

DESCRIPTIONS OF FOUR NEW SPECIES OF THE GENUS *MICROPHORELLA* BECKER
(DIPTERA: EMPIDOIDEA, MICROPHORIDAE, PARATHALASSIINI)
FROM SOUTHEAST ASIA AND NEW GUINEA, WITH NOTES
ON THE RELATIONSHIPS WITHIN THE GENUS

Igor V. Shamshev

Permanent address: All-Russian Institute of Plant Protection, shosse Podbel'skogo 3, 188620, St. Petersburg – Pushkin, Russia. Temporary at Royal Belgian Institute of Natural Sciences, Brussels
Email: shamshev@mail.ru

Patrick Grootaert

Department of Entomology, Royal Belgian Institute of Natural Sciences, Rue Vautier 29, B-1000, Brussels, Belgium
Email: Patrick.Grootaert@naturalsciences.be

ABSTRACT. – Four new species of the genus *Microphorella* Becker, *M. malaysiana*, new species (Thailand, Singapore, Indonesia), *M. papuana*, new species (Papua New Guinea), *M. bira*, new species (Sulawesi), and *M. satunensis*, new species (Thailand) are described from the coasts of Southeast Asia and Papua New Guinea. The phylogenetic relationships of the new species within the genus are discussed. A preliminary analysis leads to the conclusion that the new species form a distinctive group within the genus based primarily on the ecological data and characters of the male terminalia.

KEY WORDS. – Diptera, Empidoidea, Parathalassiini, *Microphorella*, new species, phylogeny, Oriental region, Thailand, Singapore, Indonesia, Papua New Guinea.

INTRODUCTION

The genus *Microphorella* Becker (with *M. praecox* Loew as the type species) includes very small greyish flies inhabiting river banks, wet stones and other places near fresh-water reservoirs. *Microphorella* belongs to a problematic assemblage of genera, which are known nowadays as the tribe Parathalassiini. This group is considered very closely related to the Dolichopodidae and is well represented in Cretaceous amber (Hennig, 1971; Chvála, 1988; Cumming & Brooks, 2002). Chvála (1988) has revised the Palaearctic species of *Microphorella*. The genus comprises currently 9 species known from a few localities of Europe (3 species), North America (5 species), and Australia (1 species) (Meland, 1928; Colless, 1963; Chvála, 1983, 1988). Our paper includes the descriptions of four new *Microphorella* species. They were collected together with many other Empidoidea on the coasts of Thailand, Singapore, Sulawesi and Papua New Guinea.

MATERIAL AND METHODS

This study is based on Diptera materials housed in the Entomology Department of the Royal Belgian Institute of

Natural Sciences, Brussels. All are conserved in alcohol (RBINS, Brussels), except for some voucher specimens that are on pin at the Zoological Reference Collection of the Raffles Museum of Biodiversity Research, National University of Singapore (ZRC).

The flies were collected by sweeping or in white pan traps and transferred to 75% ethanol. Additionally, pinned specimens of *M. curtipes* (Becker) [5 males, 1 female, France, Corse, VI, R.M.H.N.Belg.: 5.392, Coll. J. Villeneuve, *Sciodromia curtipes* Beck., det. Becker, *Microphorella curtipes* (Beck.), det. M. Chvála, 1982] were also examined. Terms used for adult structures primarily follows those of McAlpine (1981), although the terminology for the antenna is taken from Stuckenberg (1999). Homologies for the male terminalia follow Sinclair (2000). To facilitate observations, some parts of the body were macerated in hot 10% KOH or 85% lactic acid (terminalia) and immersed in glycerine. Drawings of morphological features were made with a camera lucida attached to a compound microscope. In describing the hypopygium, “dorsal” and “ventral” refer to morphological position prior to genital rotation and flexion. Figures showing the male genitalia in lateral view are oriented as they appear on the intact specimen (rotated and lateroflexed to the right), with the morphologically ventral surface up and dorsal surface

down. Due to inconspicuous setation of this very small flies the term “bristle” is mainly used for differentiated large setae on the head, mesonotum, and legs bearing a particular name or one of a series with a particular name (e.g., notopleural bristle, dorsocentral bristle, ocellar bristle).

List of abbreviations:

cerc = cercus, cib = cibarium, clyp = clypeus, clyp rdg = clypeal ridge, cst sp = costal spinule, epand = epandrium, hypd = hypandrium, hyphar = hypopharynx, lbl = labellum, lbr = labrum, ph = phallus, plp = palpus, pgt = postgonite, psdtrch = pseudotrachea, S = sternite, stp = stipes, sur = surstylus, T = tergite.

KEY TO THE SPECIES OF *MICROPHORELLA* FROM SOUTHEAST ASIA AND AUSTRALIA

1. Male 2
 - Female (unknown in *M. satunensis*, new species) 6
2. 6 or 5 pairs of dorsocentral bristles 3
 - 4 pairs of dorsocentral bristles 5
3. Fore tarsus thickened (Fig. 6), entirely dark brown. Scutum with 6 pairs of dorsocentral bristles. Abdominal sternites 5 and 6 with equally small median posteromarginal processes (Figs. 11, 12) *M. malaysiana*, new species
 - Fore tarsus slender. Scutum with 5 pairs of dorsocentral bristles 4
4. Fore tarsus with tarsomeres 1-2 yellow, tarsomere 3 brownish yellow and tarsomeres 4-5 brownish. Halter pale. Abdominal segments 5 and 6 with equally large processes (Figs. 36, 37) *M. satunensis*, new species
 - Legs entirely black. Halter black. Abdominal segments lacking processes *M. iota* Colless
5. Fore tarsus somewhat thickened, with tarsomeres 1-2 yellow. Femora largely brown, brownish yellow in apical part. Abdominal sternite 5 with short, rather slender median posteromarginal process, sternite 6 with longer, broad process (Figs. 25, 26). Terminalia with right surstylus broad crescent-shaped (Fig. 27) *M. papuana*, new species
 - Fore tarsus slender, with tarsomeres 1-3 yellow. Femora almost wholly yellowish, brownish dorsally. Abdominal sternite 5 lacking process, sternite 6 with large, broad process (Figs. 31, 32). Terminalia with right surstylus long, narrow (Fig. 33) *M. bira*, new species
6. 5 or 6 pairs of dorsocentral bristles 7
 - 4 pairs of dorsocentral bristles 8
7. Fore tarsus yellowish brown, with tarsomeres becoming darker from 1st to 5th; mid and hind tarsomere 1 largely yellow, brownish at apex. Halter pale *M. malaysiana*, new species
 - Legs entirely black. Halter black *M. iota* Colless
8. All tarsi almost wholly light brown, only tarsomere 1 paler basally *M. papuana*, new species
 - All tarsi with tarsomeres 1-2 yellowish brown *M. bira*, new species

TAXONOMY

***Microphorella malaysiana*, new species**
(Figs. 1-20)

Material examined. – Holotype - male, **Thailand**, Ranong, mangrove, 98039, 9 May.1998, coll. P. Grootaert (RBINS).

Paratypes – 2 males, 6 females (1 male, 1 female in coll. Chulalongkorn University, BKK), **Thailand**, Pak Bara (Satun prov.), beach, white pan traps, 97135, 28 Oct.1997, coll. P. Grootaert; 1 male, 7 females, **Thailand**, Koh Phangan, 98055, 15 May.1998, coll. P. Grootaert; 1 female, **Thailand**, Ranong prov., Som Laey, 98046, 10 May.1998, coll. P. Grootaert; 2 males, 5 females, **Thailand**, Ranong, mangrove, 98039, 9 May.1998, coll. P. Grootaert; 2 females, **Thailand**, Pak Bara, 97162, 15 Nov.1997, coll. P. Grootaert; 6 females, **Thailand**, Prov. Chonburi, Sattahip, sandy beach, 9 Sep.2002, coll. P. Grootaert; 1 female, **Thailand**, Prov. Rayong, Koh Talu, sandy beach, 22046, 27 Sep.2002, coll. P. Grootaert; 4 males, 4 females (1 male, 1 female in Zool. Museum, Chulalongkorn Univ. BKK), **Singapore**, Shangi harbour, sandy beach (s. 42), 22 Apr.1993, coll. P. Grootaert; 3 males, 17 females, **Singapore**, Labrador Park, sandy beach, 22055, 8 Dec.2002, coll. P. Grootaert & Tuksina Suwanamalik; 3 males, 2 females, **Singapore**, Pulau Ubin, sandy beach near Jetty, 22058, 13 Dec.2002, coll. P. Grootaert & Yang Chang Man (material on pin at ZRC); 10 males, 12 females, **Indonesia**, Pulau Batam, Batu besar beach, 93035, 21 Apr.1993, coll. P. Grootaert; 2 males, 3 females, **Indonesia**, P. Batam, Batu Besar beach (s. 34), 21 Apr.1994, coll. P. Grootaert. All deposited in RBINS, Brussels, except indicated otherwise.

