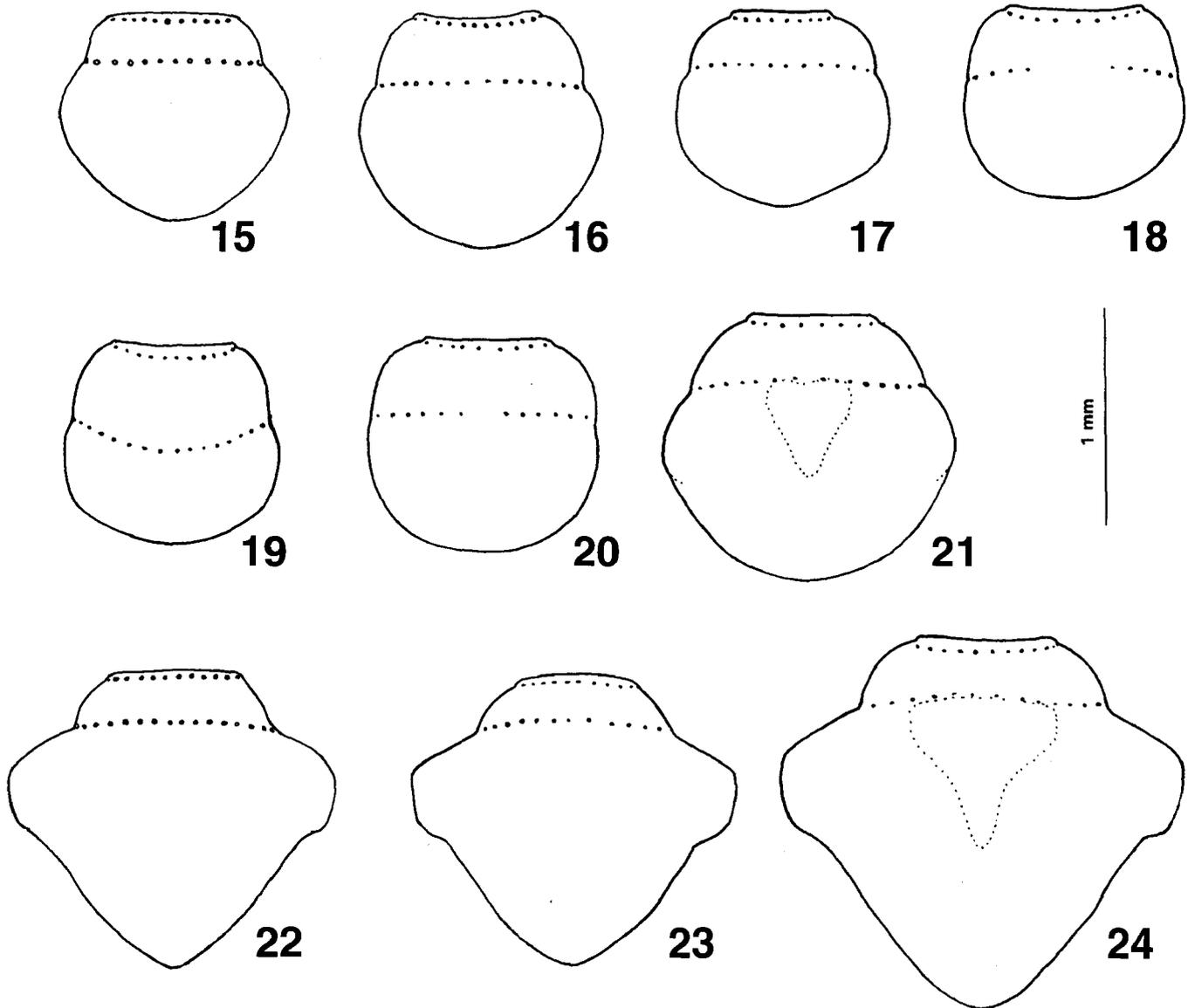
Holotype (apterous female): **MALAYSIA: Pahang:** Cameron's Highlands, Tanah Rata, L. Hendrich leg. (ZRC), 12 Dec.1996.

Paratypes: **MALAYSIA: Pahang:** 10 males, 6 females apterous, same locality data as holotype (ZRC, 2 males, 2 females NHMW); 23 males, 16 females apterous, same locality, L. Hendrich leg. (ZRC, 2 males, 2 females NHMW), 15 Dec.1996; 9 males, 8 females apterous, Cameron's Highlands, 2000 m, P. Nielsen leg.

