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New data on the genus *Pycnoscelus* Scudder, 1862 with the description of *P. schwendingeri* sp. nov. (Blaberidae: Pycnoscelinae)

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Abstract: A new species of cockroach, *Pycnoscelus schwendingeri* sp. nov., is reported from Cambodia. A detailed morphological description of the new species is given. *Pycnoscelus surinamensis* and *P. striatus* are redescribed. The structure of the female genital complex, i.e. anal and genital plates, ovipositor and adjacent structures, of *Pycnoscelus surinamensis* and the male genitalia of *P. striatus* are redescribed in detail.

Keywords: *Pycnoscelus surinamensis* - *Pycnoscelus striatus* - morphology.

INTRODUCTION

The genus *Pycnoscelus* Scudder, 1862 includes highly specialized cockroaches with more or less pronounced adaptations to living in litter and digging. The genus was reviewed by Roth (1973, 1998). New information on this genus was recently added by Anisyutkin (2002, 2004) and by Lucañas & Lit (2016). In the present paper a new species, *Pycnoscelus schwendingeri* sp. nov., is described and new data on *Pycnoscelus* morphology are given.

MATERIAL AND METHODS

The author generally follows methods described earlier (Anisyutkin, 2014, 2015). Rehn's (1951) terminology of tegmina and wing venation is used. The description of the anterior margin of the fore femur armament follows Bey-Bienko (1950) and Roth (2003). The terminology of male genital sclerites follows Klass (1997), with some modifications. The terminology used by Grandcolas (1996) for genital structures is given in parentheses. Terminology of female genital structures follows McKittrick (1964) and Klass (1998). Terms introduced by the author (in the present work and in Anisyutkin, 2014, 2015) are given in quotation marks.

The material examined has been deposited in the Muséum d'histoire naturelle in Geneva (MHNG) and in the Zoological Institute of the Russian Academy of Sciences in Saint-Petersburg, Russia (ZIN).

Abbreviation used in figures

(See text for further details):

a.a.	anterior arch of second valvifer of female genitalia;
ap.scl.	"apical sclerite" of sclerite L2D in male genitalia;
b.L2D	basal part of sclerite L2D in male genitalia;
b.L3	basal subsclerite of sclerite L3 in male genitalia;
bsv.	basivalvula of female genitalia;
c.p.R1T	caudal part of sclerite R1T in male genitalia;
Cer.	cercus;
CuP	second cubital, "cubitus posterior", vein of tegmina;
d.o.	"dorsal outgrows" of apical part of sclerite L2D in male genitalia;
f.s.	"folded structure" of sclerite L3 in male genitalia;
gg.	gonangulum of female genitalia;
h.	hook at right posterolateral angle of hypandrium;
hge	groove of sclerite L3 in male genitalia (sensu Klass, 1997);
IX	9th abdominal tergite;
L2D, L3, *L4U*	sclerites in male genitalia;
L2d, *L3d*	sclerites in male genitalia according to Grandcolas (1996);
M	medial vein of tegmina;

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par.	paraproct;
pl.	sclerotized lobes of 2nd and 3rd pairs of valves in female genitalia;
R	radial vein of tegmina;
R+N	sclerites in male genitalia according to Grandcolas (1996);
R1T, R2, R3, R4, R5	sclerites in male genitalia;
s.t.	"small tooth" of apical part of sclerite L3 in male genitalia;
Sc	costal vein of tegmina;
teVIII.	tergal process of 8th abdominal tergite;
teIX.	tergal process of 9th abdominal tergite;
v.I., *v.II.*, *v.III.*	1st, 2nd and 3rd valves of ovipositor;
vs.	vestibular sclerite in female genitalia;
X	10th abdominal tergite.

TAXONOMIC PART

Genus *Pycnoscelus* Scudder, 1862

Type species: *Pycnoscelus obscurus* Scudder, 1862 [= *P. surinamensis* (Linnaeus, 1758)], by monotypy.

Remarks: The genus was described as monotypical, on the basis of a single specimen that Scudder (1862) believed to be a male. However, it is evident from the original description that this specimen is actually a larva. Later, *P. obscurus* was synonymized with *P. surinamensis* by Princis (1964).
Pycnoscelus surinamensis is a parthenogenetic (thelytokous) species with a worldwide distribution. The closely related *P. indicus* is a bisexual species distributed in South and South-East Asia (Roth, 1998). *Pycnoscelus indicus* is evidently most closely related to *P. surinamensis*. I previously considered these as parthenogenetic and bisexual forms of a single species (Anisyutkin, 2002), but meanwhile I changed my view and follow Roth (1967, 1974, 1998) in regarding them as two distinct species: *P. indicus* and *P. surinamensis*.