Diagnosis. – A small species (1.5-1.8 mm long) with pale yellow palpi in male, brown in female; 6 dorsocentral bristles; fore tarsi thickened, wholly brown; abdominal sternites 5 and 6 of male with short median posteromarginal processes of subequal size; right surstylus leaf-like.

Description. – *Male* body length 1.5-1.7 mm, wing length 1.2-1.3 mm. Head broader than thorax in dorsal view, broad oval in lateral view, nearly 1.5 times higher than wide, dark brown in ground-colour, mostly light grey pollinose, with pale setation; clypeus brownish yellow, face (including clypeus) denser pollinose; insertion of neck high on head. Occiput moderately rounded, not far projecting beyond hind margin of eye, with upper median part moderately concave. Ocellar triangle weakly prominent. Eyes dichoptic in both sexes, entirely covered with uniform distinct ommatrichia, with inner margins not emarginate near antennae; ommatidia large, uniform. Frons broadly triangularly widening above in both sexes. Face broad below antennae, gradually narrowing below, in middle nearly as wide as distance between posterior ocelli. Clypeus rather long, produced below, convex, weaker sclerotized than upper face, rounded apically. Bristles of head mostly well-differentiated; 2 inclinate anterior frontal-orbitals, 2 laterocline posterior frontal-orbitals, 2 laterocline anterior ocellars, 2 laterocline outer-verticals and 2 inclinate inner-verticals; posterior ocellars undifferentiated, 7-9 minute setulae present. Postocular occipital bristles rather long, hair-like, arranged in 1 regular row in upper half, more numerous and irregularly spread in lower half; several long setae present just behind

mouth-opening including postgena. Antenna (Fig. 1) inserted above middle of head in profile, entirely dark brown; scape very short, cup-shaped, bare; pedicel larger than scape, subglobular, ringed with cirlet of short bristles; postpedicel bulbous, nearly 2.0 times broader than long, gradually tapered, microsetulose in apical part. Style apical, arista-like, nearly 2.0 times longer than postpedicel, 1-segmented, jointed distinctly with postpedicel, whip-like in subapical portion, microsetulose, with setulae in apical part longer than width of arisal trunk, bearing sensory pit in subbasal part, lacking secondary sexual adornments. Palpus (Fig. 2) moderately large, clavate, flattened, pale yellow in ground-colour, clothed in dense pale appressed setulae intermixed with scattered erect setulae (palpus silvery white in some angle of view), 1 basal sensory pit present (Fig. 3). Proboscis (Fig. 4) short, well visible, pointing downward, wholly brown; labellum (Fig. 5) well developed, small, with spinule-like setulae along upper margin and similar spinules near apices of pseudotracheae, covered with dense ciliae in subapical portion; lacinia absent; stipes long, slender; labrum heavily sclerotized, convex basally; epipharynx serrate along lower margin; hypopharynx slender, almost straight; prementum with 2-3 short setae on each side; 6 geminate pseudotracheae present, with walls weakly sclerotized; clypeal ridge rather short, shorter than cibarium. Genae moderately broad.

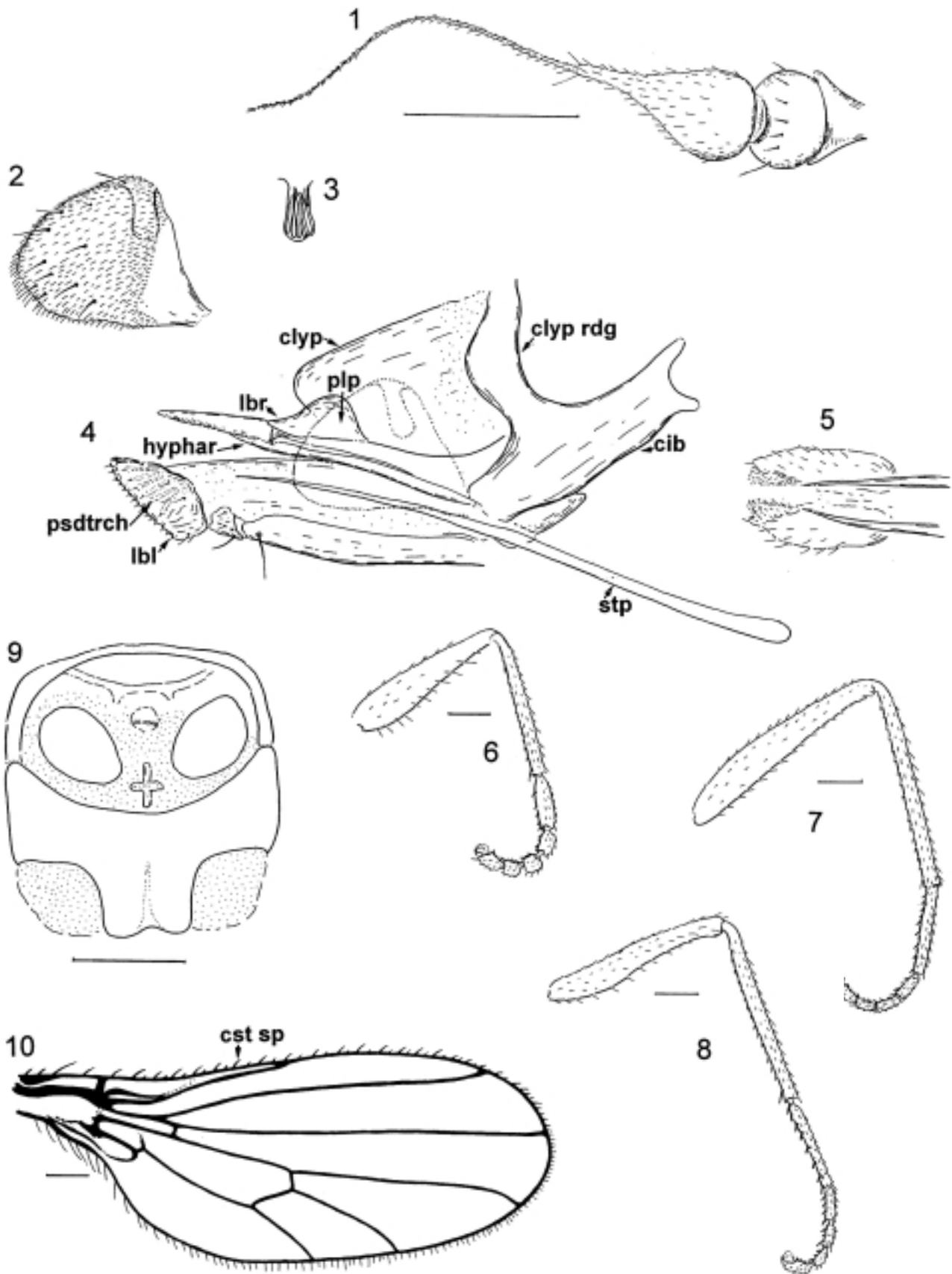
Thorax dark brown in ground-colour, greyish pollinose, with pale setation. Mesoscutum moderately arched, prescutellar depression hardly prominent. Prosteronum fused with proepisternum forming prothoracic precoxal bridge (Fig. 9). Anteprepronotum with 4 setulae. Postpronotal lobe distinct, with 1 setula. Scutum unicolorous. Mesonotum short, rectangular (viewed dorsally), with bristles well-differentiated but reduced in number; 0 presutural supra-alar, 2 postsutural supra-alars of different length, 2 notopleurals, 1 short post-alar and 2 long cruciate scutellars; upper part of vertical anterior surface of scutum with 1 pair of setulae. Dorsocentrals 1-serial, 6 per row, rather long, of subequal length (prescutellars somewhat longer), lacking accessory setulae. Acrostichals lacking. Mesopleuron bare. Thoracic spiracles pale. Halter pale.