(ZMUC, NHMW), 27 Nov.1979; 3 males, 2 females apterous, Cameron's Highlands, Padang, fish pond, 4700 ft., H.M. Pendlebury leg. (BMNH, 1 male NHMW), 21 May 1931; 1 male apterous, Cameron's Highlands, near Bertam, river, 4800 ft., H.M. Pendlebury leg. (BMNH), Jun.1923; 1 female apterous, 19 km SW Teranum, unnamed stream, W.D. Shepard leg. (WDS-A-1082) (NHMW), 14 Apr.1994; **Perak:** 1 male, 1 female apterous, Taiping, hill stream near reservoir, C. Dover leg. (BMNH), 9 Mar.1927; 2 males, 1 female apterous, Maxwell Hill, Taiping, 1200 m, P. Schwendinger leg. (NHMW), 7 Jan.1996.

Description of apterous female. – Size. – Body length 3.4 (3.0 - 3.6) mm; pronotal width 1.13 mm; length of second antennal segment 0.37 mm; length of metatibia 1.58 mm.

Colour. – Dorsally dull orange to red, rarely relatively bright; abdominal mediotergites often brownish; venter yellow; antennal segment 1 yellowish brown, segments 2 - 4 blackish; legs yellow, distal parts of femora strongly infuscated, tibiae yellowish brown (at inner surface yellowish), with dark apices; tarsi blackish.



Figs. 15-24. Dorsal view of pronota: (15) *Perittopus asiaticus*, new species, (16) *P. webbi*, new species, (17) *P. borneensis*, new species, (18) *P. sumatrensis*, new species, (19) *P. schuhi*, new species, (20) *P. vicarians*, (21) *P. breddini* (Gunung Ardjuna), (22) *P. asiaticus*, new species, (23) *P. borneensis*, new species, (24) *P. breddini* (Gunung Ardjuna); 15-21: apterous male; 22-24: macropterous female

Structural characteristics. – Hind margin of head laterally and ventrally with some black spiculae; relative lengths of antennal segments as 1.1 : 1 : 1.0 : 1.3; pronotum long, medially reaching basal third of mediotergite 2, 1.05 times as wide as long, anterior third with weak lateral constriction, posterior part distinctly wider than anterior (Fig. 3), anteriorly and laterally with long black bristles; prosternum anteromedially with one row of black spiculae; relative lengths of leg segments (metatibia = 100): FL: Fe 51, Ti 52, Ta 3+21; ML: Fe 71, Ti 80, Ta 19+21+23; HL: Fe 73, Ti 100, Ta 4+16+25; connexiva strongly convergent, their smallest distance at base of segment 7 approximately 3 times width of one connexivum; in lateral view connexiva without any long pilosity, posterior corner of segment 7 completely rounded (Fig. 9); mediotergites 1 - 3 with short pilosity and some long black hairs; mediotergites 4 - 6 bare; mediotergite 7 with long, dark, posterodorsad directed pilosity in posterior third; mediotergite 8 with short, dark pilosity dorsally, laterally with some longer black hairs (not distinct in all specimens); laterotergites 5 - 7 with posteriad directed, long black pilosity, longest on segment 7 (Fig. 3), in lateral view not or hardly visible (Fig. 9); gonocoxa with short pilosity and a few scattered long dark setae.

Description of apterous male. – Size. – Body length 3.1 (2.7 - 3.3) mm; pronotal width 1.18 mm; length of second antennal segment 0.34 mm; length of metatibia 1.56 mm.

Colour. As in female.

Structural characteristics. – Pronotum as in female, but with less distinct constriction (Fig. 16); length of grasping comb 0.32 times length of protibia; all mediotergites with suberect black hairs; mediotergite 7 with a few black spiculae at inner hind margin; paramere with broad basal part and triangular distal part, apically usually acute (Fig. 26).

Macropterous morph. – Unknown.

Variability. – Specimens from Perak differ from those from the Cameron's Highlands by on average smaller size, brighter reddish colouration, and relatively longer pilosity on abdominal mediotergites of male, but cannot be clearly separated.

Comparative notes. – *Perittopus webbi*, new species, is similar to *P. vicarians* from West Java. However, in the apterous morph of *P. vicarians* the posterior part of the pronotum is hardly broader than the anterior (cf. Figs. 3 and 34 for females, and Figs. 16 and 20 for males) and the tibiae are less infuscated; the male differs slightly in the shape of the apical part of the paramere (cf. Figs. 26 and 29), and the connexiva of the apterous female of *P. vicarians* are not obviously flattened (comp. Figs. 3 and 34).

Distribution. – Malaysia: Pahang, Perak.