Species included: Those given in Beccaloni (2014) [*P. aurantia* Hanitsch, 1935, *P. conferta* Walker, 1869, *P. femapterus* Roth, 1998, *P. gorochovi* Anisyutkin, 2002, *P. indicus* (Fabricius, 1775), *P. janetscheki* Bey-Bienko, 1968, *P. micropterus* Hanitsch, 1931, *P. nigra* (Brunner von Wattenwyl, 1865), *P. rothi* Anisyutkin, 2002, *P. semivitreus* Princis, 1967, *P. striatus* (Kirby, 1903), *P. surinamensis* (Linnaeus, 1758), *P. tenebrigera* (Walker, 1868) and *P. vietnamensis* Anisyutkin, 2002] plus *P. schwendingeri* sp. nov.

Pycnoscelus surinamensis (Linnaeus, 1758)

Figs 1-5

Material examined: ZIN, without accession number; 5 females of unknown provenance, reared in captivity in Saint Petersburg in 2017.

Additions to description of female (Figs 1-5): Based on specimens listed above, the description of Roth (1998) can be supplemented with the following details.
Somatic characters of female (Figs 1-2): Abdomen without visible glandular specializations; spiracle-bearing outgrowths of tergite VIII weakly expressed (Fig. 1). Anal plate (tergite X) wider than long, its hind margin widely rounded and with a weak medial notch (Fig. 1). Cerci short, flatten, with segments solidly connected but distinct (Fig. 1). Genital plate wide, with a distinct pair of paramedian emarginations on hind margin (Fig. 2). Paraprocts mostly membranous, bordered with a thin angulate sclerite on anterior and posterior side (Fig. 3, *par.*).
Ovipositor and adjacent structures (Figs 3-5): Intercalary sclerite absent. Tergal processes of abdominal segment VIII wide and reduced, not reaching paratergites of tergite VIII, fused with basivalvula (Fig. 3, *teVIII.*); tergal processes of abdominal segment IX fully developed (Fig. 3, *teIX.*). Gonangulum distinct, well sclerotized (Figs 3-5, *gg.*). All valves of ovipositor mostly membranous, only partly sclerotized. First valves large, membranous at apex, with numerous setae along inner side (Fig. 4, *v.I.*). Base of 2nd and 3rd pairs of valves as in Fig. 5, sclerotized lobes well developed (Figs 4-5, *pl.*). Anterior arch of second valvifer slightly angulate, as in Fig. 5, *a.a.* Second valves of ovipositor small, completely hidden under 1st ones (Fig. 4, *v.II.*). Third valves of ovipositor (gonoplacs) wide (Figs 3-4, *v.III.*). Basivalvula developed as a pair of slightly asymmetrical, widely rounded and partly sclerotized plates (Figs 3-5, *bsv.*). Vestibular structure in shape of membranous pad (Fig. 3, *vs.*). Brood sac (Fig. 3) without sclerotized structures.