Legs (Figs. 6-8) moderately long, subshining, mostly with pale inconspicuous setation. Coxae brownish, somewhat paler apically; trochanters of fore and mid legs brownish yellow, trochanter of hind leg pale brownish; fore and mid femora largely yellow, yellowish brown dorsally (in darker specimens fore and mid femora largely yellowish brown, yellow in apical part), hind femur largely brownish yellow, yellow apically; tibiae yellow (in darker specimens somewhat brownish yellow in basal part); fore tarsus brown black; mid and hind tarsi with tarsomere 1 at apex, tarsomere 2 largely (except base) and tarsomeres 3-4 entirely yellowish brown, tarsomere 5 brown. Femora broader than corresponding tibiae, more or less gradually tapering toward apex, subequal in thickness. Tibiae slender. Fore tarsomeres thickened, tarsomere 1 nearly 2 times longer than tarsomere 2 but 1.5 times shorter than tarsomeres 2-5 combined; tarsomeres 2-4 of equal length; tarsomere 5 of all legs distinctly flattened dorsoventrally. Fore coxa with numerous, rather long hair-like setae anteriorly;

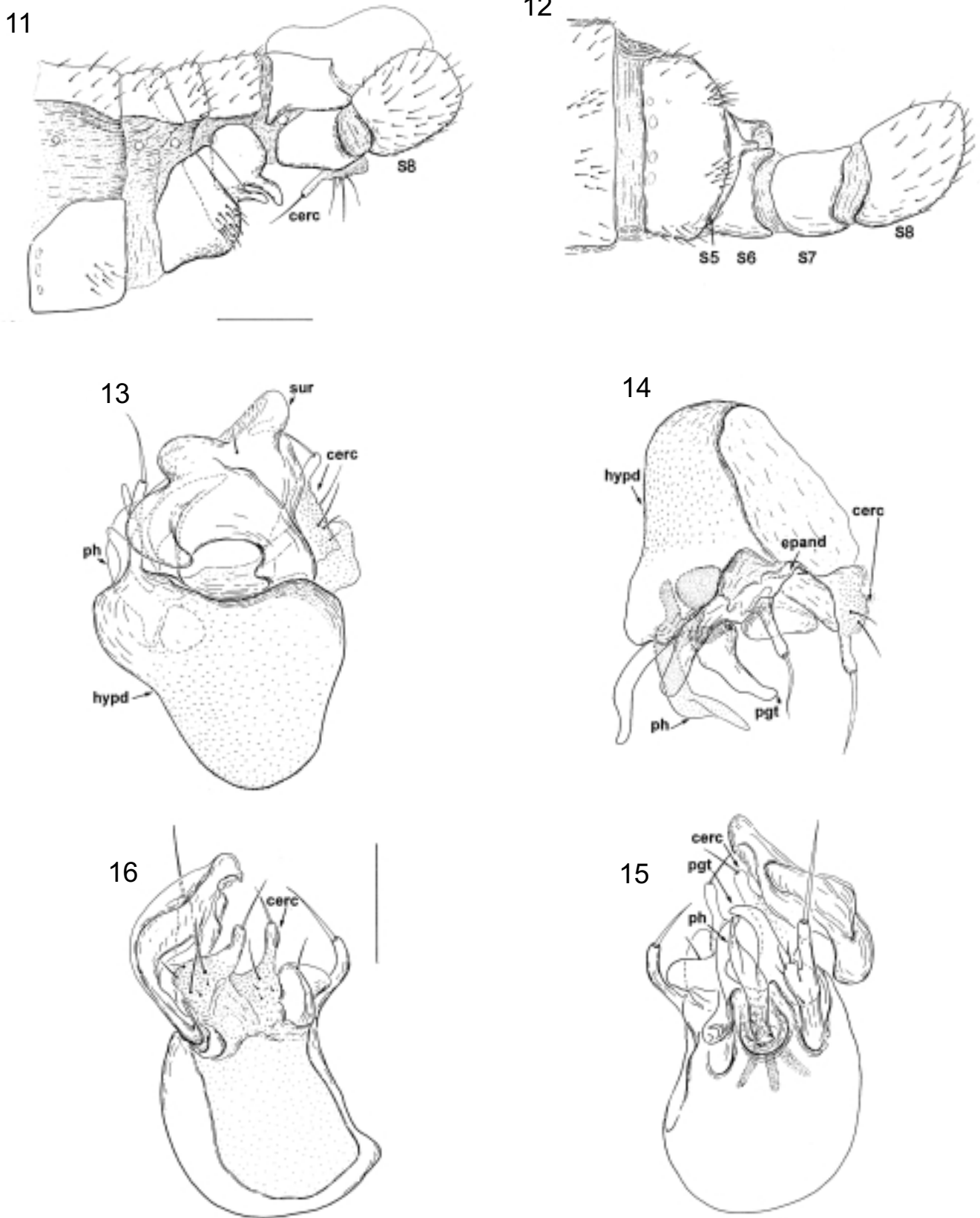
mid and hind coxae with similar but scattered setae. Trochanters of all legs with few setulae. Fore femur with 1 row of postero- and 1 row of anteroventral setae; mid femur with 1 row of anteroventral setae becoming longer toward apex; hind femur with 1 row of rather short anteroventral setae; additionally, some prominent short setae present on all femora near apex and dorsally; longest setae on femora at most as long as corresponding femur is wide; otherwise femora clothed in inconspicuous setulae. Fore tibia with anterior apical comb and 1 short spine-like ventral preapical seta; mid tibia with several setae around apex, including 1 longest ventral preapical one; hind tibia with posterior apical comb and 1 ventral apical spine; all tibiae with somewhat longer dorsal setae; otherwise tibiae clothed in inconspicuous setulae. Tarsomeres 1-4 with dark ventral spinules (longer and more numerous on mid tarsomere 1); hind tarsomere 1 with posterior apical comb and 1 short ventral apical spine. Tarsal claws, pulvilli and setiform empodium well developed on all legs; tarsal claw shorter than apical width of tarsomere 5; pulvilli short, broad; empodium slender, with ventral pubescence.

Wing (Fig. 10) moderately broad, 2.5-2.7 times longer than wide; very finely infuscate, with brownish yellow to brownish veins, pale marginal fringe, yellow basicostal setae and dark costal spinules; entirely covered with minute microtrichia (including veins); with anal lobe weakly developed; alula absent. Basal section of costa with 3-4 bristles becoming longer distad; additionally, costa bearing 2 rows of short spine like setae along anterior margin and entirely ciliate along posterior margin. Pterostigma (or stigmatic sclerotization) lacking. Costa circumambient, distinct throughout. All longitudinal veins complete, distinctly reaching wing margin. Sc very close to R_1 , reduced to fold in its apical section, ending in costa. Rs in basal 1/5 of wing, with 2 branches. R_1 not thickened, moderately long, extending to wing midpoint, somewhat arcuate. R_{2+3} more or less straight, ending nearer to wing apex, somewhat divergent with R_{4+5} . R_{4+5} unforked, ending near wing-tip. R_{4+5} and M_1 somewhat divergent near wing-apex. M_{1+2} unforked, anterior portion of crossvein m-cu (base of M_2) about at midpoint of wing. Distance between apices of M_1 and M_2 longer than distance between apices of M_2 and CuA_1 . CuA_2 reflexed, very thin in apical part. A_1 absent. A_2 present on posterobasal margin of wing. Crossvein h almost opposite to base of Rs. Short r-m crossvein present, in basal 1/5 of wing, perpendicular to longitudinal veins, sometimes very thin. Crossvein bm-cu incomplete, sometimes absent. Cell dm present, rather short. Cells br, bm and cup in basal 1/5 of wing. Cell br slender, longer than cells bm and cup. Cells bm and cup subequal in length and width, both somewhat broader than cell br. Cell cup closed, with proximal end acutely rounded. Squamae pale, with scattered pale ciliae. Halter white.