Etymology. – Named in honour of Dr. Mick Webb (The Natural History Museum London) who provided the author with numerous interesting specimens of Perittopinae

including a part of the type series of this species.

***Perittopus borneensis*, new species**

(Figs. 1, 12, 13, 17, 23, 27)

Holotype (apterous female) – **MALAYSIA: Sabah:** Batu Punggul Resort env., river about 10 m wide, flowing in primary forest, partly shaded (11a) (NHMW), 24 Jun. - 1 Jul.1996.

Paratypes – **MALAYSIA: Sabah:** 5 males, 4 females apterous, same locality data as holotype (NHMW); 19 males 29 females apterous, same locality and date, shaded stream, 1.5 - 2.0 m wide, flowing through dense primary forest (11b) (NHMW, reference specimens in BMNH, CKB, JTPC, NCTN, PPCC, RMNH, ZMUC); 1 male macropterous, Crocker Range, Mawar Waterfall env., small pools in primary forest, sandy substrate (9b) (NHMW), 17 Jun.1996; 1 male, 2 females apterous, 6 males, 3 females macropterous, Crocker Range, Tenom env., Kalang Waterfall, J. Kodada & F. Ciampor leg. (NHMW, 1 male ZMUC), 16 - 18 May 1996; 1 male apterous, 1 male macropterous, Crocker Range, Tenom env., Sapong Waterfall, J. Kodada & F. Ciampor leg. (NHMW), 19 Jun.1998; 14 males, 7 females apterous, 14 males, 10 females macropterous, Crocker Range, Keningau env., stream near Liang Cave, J. Kodada & F. Ciampor leg. (NHMW, 1 male, 1 female in PPCC, ZIAS, ZRC), 13 Jun.1998; 5 males 6 females apterous, 5 males, 2 females macropterous, Danum Valley, nr. Segama Bridge, H. Zettel leg. (12) (NHMW, SPC, UMS), 11 Feb.1997; 5 females apterous, Danum Valley, Nature Trail, H. Zettel leg. (3) (NHMW, UMS), 2 Feb.1997; 1 male apterous, S Lahad Datu, Mt. Silan, H. Zettel leg. (9) (NHMW), 6 Feb.1997; 1 male, 2 females apterous, Ranau env., Liwagu River, J. Kodada & F. Ciampor leg. (NHMW), 1 Jun.1998.

Description of apterous female. – Size. Body length 2.7 (2.6 - 2.8) mm; pronotal width 1.05 mm; length of second antennal segment 0.27 mm; length of metatibia 1.19 mm.

Colour. - Dorsally dull yellowish orange, rarely relatively bright, on abdomen dull, rather brownish yellow; venter yellow; antenna black, segment 1 brownish; legs yellow, apex of femora blackish infuscated, mesotibia dark brown, metatibia yellowish brown, tarsi blackish brown.

Structural characteristics. - Hind margin of head laterally and ventrally with some (sometimes numerous) black spiculae; relative lengths of antennal segments as 1.1 : 1 : 1.1 : 1.3; pronotum long, medially reaching base of mediotergite 2, 1.15 times as wide as long, anterior third with lateral constriction, posterior part distinctly wider than anterior (Fig. 1), anteriorly and laterally with long black bristles; prosternum anteromedially with row of black spiculae; relative lengths of leg segments (metatibia = 100): FL: Fe 53, Ti 50, Ta 3+21; ML: Fe 68, Ti 80, Ta 16+18+23; HL: Fe 75, Ti 100, Ta 4+14+22; connexiva distinctly convergent, their smallest distance at apex of segment 7 approximately 5 times dorsal width of one connexivum; in lateral view connexivum 7 with some posteriad directed, black hairs, posterior corner of segment 7 rounded (Fig. 12); mediotergites 1 - 3 with short pilosity and some long black hairs; mediotergites 4 - 6 bare; mediotergite 7 with long, black, posteriad directed hairs in posterior third; mediotergite 8 with relatively short, black hairs laterally; laterotergites 5 - 7 with posteromedial directed, long black hairs (Fig. 1);

gonocoxa with short pilosity and a few scattered setae.

Description of apterous male. – Size. – Body length 2.5 (2.4 - 2.7) mm; pronotal width 1.00 mm; length of second antennal segment 0.28 mm; length of metatibia 1.22 mm.

Colour. – As in female.

Structural characteristics. – Pronotum as in female, but with less distinct constriction (Fig. 17); length of grasping comb 0.30 times length of protibia; all mediotergites with suberect black hairs; mediotergite 7 and sternite 7 laterally with a few black spiculae at inner hind margin; paramere with relatively slender basal part and broad, triangular distal part, apically rounded (Fig. 27).