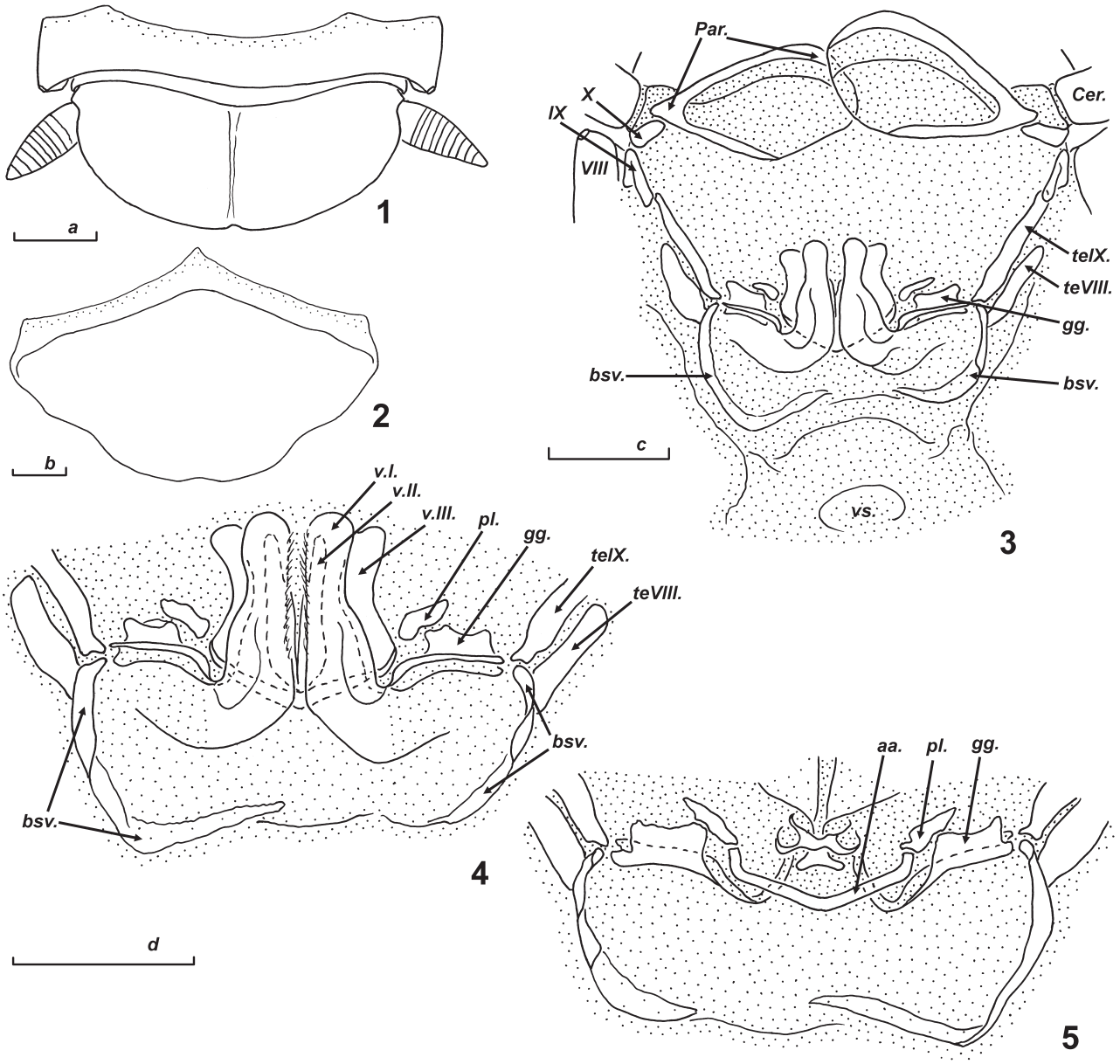
Pycnoscelus schwendingeri sp. nov.

Figs 6-7, 12-26

Material examined: MHNG, without accession number; male holotype (genital complex in prep. 110817/01); THKN-12/04: Cambodia, Siem Reap Prov., Kbal Spean (13°41'04''N, 104°01'10''E), 200 m, semi-evergreen forest; 27.VI.2013; leg. P. Schwendinger.