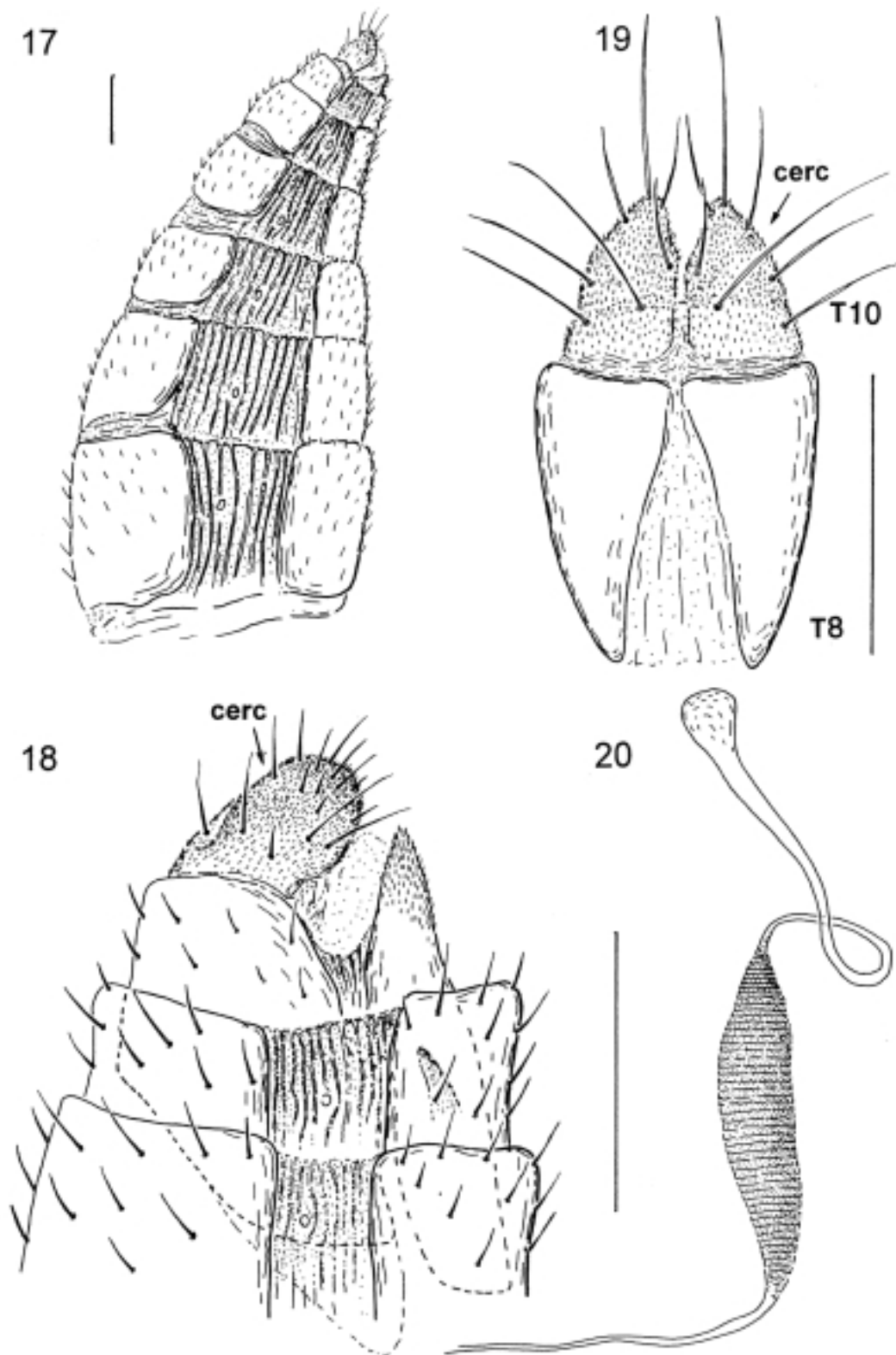
Abdomen rather short and broad, brown in ground-colour, finely greyish pollinose, pale setose, lacking conspicuous posteromarginal setae; preabdomen with posterior margins of tergites paler, postabdomen darker. Abdominal muscle plaques present, distinct. Segments 1-4 symmetrical with simple sternites and tergites, forming preabdomen; sternite



Figs. 1-10: *Microphorella malaysiana*, new species, male. 1 – antenna, dorsal view, 2 – palpus, lateral view, 3 – inside structure of basal sensory pit on palpus, lateral view, 4 – mouthparts, lateral view, 5 – labella, dorsal view, 6 – fore leg, anterior view, 7 – mid leg, anterior view, 8 – hind leg, anterior view, 9 – prothoracic pleurosternal region, anterior view, 10 – wing, dorsal view. Scale: 0.1 mm.



Figs. 11-16: *Microphorella malaysiana*, new species, male. 11 – postabdomen, left lateral view, 12 – same, ventral view, 13 – male terminalia, right lateral view, 14 – same, left lateral view, 15 – same, dorsal view, 16 – same, ventral view. Scale: 0.1 mm.



Figs. 17-20: *Microphorella malaysiana*, new species, 17-20 – female. 17 – abdomen, lateral view, 18 – postabdomen, lateral view, 19 – apical part of ovipositor, dorsal view, 20 – spermatheca, dorsal view. Scale 0.1 mm.

3 with cluster of short setae on each side posteriorly; sternite 4 with similar cluster of stronger and longer setae. Postabdomen (Figs. 11, 12) spirally contorted, segments 5-7 confined to left side forming cavity to place hypopygium, somewhat stronger sclerotized; sternite 5 greatly reduced; sternites 5 and 6 with short median posteromarginal process; tergite 5 and segment 7 lacking setation, sternite 6 with 0-1 short lateral setae. Sternite 8 moderately large, subrectangular, lying at hind and exposed ventrolaterad, covered with numerous long setae; tergite 8 atrophied; foramen unformed. Terminalia (Figs. 13-16) lateroflexed to the right, inverted and with caudal pole directed forward, asymmetrical; hypandrium brown, processes brown to pale yellow, cerci pale. Hypopygium small, somewhat shorter than apical half of abdomen. Hypandrium very large, occupying most part of hypopygium, produced at apex and with several accessory processes, bare (except microtrichia). Epandrium greatly reduced and represented only by small inconspicuous sclerites, separated from hypandrium; right surstylus very large, "leaf-like"; left surstylus smaller, with two processes more prominent. Cerci weakly sclerotized, moderately large, covered with microtrichia, bearing several setae of different length including longest one at tip. Postgonites present, rather large, well sclerotized, of complicated structure. Phallus tubular, more or less smoothly arcuate, directed forwards, with pointed tip; ejaculatory apodeme subrectangular.

Female body length 1.5-1.8 mm, wing length 1.3-1.4 mm. Similar to male except the following characters. Palpus brownish, with ordinary setulae. Legs unmodified, with more distinct colour pattern; femora largely brown, yellow in apical 1/4; fore tarsus yellowish brown, with tarsomeres becoming darker from 1st to 5th; mid and hind tarsomere 1 largely yellow, yellowish brown at apex, tarsomeres 2-5 similar in colour to those on fore tarsus. Abdomen (Fig. 17) more or less gradually tapering, segments 1-6 forming preabdomen into which posterior segments are retracted and only partly visible. Postabdomen (Fig. 18, 19) rather slender, brown, mostly covered with scattered setulae; sternite 8 articulated with tergite 8 posteriorly, tergite 8 paired, tergite 10 and sternite 10 articulated, hemitergites 10 small, hardly distinguished from cerci, with 3 long bristles each. Cerci rather broad, well sclerotized, bearing setae of different length (longest one at tip). Spermatheca (Fig. 20) tubular, with receptacle spherical and unpigmented; middle part of spermathecal duct broadened, finely pigmented and with tracheae-like surface.

Differential diagnosis. – *Microphorella malaysiana*, new species, can be distinguished from all other closely related species as it is given in the key.