Description of macropterous female. – Size. – Body length 3.0 (2.9 - 3.0) mm; pronotal width 1.52 mm; length of second antennal segment 0.27 mm; length of metatibia 1.23 mm.

Colour. – Dorsally bright or yellowish orange, connexiva yellow, hemelytra blackish brown, but anterior (external) cell and surrounding veins of corium yellowish brown.

Structural characteristics. – Pronotum 1.1 times as wide as long, with distinct constriction in front of humeral corners (Fig. 23); hemelytron with numerous relatively short, decumbent, black hairs on veins (Fig. 13); connexivum 7 with some relatively short, posteriad directed, black hairs; mediotergite 8 with some black hairs laterally.

Description of macropterous male. – Size. – Body length 2.8 (2.7 - 2.9) mm; pronotal width 1.36 mm; length of second antennal segment 0.27 mm; length of metatibia 1.20 mm. – Other characteristics as in apterous male or macropterous female, respectively.

Comparative notes. – *Perittopus borneensis*, new species, is similar to *P. vicarians* from Java and *P. sumatrensis*, new species, from Sumatra, but can be distinguished by relatively short and stout abdomen of both sexes (comp. Figs. 1, 4, and 34 for females). Further differences are found in the pilosity of the female abdomen and in the male parameres. *Perittopus borneensis*, new species, is most similar, but not conspecific, with *P. rufus* sensu Distant (1903) from southern Burma, a name which must be regarded as unavailable (Zettel, in preparation).

Distribution. – North Borneo (This is the only species known from Borneo).

Etymology. – Named after its occurrence in Borneo.

***Perittopus sumatrensis*, new species**

(Figs. 4, 11, 18, 30)

Holotype (apterous female) – **INDONESIA: Sumatra:** Air Njuruk Dempu [? = Dempu mountain, 5°07'S 104°55'E, Sumatra Selantan], 1400 m, E. Jacobson leg. (RMNH), Aug.1916.

Paratype – 1 male apterous, same locality data (RMNH).

Description of apterous female. – Size. – Body length 3.2 mm; pronotal width 1.02 mm; length of second antennal segment 0.32 mm; length of metatibia 1.45 mm.

Colour. – Dorsally bright orange, ventrally yellow; antennal segment 1 yellow, segments 2 - 4 yellowish brown; legs yellow, apices of femora weakly infuscated, tarsi brown.

Structural characteristics. – Hind margin of head laterally and ventrally with some black spiculae; relative lengths of antennal segments as 1.2 : 1 : 1.1 (segment 4 missing); pronotum medially reaching distal third of mediotergite 1, 1.2 times as wide as long, middle with distinct constriction, posterior part slightly wider than anterior (Fig. 4), anteriorly and laterally with long black bristles; prosternum anteromedially with one row of black spiculae; relative lengths of leg segments (metatibia = 100): FL: Fe 53, Ti 53, Ta 3+22; ML: Fe 71, Ti 82, Ta 13+23+28; HL: Fe 73, Ti 100, Ta 5+14+27; connexiva strongly convergent, their smallest distance at base of segment 7 about 1.5 times dorsal width of one connexivum; in lateral view connexiva without any long pilosity, posterior corner of segment 7 completely rounded (Fig. 11); mediotergite 1 with short pilosity and some long black hairs; mediotergites 2 - 4 with short pilosity; mediotergites 5 - 6 bare; mediotergite 7 with long, dark, posteriad directed pilosity in posterior half; mediotergite 8 with short, light pilosity dorsally; laterotergites 5 - 7 with posteriad directed, long black pilosity, longest on segment 7 (Fig. 4); gonocoxa with short pilosity.

Description of apterous male. – Size. – Body length 3.0 mm; pronotal width 1.05 mm; length of second antennal segment 0.37 mm; length of metatibia 1.45 mm.