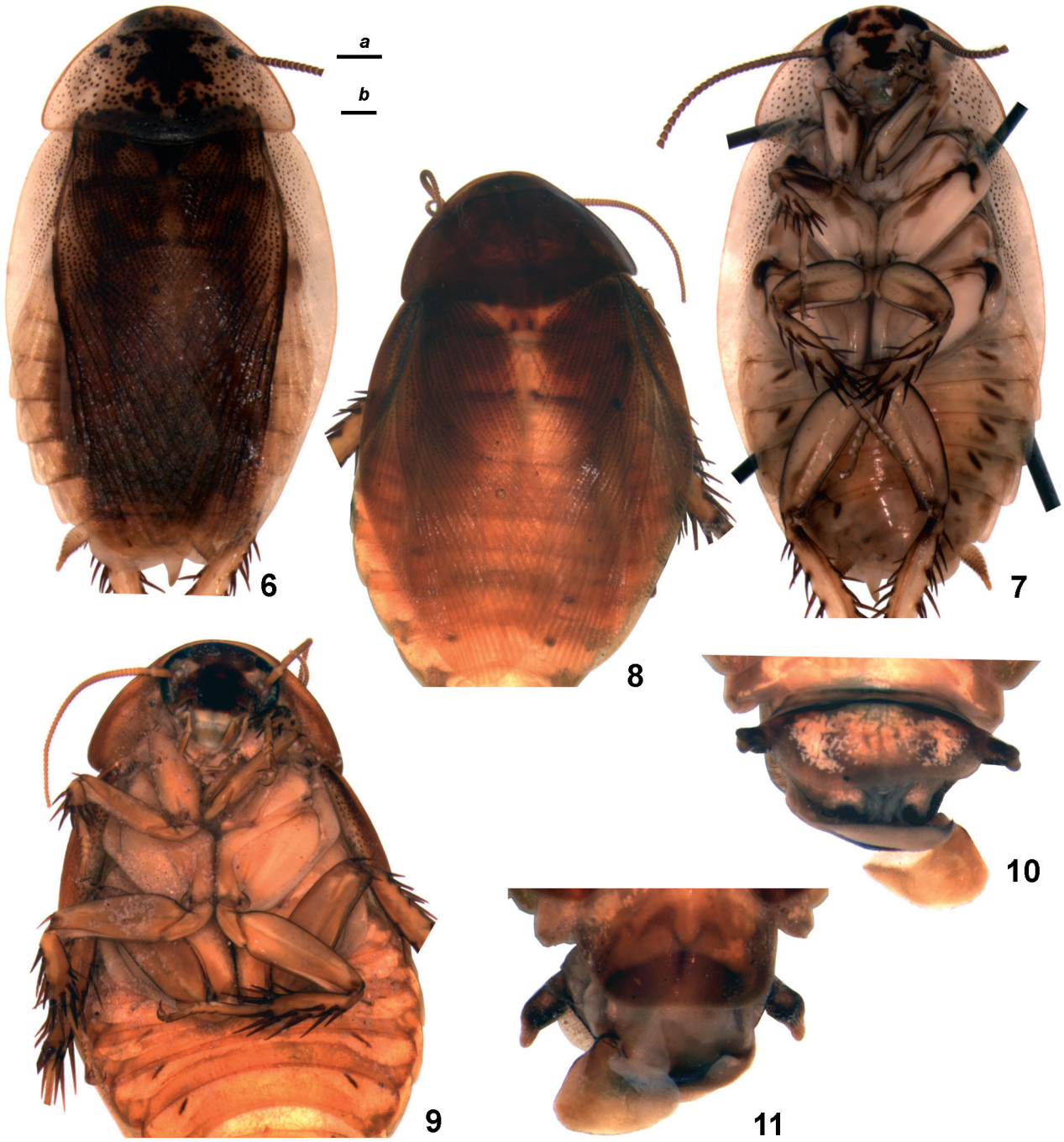
Etymology: This species is named in honor of Dr Peter Schwendinger, collector of the holotype of this species and curator of the Arthropoda collections of the Muséum d'histoire naturelle de Genève.

Description:
Somatic characters of male (holotype): General colour yellowish brown, with scattered black spots (Figs 6-7);



Figs 1-5. *Pycnoscelus surinamensis* (Linnaeus, 1758), female. (1) Abdominal apex, dorsal view. (2) Genital plate, ventral view. (3) Ovipositor and adjacent structures, ventral view. (4) Ovipositor, ventral view. (5) Basal part of ovipositor, dorsal view. Dotted areas show membranous parts, except for valves of ovipositor in Figs 3-4. Abbreviations: *aa.*, *bsv.*, *Cer.*, *gg.*, *par.*, *pl.*, *teVIII.*, *teIX.*, *v.I.*, *v.II.*, *v.III.*, *vs.* - see paragraph "abbreviation used in figures"; *VIII*, *IX*, *X* - abdominal tergites VIII-X; for details see text. Scale bars 1 mm: a: 1, b: 2, c: 3, d: 4-5.