Etymology. – The new species is named after the whole region of its origin, Malaysia.

Distribution. – Thailand, Indonesia, Singapore.

Microphorella papuana, new species

(Figs. 21-30)

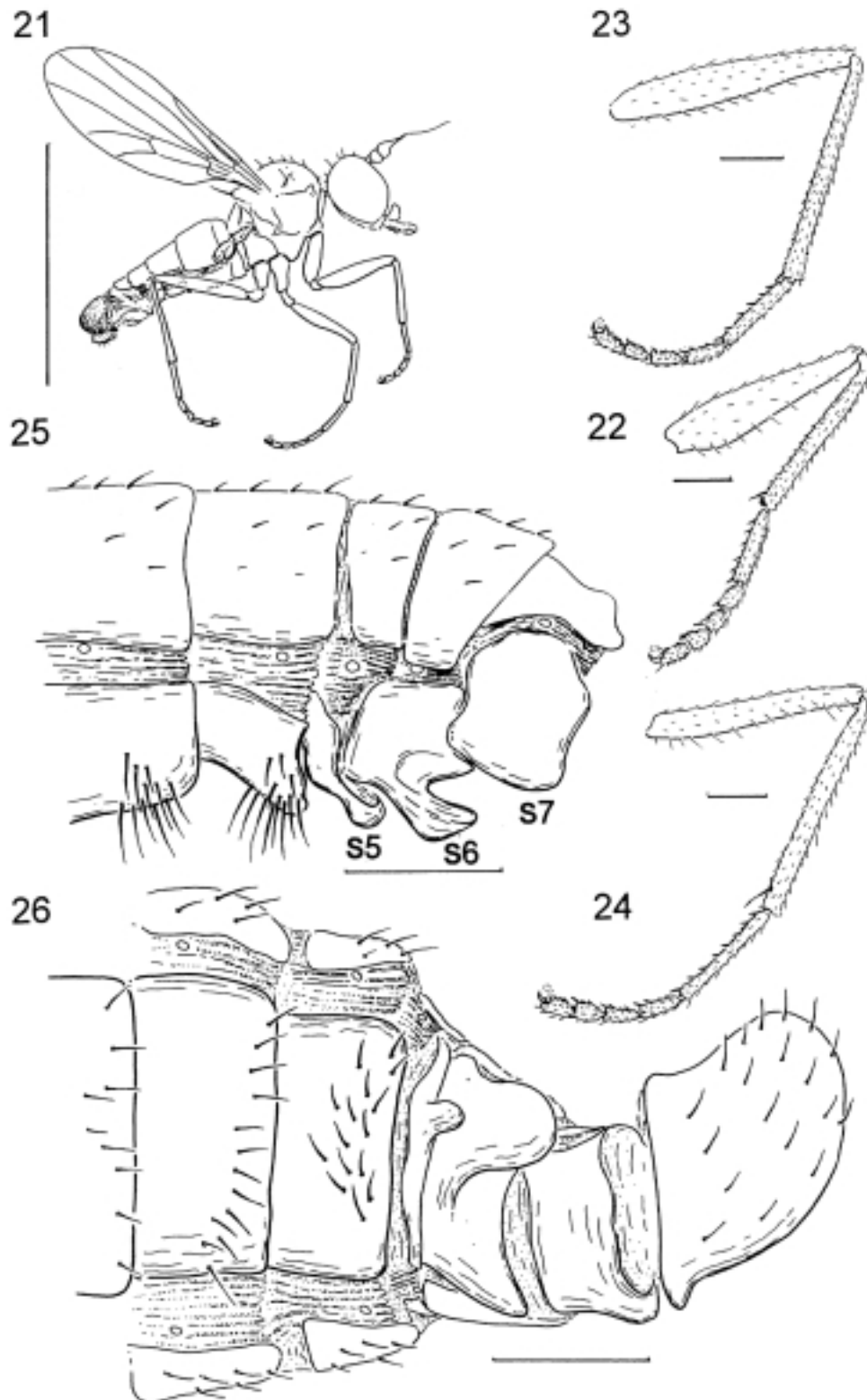
Material examined. – Holotype - male, West Papua or Irian Jaya, Nabire, Kaladiri beach, 970061, 30 Apr.1997, coll. P. Grootaert (in RBINS).

Paratypes – 3 males, 5 females, same data as in holotype (1 male ZRC); 1 male, 2 females, Irian Jaya, Sanoba beach (Nabire), 970021, 21 Apr.1994, coll. P. Grootaert & Ph. Hoyois; 3 males, Irian Jaya, Biak, Bosnik beach, 970080, 6 May.1997, coll. P. Grootaert. All deposited in RBINS, Brussels, except otherwise indicated.

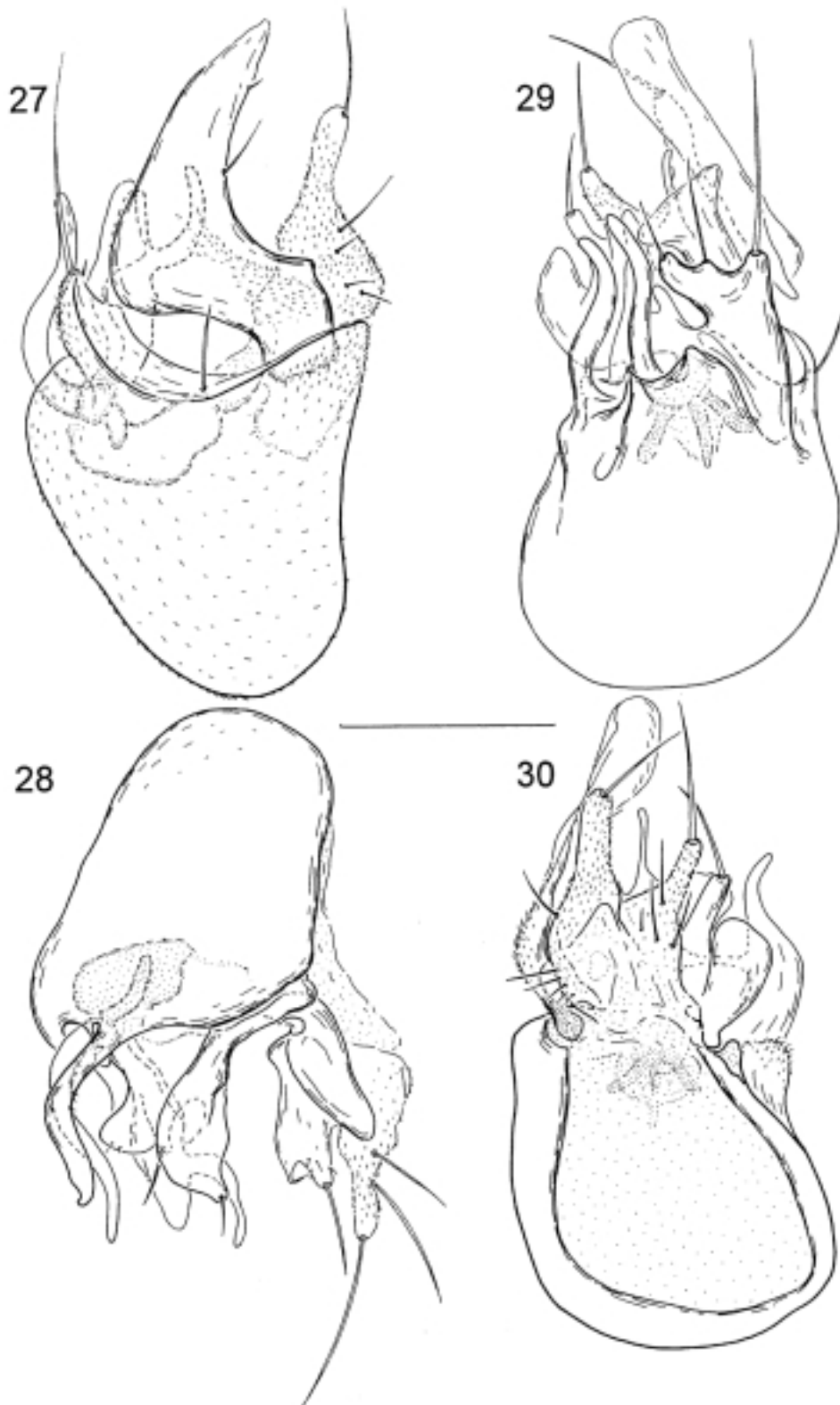
Diagnosis. – Resembling *M. malaysiana*, new species, but fore tarsi less thickened and partly yellow in male, scutum with 4 dorsocentral and 1 postsutural supra-alar bristles; male abdominal sternite 5 with short and rather slender median posteromarginal process, sternite 6 with longer, broad (viewed ventrally) process; right surstylus broad, crescent-shaped.