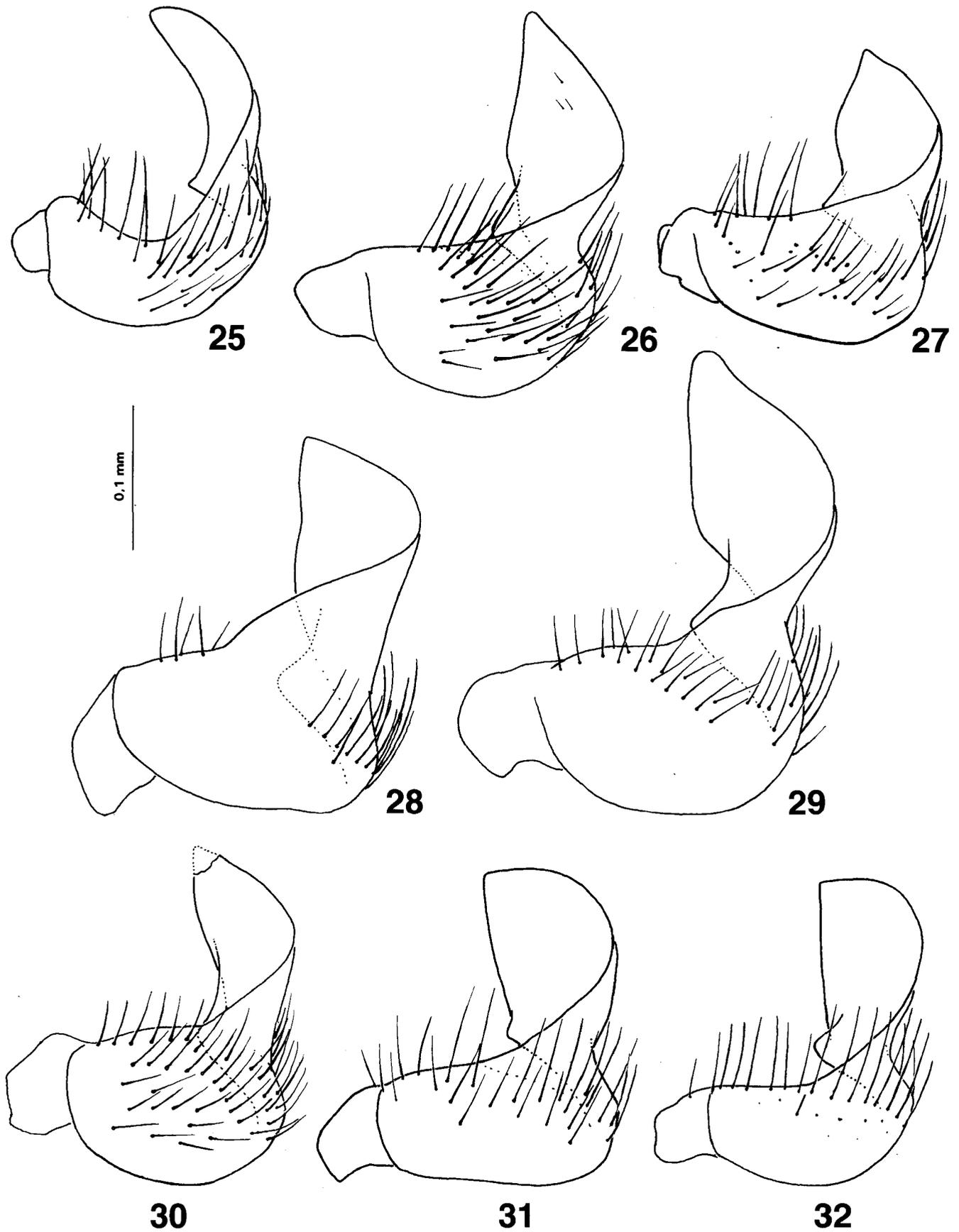
Colour. – As in female.

Structural characteristics. – Hind margin of head laterally and ventrally with some black spiculae; relative lengths of antennal segments as 1.2 : 1 : 1.1 : 1.4; pronotum as in female, but with less obvious constriction (Fig. 18); prosternum without spiculae; length of grasping comb 0.21 times length of protibia; mediotergites 1 - 5 with decumbent pilosity, mediotergites 6 - 7 with suberect pilosity; segment 8 with a few black spiculae laterally; paramere with very broad basal part and relatively short and narrow, triangular distal part, apically not very acute (Fig. 30).

Macropterous morph. – Unknown.

Comparative notes. – This species is closely related to *P. vicarians* from West Java, but the female differs by several characters of the abdomen: connexiva 5 - 7 weakly flattened, pilosity of laterotergites 5 - 7 subequal in length, mediotergite 7 with dark pilosity in the whole posterior half, and mediotergite 8 lacking long dark pilosity (comp. Figs. 4 and 34). The male can be identified by details of the paramere (Fig. 30).