facial part of head contrastingly coloured (Fig. 7); eyes black; antennae greyish; pronotum, tegmina and abdominal sternites with black spots; legs yellow, partly darkened. Surfaces smooth and lustrous, antennae with proximal 8-10 segments lustrous, the remaining segments dull; pronotum, tegmina, mostly in proximal half, and, to a lesser degree, facial part of head with distinct punctuation. Head slightly longer than wide, with transverse impression between antennal sockets (Figs 7, 12); ocellar spots small but distinct; distance between eyes about equal to eye length; distance between antennal sockets about 2.5 times scape length (~0.6 mm); approximate length ratio of 3rd-5th segments of maxillary palps 1.1 : 1.0 : 1.2. Pronotum as in Figs 6, 13; cranial margin widely rounded, caudal one distinctly angulate. Tegmina and wings slightly abbreviate, reaching abdominal apex (Figs 6-7). Tegmina with widely rounded apex (Fig. 6), sclerotized in costal field; venation simplified and slightly obliterated along cranial margin; *Sc* thickened (well visible on ventral side of tegmen); *R*, *M* and *CuP* weak; anal field with obliterated venation. Hind wings membranous, shorter



Figs 6-11. Photos of males of *Pycnoscelus schwendingeri* sp. nov. (6-7: holotype) and *P. striatus* (Kirby, 1903) (8-11: specimen from Batu Caves). (6, 8) General view from above. (7, 9) General view from below. (10) Abdominal apex, dorsal view. (11) Same, ventral view. Stylus in Figs 10-11 in everted state. Scale bars 10 mm: a: 6, b: 8. Other photos not to scale.

than tegmina, with simplified venation. Fore tibiae distinctly thickened distally (Fig. 14). Anterior margin of fore femora of armed type C, with single apical spine (Fig. 14). Tibial spines well developed. Structure of hind tarsus (Fig. 15): metatarsus about as long as other tarsal segments combined, with large euplantula; spines absent; claws symmetrical, simple; arolium distinct, about half as long as claw. Fore and mid tarsi similar to hind tarsi, but segments comparatively shorter. Abdomen without visible glandular specializations; tergite VIII with distinct spiracle-bearing outgrowths (Figs 16-17), large medial and two smaller oval lateral membranous areas; sternite VIII large, plate-like and weakly sclerotized (Fig. 18). Anal plate (tergite X) weakly sclerotized and asymmetrical (Figs 16-17). Cerci short, with distinct segments. Paraprocts of blaberi-type, with curved

hook on right paraproct and with membranous area at cranio-medial angles of left paraproct (Fig. 17, *par*.). Hypandrium asymmetrical (Figs 19-20), with caudal margin weakly concave, hook at caudolateral angle well sclerotized (Fig. 20, *h.*); left stylus absent, right one in shape of elongated triangle.
Genitalia of male holotype (Figs 20-26): Right phallomere (*R+N*): caudal part of sclerite *R1T* well sclerotized, widely rounded (Fig. 21, *c.p.R1T*); bristles absent; *R1T* nearly straight; *R2* weakly curved; *R3* elongated (Figs 21-22); *R4* small, not fused with other sclerites; *R5* absent; *R1T* and *R2* cranially prolonged into large sclerotized plate. Sclerite *L2D* (*L1*) divided into basal and apical parts (Fig. 24); basal part robust, widened cranially (Fig. 24, *b.L2D*); "apical sclerite" with small teeth at caudal margin (Figs 23-24, *ap. scl.*); bristles absent; "dorsal outgrowth" present (Figs 23-24, *d.o.*). Sclerite *L3* (*L2d*) without basal subsclerite (Figs 25-26); "folded structure" weakly developed, without bristles (Fig. 26, *f.s.*); apex of *L3* with "small tooth" (Figs 25-26, *s.t.*); groove *hge* absent. Sclerite *L4U* (*L3d*) divided into two parts (Fig. 25).
Female: Unknown.

Measurements (in mm): Head length 2.6, head width 2.5; pronotum length 4.0, pronotum width 5.8; tegmen length 10.8, tegmen width 3.9.

Comparison: *Pycnoscelus schwendingeri* sp. nov. belongs to the *indicus* species-group (Roth, 1998) judging from the structure of its right stylus. This species-group includes nine species (Roth, 1998; Anisyutkin, 2002): *P. conferta*, *P. femapterus*, *P. indicus*, *P. janetcheki*, *P. nigra*, *P. surinamensis*, *P. gorochovi*, *P. vietnamensis* and *P. rothi*. The new species readily differs from all species of the *indicus* species-group by a contrastingly coloured pronotum and facial part of head (Figs 6-7). From *P. indicus*, *P. nigra*, *P. janetsheki*, *P. conferta* and *P. femapterus* the new species differs by a distinctly asymmetrical, i.e. emarginated at right side (Figs 16-17), anal plate. The shape of the anal plate is somewhat similar in *P. gorochovi*, *P. vietnamensis*, *P. rothi* and *P. schwendingeri* sp. nov., but these species can be readily differentiated by the shape of the apical part of sclerite *L2D* of the male genitalia (compare figs 26-28 in Anisyutkin, 2002 and Figs 23-24 of present paper).