Description. – *Male* (Fig. 21) body length 1.4-1.5 mm, wing length 1.2-1.3 mm. Head and thorax light grey pollinose, with dark-green tinge (in some angle of view). Ocellar tubercle with 2 long anterior and 2 very short posterior ocellar bristles. Face in middle somewhat narrower than distance between posterior ocelli. Scutum with 1 postsutural supra-alar bristle. Dorsocentrals represented by 4 long bristles per row. Legs (Figs. 22-24) with following pattern colour: coxae almost wholly brownish, fore coxa brownish yellow at apex; trochanter of fore leg brownish yellow, those mid and hind legs brownish; fore femur brownish in basal 2/3, brownish yellow in apical 1/3; mid and hind femora brownish in basal 3/4, brownish yellow in apical 1/3; all tibiae wholly yellowish (often with brownish tinge); fore tarsus with tarsomeres 1-2 yellow (sometimes with brownish tinge), tarsomere 3 brownish (sometimes indistinctly), tarsomeres 4-5 dark brown; mid tarsus with tarsomere 1 largely yellowish, yellowish brown apically, tarsomeres 2-5 brown; hind tarsus similar to mid tarsus but tarsomere 2 paler (in paler specimens mid and hind tarsi with tarsomere 2 yellowish, with slight brownish tinge); additionally, femora with dark-green tinge on darkened parts (in some angle of view). Wing as in *M. malaysiana*, new species, but basal section of costa with 1 short and 1 long bristles. Abdomen with sternites 3 and 4 bearing cluster of long and strong setae on each side (Figs. 25, 26); sternite 5 with short and rather slender median posteromarginal process, sternite 6 with longer, broad (viewed ventrally) process; sternites 5-6 and segment 7 lacking setation. Terminalia (Figs. 27-30) with right surstylus long, broad, crescent-shaped. Otherwise as in *M. malaysiana*, new species.

Female body length 1.4-1.5 mm, wing length 1.2-1.3 mm. Similar to male except the following characters. Palpus brown, with ordinary setulae. Colour pattern of legs similar to that in male but all femora with broader brown space, tibiae usually darker and tarsi almost wholly light brown (tarsomere 1 paler basally). Postabdomen, including cerci, brown, as in *M. malaysiana*, new species (spermatheca was not studied).



Figs. 21-26. *Microphorella papuana*, new species, male. 21 – habitus, right lateral view (scale 1.0 mm), 22 – fore leg, anterior view, 23 – mid leg, anterior view, 24 – hind leg, anterior view, 25 – postabdomen (segment 8 and hypopygium not shown), left lateral view, 26 – same, ventral view. Scale 0.1 mm.



Figs. 27-30. *Microphorella papuana*, new species, male. 27 – terminalia, right lateral view, 28 – same, left lateral view, 29 – same, dorsal view, 30 – same, ventral view. Scale 0.1 mm.

Differential diagnosis. – This species is most closely related to *M. bira*, new species. Main differences between these species are given in the key. The females of these species are hardly distinguishable in the colour of legs.

Etymology. – The species is named after the whole region of its origin, Papua New Guinea.

Distribution. – New Guinea.

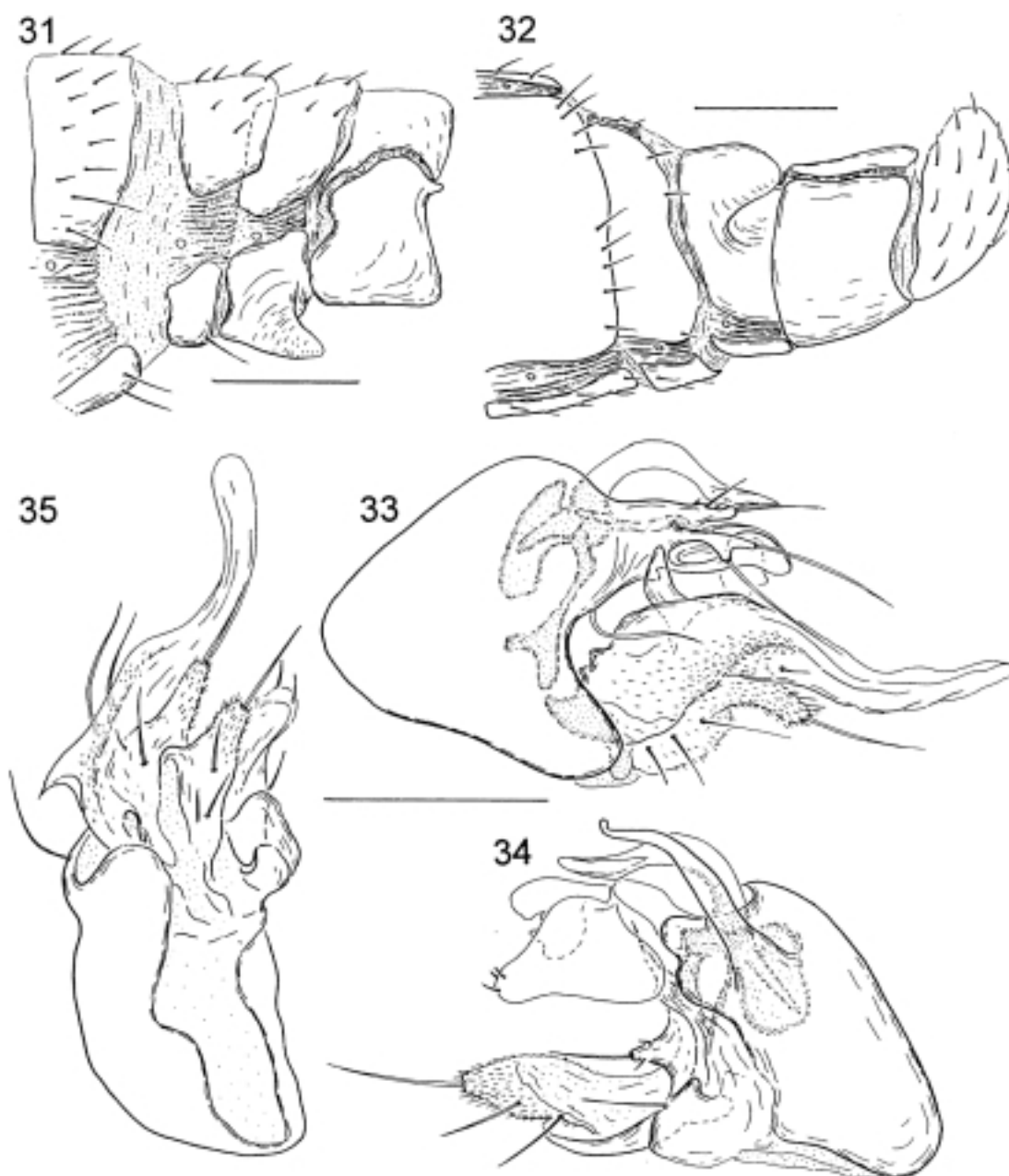
***Microphorella bira*, new species**
(Figs. 31-35)

Material examined. – Holotype - male, **Indonesia, Sulawesi:** Bira, beach, 970011, 19 Apr.1997, coll. P. Grootaert (RBINS).

Paratypes: 2 females, same data as in holotype. All deposited in RBINS, Brussels.

Diagnosis. – Resembling *M. papuana*, new species, but smaller, legs with indistinct pattern, only male abdominal sternite 6 with large, broad process; right surstylus long, narrow.