Distribution. – Sumatra. (From Sumatra no other species



Figs. 25-32. Lateral view of left parameres: (25) *Perittopus asiaticus*, new species, (26) *P. webbi*, new species, (27) *P. borneensis*, new species, (28) *P. schuhi*, new species, (29) *P. vicarians*, (30) *P. sumatrensis*, new species (apex broken, reconstructed from right paramere), (31, 32) *P. breddini* (31 from Gunung Ardjuna, 32 from Gunung Murjo).

has been recorded so far. However, in NHMW there is one macropterous male belonging to another species, which will be described if more material becomes available.)

Etymology. – Named after its occurrence in Sumatra.

***Perittopus schuhi*, new species**

(Figs. 5, 10, 19, 28)

Holotype (apterous female) – **INDONESIA: Djawa Barat** (West Java): ca. 40 km SW Bandung, 10 km W Ciwidey, “Rance Upas”, 1300 m, 8 Aug.1994, R. Schuh leg. (12) (NHMW).

Paratype – 1 male apterous, same locality data (NHMW).

Description of apterous female. – Size. – Body length 3.5 mm; pronotal width 1.28 mm; length of second antennal segment 0.38 mm; length of metatibia 1.65 mm.

Colour. – Dorsally red, abdominal mediotergites orange brown, connexiva blackish, ventrally yellow; antenna blackish, except extreme base of segment 1 yellowish; legs blackish, but coxae, trochanters, profemur except apex, and meso- and metafemur at base dark yellow.

Structural characteristics. – Hind margin of head laterally and ventrally with some black spiculae; relative lengths of antennal segments as 1.3 : 1 : 1.1 : 1.4; pronotum medially reaching basal half of mediotergite 1, 1.2 times as wide as long, middle with distinct constriction, posterior part slightly wider than anterior (Fig. 5), anteriorly and laterally with long black bristles; prosternum anteromedially with one row of black spiculae; relative lengths of leg segments (metatibia =

100): FL: Fe 54, Ti 52, Ta 3+22; ML: Fe 75, Ti 82, Ta 17+27+25; HL: Fe 75, Ti 100, Ta 5+18+23; connexiva distinctly convergent, their smallest distance at base of segment 7 approximately 2.5 times dorsal width of one connexivum; in lateral view connexiva without any long pilosity, posterior corner of segment 7 rounded (Fig. 10); mediotergite 1 with short pilosity and some long black hairs; mediotergites 2 - 3 with short pilosity; mediotergites 4 - 6 bare; mediotergite 7 with short, light, posteriad directed pilosity in posterior half; mediotergite 8 with short, light pilosity dorsally, slightly longer and black along hind margin and laterally; all laterotergites with posteriad directed, short black pilosity (Fig. 5); gonocoxa dorsally with a few black hairs.

Description of apterous male. – Size. – Body length 3.2 mm; pronotal width 1.01 mm; length of second antennal segment 0.36 mm; length of metatibia 1.60 mm.

Colour. – As in female, except connexiva less infuscated.

Structural characteristics. – Pronotum as in female, but with less obvious constriction (Fig. 19); length of grasping comb 0.24 times length of protibia; all mediotergites with decumbent pilosity; paramere with very broad basal part and relatively short and narrow, triangular distal part, apically acute (Fig. 28).

Macropterous morph. – Unknown.

Comparative notes. – *Perittopus schuhi*, new species, differs from all species of the area by the second tarsomere of the mesotarsus, which is slightly longer than the third. This species seems to be closely related to *P. vicarians*, also from West Java, but both sexes can be distinguished easily by the infuscated tibiae, first antennal segments, and connexiva. The apterous female differs distinctly by dorsally unflattened connexiva 5 - 7 and lack of long pilosity on laterotergites 5 - 7 and mediotergite 7 (comp. Figs. 5 and 34). The single known female has a very reduced number of black erect bristles on the abdominal sternites.

Distribution. – West Java.