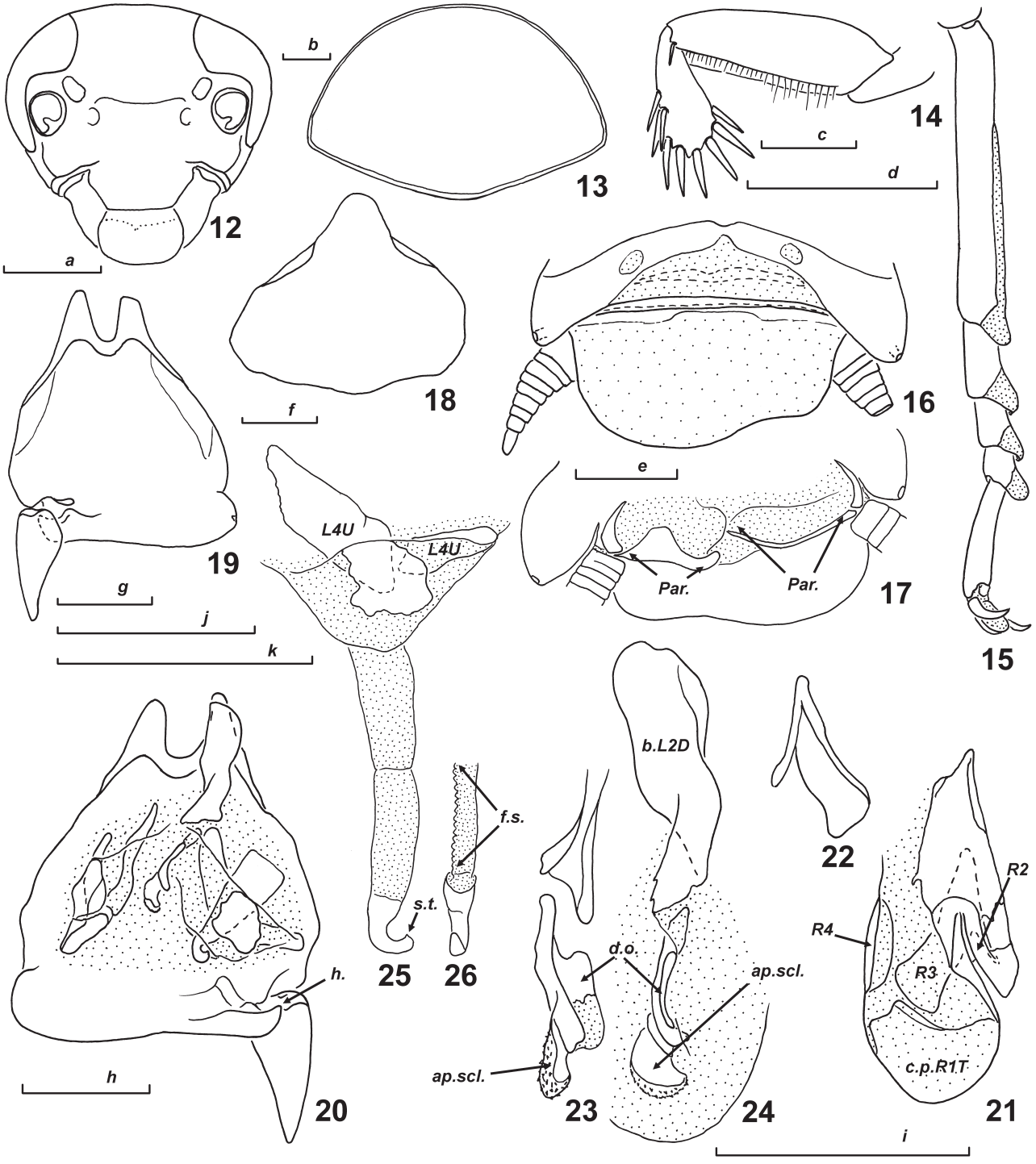
Pycnoscelus striatus (Kirby, 1903)