Description. – *Male* body length 1.3-1.4 mm, wing length 1.1-1.2 mm. Head and thorax greyish pollinose, with dark-green tinge (in some angle of view). Ocellar tubercle with 2 long anterior and 2 very short posterior ocellar bristles. Face in middle somewhat narrower than distance between posterior ocelli. Scutum with 1 postsutural supra-alar bristle. Dorsocentrals represented by 4 long bristles per row. Legs with indistinct pattern: coxae yellowish brown, fore coxa



Figs. 31-35. *Microphorella bira*, new species, male. 31 – postabdomen (segment 8 and hypopygium not shown), left lateral view, 32 – same, ventral view, 33 – terminalia, right lateral view, 34 – same, left lateral view, 35 – same, ventral view. Scale 0.1 mm.

yellowish in apical part; trochanters of all legs brownish yellow; femora yellowish, with brownish tinge, more distinctly brownish dorsally; tibiae yellow; fore tarsus with tarsomeres 1-3 yellow and tarsomeres 4-5 brown, mid and hind tarsi with tarsomeres 1-2 yellow and tarsomeres 3-5 becoming gradually darker (tarsomere 5 brown). Tarsi slender (except tarsomere 5). Wing with basal section of costa bearing 1 short and 1 long bristles. Abdomen with sternite 4 bearing row of long, strong setae on each side (Figs. 31, 32); sternite 5 lacking process, with several ordinary setae, sternite 6 with large broad (viewed ventrally) process; sternite 6 and segment 7 lacking setation. Terminalia (Figs. 33-35) with right surstylus long, rather narrow. Otherwise as in *M. malaysiana*, new species.

Female body length 1.3-1.4 mm, wing length 1.2-1.3 mm. Similar to male except the following characters. Palpus brown, with ordinary setulae. Legs darker, with more distinct pattern; femora largely brownish, paler apically, all tibiae and tarsomeres 1-2 of all tarsi yellowish brown. Postabdomen, including cerci, brown, as in *M. malaysiana*, new species (spermatheca was not studied).

Differential diagnosis. – The new species can be distinguished from other species described here as it is given in the key.

Etymology. – The species is named after the type locality, Bira.

Distribution. – Indonesia, Sulawesi.

***Microphorella satunensis*, new species**

(Figs. 36-40)

Material examined. – Holotype - male, **Thailand**, Pak Bara (Satun prov.), beach, white pan traps, 97135, 28 Oct.1997, coll. P. Grootaert.

Paratypes – 3 males, same data as in holotype. All deposited in RBINS, Brussels, except otherwise indicated.

Diagnosis. – Resembling *M. papuana*, new species, smaller (1.2-1.4 mm long), scutum with 5 dorsocentrals, abdominal segments 5 and 6 with equally large processes; right surstylus subtriangular.

Description. – *Male* body length 1.2-1.4 mm, wing length 1.1-1.2 mm. Head and thorax finely greyish pollinose. Ocellar tubercle with 2 long anterior and 2 very short posterior ocellar bristles. Face in middle nearly as broad as distance between posterior ocelli. Scutum with 2 postsutural supra-alar bristles. Dorsocentrals represented by 5 long bristles per row (2 prescutellar pairs somewhat longer). Tarsi with slender tarsomeres (except tarsomere 5). Legs with following pattern: coxae almost wholly brown, fore coxa paler at apex; mid and hind trochanters yellowish brown, fore trochanter somewhat paler; femora largely brownish; fore femur at extreme base and in apical 2/5, mid femur in apical 1/3 and hind femur in apical 1/4 yellow; all tibiae pale yellow; all tarsi with

tarsomeres 1-2 yellow, tarsomere 3 brownish yellow and tarsomeres 4-5 brownish. Wing finely infuscate, basal section of costa with 1 short and 1 long bristles. Abdomen with sternite 4 bearing clusters of long, strong setae on each side (Figs. 36, 37); sternites 5 and 6 with equally large (viewed ventrally) processes, both bearing few setae laterally; segment 7 lacking setation. Terminalia (Figs. 38-40) with right surstylus rather subtriangular. Otherwise as in *M. malaysiana*, new species.

Female unknown.

Differential diagnosis. – The new species differs from other species by a set of the characters given in the key.

Etymology. – The species is named after the province of the type locality, Satun.

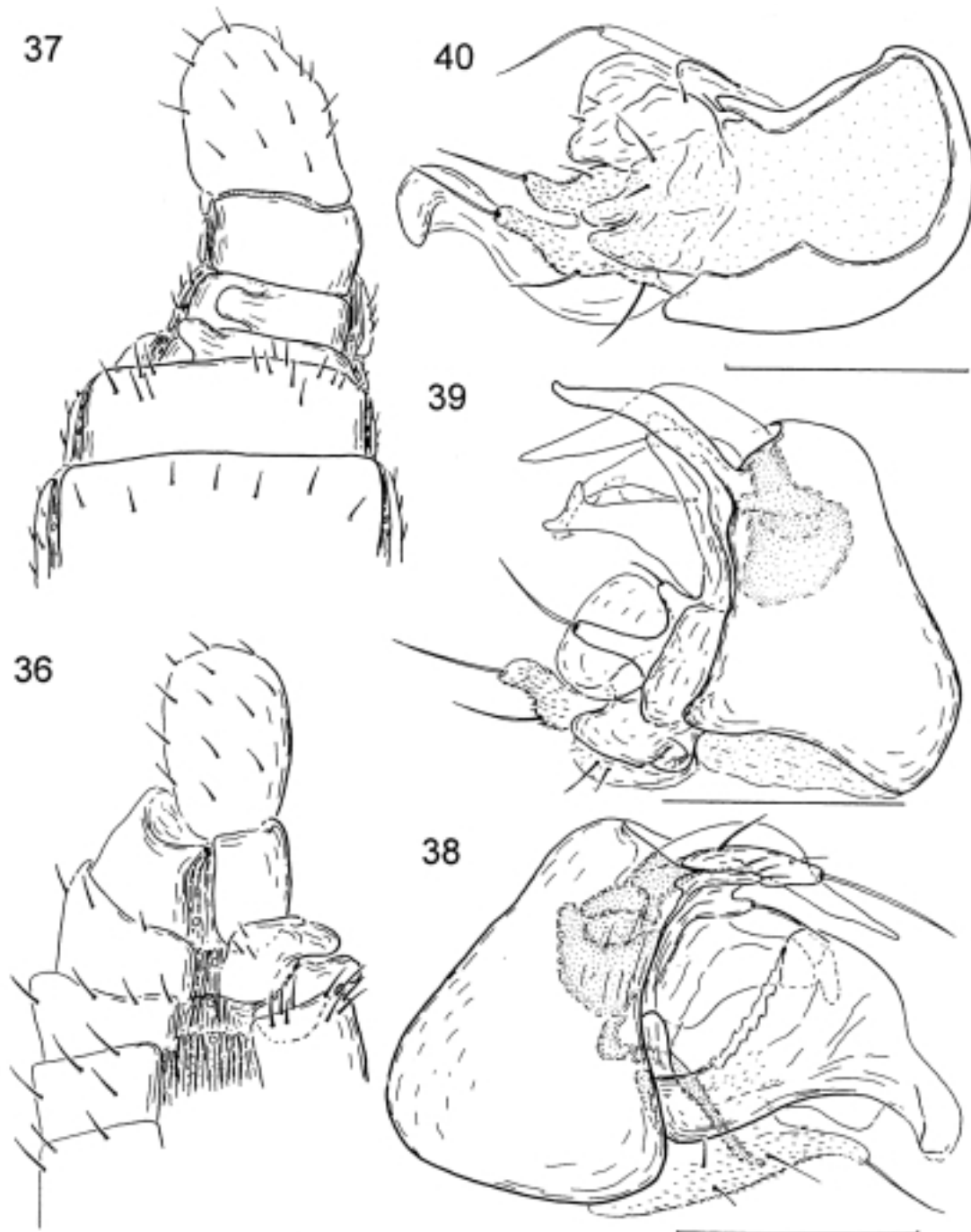
Distribution. – Thailand.