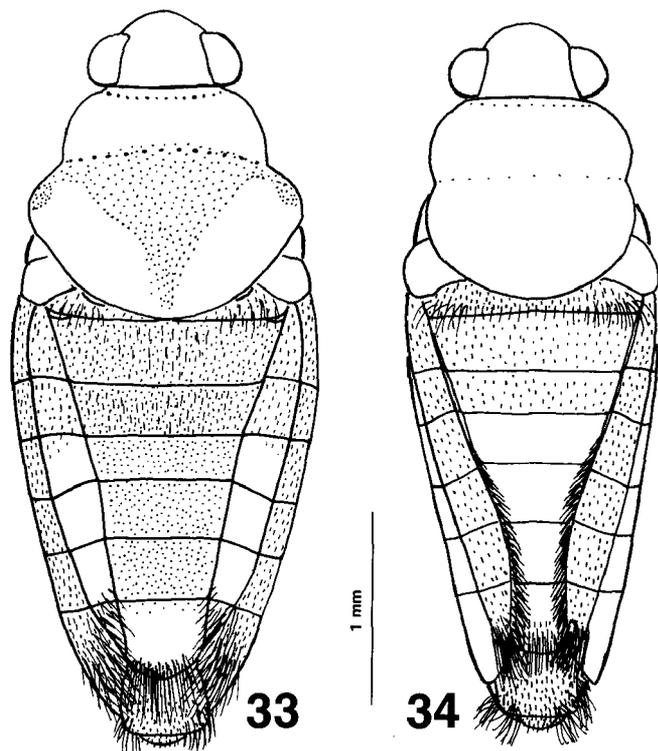
Etymology. – Named in honour of Rudolf Schuh (H Katzelsdorf) who collected the type specimens.

***Perittopus breddini* Kirkaldy, 1901**

(Figs. 7, 21, 24, 31 - 33)

Perittopus breddini Kirkaldy, 1901: 286. - Lundblad, 1933: 297-301, tab. VI.

Material examined. – **INDONESIA: Djawa Timur** (East Java): 8 males, 16 females apterous, 2 males macropterous, 50 km S Surabaya, Gunung Ardjuna (NE slope), small creek, 1550 m, P. Koubek & H. Schillhammer leg. (3) (NHMW), 21 Sep.1995; 2 females macropterous, Gunung Ardjuna (NE slope), Alap Alap Waterfall, 1000 m, P. Koubek & H. Schillhammer leg. (4) (NHMW), 23 Sep.1995; 4 males, 2 females apterous, 3 males, 2 females macropterous, Gunung Ardjuna (NE slope), Kekek Bodo



Figs. 33-34. Dorsal view of apterous females (legs and antennae omitted; only diagnostic pilosity drawn): (33) *Perittopus breddini*, (34) *P. vicarians*.

Waterfall, P. Koubek & H. Schillhammer leg. (1) (NHMW), 20 Sep.1995; **Djawa Tengah** (Central Java): 10 males, 9 females apterous, Gunung Murjo [= Moerja, Muria], E Jepara, 3000 ft, E. le Moutl leg. (RMNH, 2 males, 2 females NHMW), Dec.1935.

Diagnosis. – Relatively large, length of apterous female 3.3 - 4.0 mm, of apterous male 3.2 - 3.7 mm, of macropterous female 3.7 - 4.0 mm, of macropterous male 3.5 - 3.8 mm; pronotum with blackish central mark of varying size (rarely indistinct); mediotergites (at least anterior mediotergites) more or less infuscated; all tibiae blackish; pronotum of apterous morph with posterior part distinctly wider than anterior (“humeral corners”; Figs. 21, 33). Male: paramere as in Figs. 31, 32; Apterous female: connexiva weakly convergent, dorsally not flattened; laterotergites (6-) 7 with long, dark pilosity, partly visible in lateral view; mediotergite 4 - 6 bare, mediotergite 7 with (long) dark pilosity at hind margin; mediotergite 8 with long black pilosity laterally (Fig. 7, 33). Macropterous female: mediotergite 8 with conspicuous tufts of black pilosity laterally.

Distribution. – Java, Bali. – This species was described from the Tengger Mountains in East Java (Kirkaldy, 1901), and later recorded from Central Java and Bali by Lundblad (1933). All records are from isolated mountains at 730 - 1550 m a.s.l. The material examined in this study exhibits small regional differences in colour (as also stated by Lundblad, 1933) and structural characteristics, which may justify a (sub)specific differentiation after more specimens from various localities have been studied.

***Perittopus vicarians* Breddin, 1905**

(Figs. 8, 20, 29, 34)

Perittopus vicarians Breddin, 1905: 129-130. - Lundblad, 1933: 302-304, tab. VII.

Material examined. – **INDONESIA: Djawa Barat** (West Java): 2 males, 2 females apterous, Cibodas, 1400 m, D.v. Leeuwen leg. (RNMH), Jan.1927; 5 males, 3 females apterous, Ind. G. Gedeh, Cibodas Bot Gron, P.H.v. Doesburg leg. (RNMH), 4 Jan.1977; 6 males, 6 females apterous, same locality (RNMH), 1 male, 2 females NHMW), 5 Jan.1977; 1 male apterous, Gede-Pangrango NP, Seiabintana gate to Sawer Waterfall, 1000 - 1200 m, R. Schuh leg. (NHMW), 23 Aug.1994.