DISCUSSION

Ulrich (1991) and, quite recently, Cumming & Brooks (2002) discussed the relationships of *Microphorella* with other genera assigned to the Parathalassiini. However, the relationships within *Microphorella* have never been examined. The preliminary comparative analysis of the species included in the *Microphorella* is given in Table 1. We have included only those characters, which were noted in the original descriptions. Unfortunately, some important morphological features (especially of the male and female terminalia) are unknown for a number of species.

Four species known currently from Southeast Asia are hypothesised to form a monophyletic subgroup within *Microphorella*. The support of the subgroup is based on the presence of a modified palpus and ventral processes on abdominal sternites 5 and 6 in the male and a setose tergite 10 in the female. The palpus is sexually uniform in other *Microphorella* species as well as in most Parathalassiini (except for some undescribed taxa). The presence of the processes on the abdominal sternites 5 and 6 is a unique feature of these species and it is undoubtedly a synapomorphy of this subgroup. Among Parathalassiini, short processes on sternites of pregenital segments in the male are probably present in the fossil genus *Electrophorella* (Cumming & Brooks 2002: 46, Fig. 5). Another character that could support this subgroup is a setose tergite 10 of the female. The presence of the acanthoporous setae on tergite 10 is considered to be an apomorphic feature of Parathalassiini (Sinclair, 1995). However, the female sex is unknown for *M. satunensis*.

The hypertrophied terminalia of the male and a cup-shaped phallus indicate a closer relationship between European and North American species. Although, the last character should be checked in the Nearctic group. The Australian *M. iota* is likely to belong to this subgroup. This species possesses a peculiar brush of setae on the tip of the phallus that is an autapomorphic state within *Microphorella*.



Figs. 36-40. *Microphorella satunensis*, new species, male. 36 – postabdomen (hypopygium not shown), left lateral view, 37 – same, ventral view, 38 – terminalia, right lateral view, 39 – same, left lateral view, 40 – same, ventral view. Scale 0.1 mm.

Table 1. Comparative analysis of the species included in the genus *Microphorella* (selected characters).

Species	Region	Biology	Palpus	Male legs	Dc bristles per row	Sternite(s) pregenital segments in male	Hypopygium	Phallus	Tergite 10 of oviscapt
<i>M. praecox</i> (Loew)	Europe	river banks	black	unmodified	6	without processes	hypertrophied	directed downwards, cup-shaped at tip	spinose
<i>M. curtipes</i> (Becker)	Europe	river banks	black	unmodified	6	without processes	hypertrophied	directed downwards, cup-shaped at tip	spinose
<i>M. beckeri</i> (Strobl)	Europe	river banks	black	unmodified	5	with processes?	hypertrophied	directed downwards, cup-shaped at tip	spinose
<i>M. acroptera</i> Melander	North America	plants along streams	black	modified	6	with processes?	hypertrophied	?	spinose
<i>M. chiragra</i> Melander	North America	plants along streams	black	modified	7	without processes	hypertrophied	?	spinose
<i>M. longitarsis</i> Melander	North America	plants along streams	black	modified	6	with processes?	hypertrophied	?	?
<i>M. ornatipes</i> Melander	North America	plants along streams	black	modified	6	with processes?	hypertrophied	?	?
<i>M. tubifera</i> Melander	North America	plants along streams	black	modified	6	with processes?	hypertrophied	?	?
<i>M. iota</i> Colless	Australia	moist rocks near streams	black	unmodified	5	with processes?	hypertrophied	directed downwards, cup-shaped at tip	spinose
<i>M. malaysiana</i> , new species	Southeast Asia	sea coasts	pale in male	modified	6	with processes	compact	directed forwards, pointed at tip	setose
<i>M. papuana</i> , new species	Southeast Asia	sea coasts	pale in male	unmodified	4	with processes	compact	directed forwards, pointed at tip	setose
<i>M. bira</i> , new species	Southeast Asia	sea coasts	pale in male	unmodified	4	with process	compact	directed forwards, pointed at tip	setose
<i>M. satunensis</i> , new species	Southeast Asia	sea coasts	pale in male	unmodified	5	with processes	compact	directed forwards, pointed at tip	?

The modified legs of the male may support a monophyly of the North American species. However, this appears a too weak argumentation and a detailed study of these species is required. The modified legs in the male are likely to have arisen in *M. malaysiana* independently from those found in the North American species.

The European species subgroup may be a monophyletic lineage on the base of the greatly modified pregenital segments in the male (segments 3 and (or) 4 involved).

It is interesting to note the ecological differences among the species of *Microphorella*. The European species were mostly collected on sandy areas of river banks. The Nearctic and Australian species are found near streams. The species from Southeast Asia were taken from the sandy beaches of the sea coasts.

To summarise, the species described in the present paper form a separate group within the genus *Microphorella*. They are distinctive in several important morphological characters and ecological features. This could lead to the conclusion that these species need to be separated as a new genus (or subgenus). However, we consider that it would be prematurely.

This group is apparently worldwide in its distribution and additional intermediate forms may yet be found. It is evident also that a world revision of the genus is needed.

ACKNOWLEDGEMENTS

This study was supported by the Belgian Federal Services for Scientific, Technical and Cultural Affairs. The second author P.G. thanks Prof. Dr. Peter Ng, Dr. Yang Chang Man and Dr. Darren Yeo Chong Jinn for their hearty hospitality at NUS. His stay at the Raffles Museum in December 2002 was supported by a grant from NUS.

LITERATURE CITED

- Chvála, M., 1983. The Empidoidea (Diptera) of Fennoscandia and Denmark. II. General Part. The families Hybotidae, Atelestidae and Microphoridae. *Fauna entomologica scandinavica*, **12**, 281 pp.
- Chvála, M., 1988. Revision of Palaearctic Microphoridae (Diptera). 3. Parathalassiinae (*Parathalassius* Mik and *Microphorella* Becker). *Acta Entomologica Bohemoslovaca*, **85**: 352-372.

- Colless, D. H., 1963. An Australian species of *Microphorella* (Diptera: Empididae), with notes on the phylogenetic significance of the genus. *Proceedings of the Linnean Society of New South Wales*, **88**: 320-323.
- Cumming, J. M. & S. E. Brooks, 2002. *Electrophorella*, a new genus of parathalassiine flies from Baltic amber, with a cladistic analysis of the Microphorinae + Dolichopodidae lineage (Diptera: Empidoidea). *Studia dipterologica*, **9**: 41-54.
- Hennig, W., 1971. Insektenfossilien aus der Unteren Kreide. 3. Empidiformia ("Microphorinae") aus der Unteren Kreide und aus dem Baltischen Berstein; ein Vertreter der Cyclorrhapha aus der untere Kreide. *Stuttgarter Beitr. z. Naturkunde*, **232**: 1-28.
- McAlpine, J. F., 1981. Morphology and terminology – Adults. [Chapter] 2. In: McAlpine, J. F., B. V. Peterson, G. E. Shewell, H. J. Teskey, J. R. Vockeroth & D. M. Wood (eds.), *Manual of Nearctic Diptera*, **1**: 9-63. *Agriculture Canada Monograph*, **27**. Ottawa.
- Melander, A. L., 1928. Diptera, Fam. Empididae. In: Wytzman, P. (ed.), *Genera Insectorum*, **185**, 434 pp., Louis Desmet-Verteneuil, Bruxelles.
- Sinclair, B. J., 1995. Generic revision of the Clinocerinae (Empididae), and description and phylogenetic relationships of the Trichopezinae, new status (Diptera: Empidoidea). *Canadian Entomologist*, **127**: 665-752.
- Sinclair, B. J., 2000. Morphology and terminology of Diptera male terminalia. In: Papp, L. & B. Darvas (eds.), *Contributions to a Manual of Palaearctic Diptera*, **1**: 53-74, Budapest: Science Herald.
- Stuckenberg, B. R., 1999. Antennal evolution in the Brachycera (Diptera), with a reassessment of terminology relating to the flagellum. *Studia dipterologica*, **6**: 33-48.
- Ulrich, H., 1991. Two new genera of parathalassiine-like flies from South Africa (Diptera, Empidoidea). *Bonner Zoologische Beitrage*, **42**: 187-216; Bonn.