Diagnosis. – Body length of apterous female 3.2 - 3.5 mm, of apterous male 3.0 - 3.4 mm; body without black marks; pronotum of apterous morph relatively narrow, posterior part hardly wider than anterior (Figs. 20, 34). Male: paramere as in Figure 29. Apterous female: pronotum with conspicuous constriction; connexiva strongly convergent, dorsally strongly flattened on segments 5 - 7; connexivum laterotergites 5 - 6 with short, 7 with long, black pilosity; mediotergite 7 with long black pilosity at hind margin; mediotergite 8 with long black pilosity laterodorsally and laterally (Figs. 8, 34).

Distribution. – West Java. – Cibodas (= “Tjibodas”) is the type locality of *P. vicarians* (Breddin, 1905); all records so far refer to this area.

**KEY TO THE MALESIAN SPECIES OF
PERITTOPUS (APTEROUS MORPH)**

1. Female 2
– Male 8
2. In lateral view, connexiva (5 -) 6 - 7 with long, erect or suberect, black bristles (Figs. 6, 7); in dorsal view, connexiva weakly convergent, sternites not or hardly visible (Fig. 2, 33). ... 3
– In lateral view, at most connexivum 7 with (sub-)erect black bristles (Figs. 8 - 12); in dorsal view, connexiva distinctly convergent, sternites partly visible (Figs. 1, 3 - 5, 34). ... 4
3. Pronotum in centre (in most specimens) and mediotergites more or less infuscated; abdomen very broad (Fig. 33) (Central and East Java, Bali). *P. breddini*
– Pronotum and mediotergites not infuscated; abdomen relatively slender (Fig. 2) (Southeast Asian mainland). *P. asiaticus*, new species
4. In dorsal view, mediotergite 7 and laterotergites (5 -) 6 - 7 with long, posteriad directed, black hairs (Figs. 1, 3, 4, 34); all tibiae yellowish or only mesotibia blackish. 5
– In dorsal view, mediotergite 7 and laterotergites 5 - 7 without any long pilosity (Fig. 5); all tibiae strongly infuscated (West Java). *P. schuhi*, new species
5. Connexiva 5 - 7 strongly flattened; mediotergite 8 with long dark pilosity laterodorsally and laterally (Fig. 34) (West Java). *P. vicarians*
– Connexiva 5 - 7 weakly flattened; mediotergite 8 without long black pilosity (Figs. 1, 3, 4). 6
6. Mediotergite 4 with short pilosity; abdomen long and slender (Fig. 4) (Sumatra). *P. sumatrensis*, new species
– Mediotergite 4 bare. 7
7. Abdomen relatively short and broad (Fig. 1) (Borneo). *P. borneensis*, new species
– Abdomen relatively long and slender (Fig. 3) (West Malaysia). *P. webbi*, new species
8. Distal part of paramere elongate and slender (Fig. 25) (Southeast Asian mainland). *P. asiaticus*, new species
– Distal part of paramere triangular (Figs. 26 - 32). 9
9. Pronotum in centre (in most specimens) and mediotergites more or less infuscated; distal part of paramere very broad, with nearly rectangular apex (Figs. 31, 32) (Central and East Java, Bali). *P. breddini*
– Pronotum and mediotergites not infuscated, distal part of paramere not so broad (Figs. 26 - 30). 10
10. Mediotergite 7 at most as wide as long; basal part of paramere very broad (Figs. 28, 30). 11
– Mediotergite 7 at least 1.2 times as wide as long, basal part of paramere varying. 12
11. Grasping comb 0.24 times protibial length; all tibiae and antennal segment 1 blackish infuscated; paramere as in Fig. 28 (West Java). *P. schuhi*, new species
– Grasping comb 0.37 times protibial length; all tibiae and antennal segment 1 yellowish; paramere as in Fig. 30 (Sumatra). *P. sumatrensis*, new species
12. Body short and stout, length at most 2.7 mm; dorsal colour yellowish orange; mediotergite 7 about 1.3 times as wide as long; paramere as in Fig. 27 (Borneo). *P. borneensis*, new species

- Body more slender, at least 2.7 mm, usually more than 2.9 mm; dorsal colour reddish orange to brownish; mediotergite 7 about 1.2 times as wide as long 13
- 13. Posterior part of pronotum distinctly broader than anterior one (Fig. 16); paramere as in Fig. 26 (West Malaysia)
..... *P. webbi*, new species
- Posterior part of pronotum hardly broader than anterior one (Fig. 20); paramere as in Fig. 29 (West Java)
..... *P. vicarians*

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