Figs 8-11, 27-38

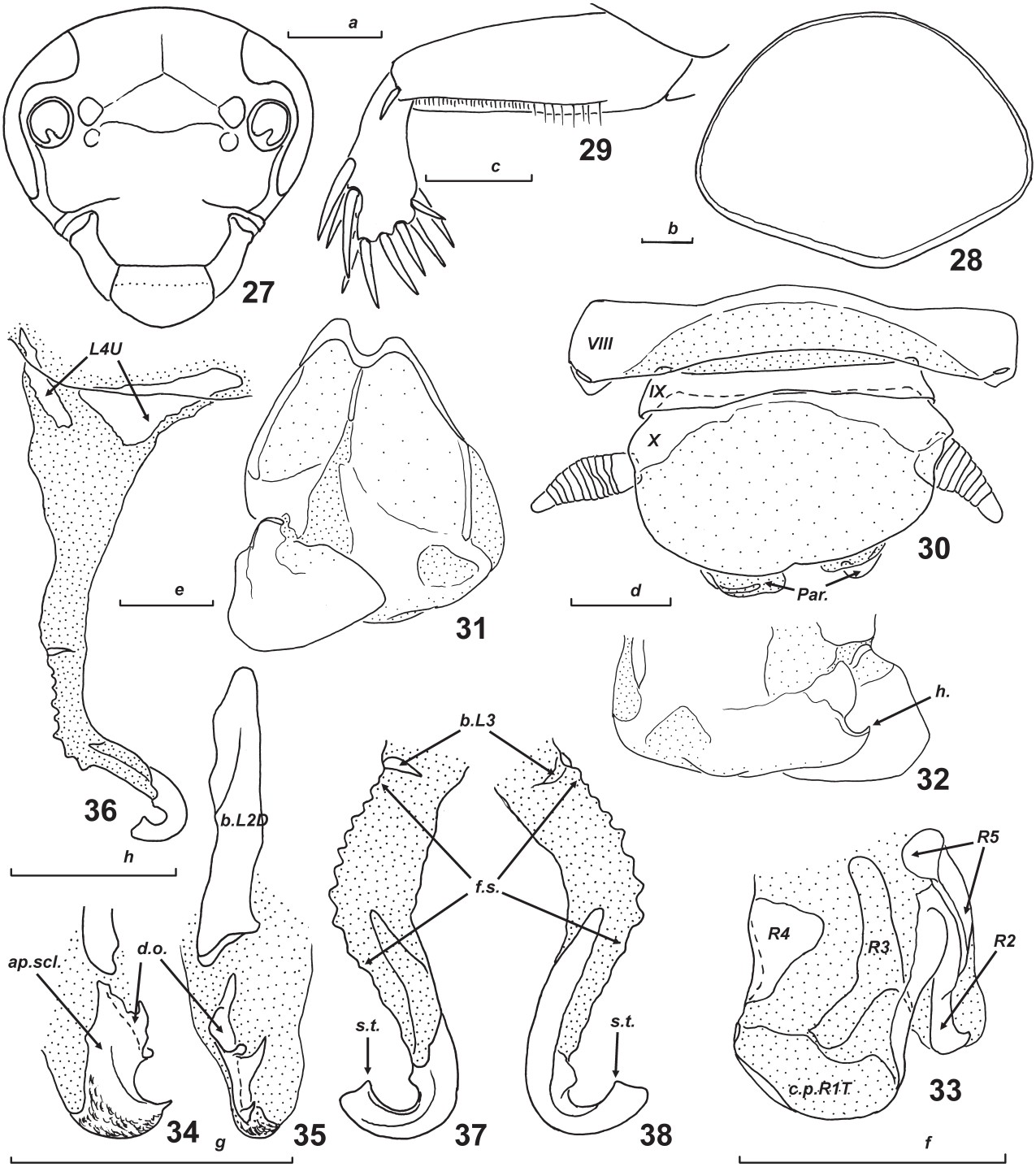
Material examined: MHNG, without accession number; 1 male (genital complex in prep. 110817/02) and 18 larvae; W. Malaysia, N. of Kuala-Lumpur, Batu Caves; November 1976; collector unknown, probably Dr Brigitte Köpchen.

Description: On the basis of the newly examined male specimen the description of Roth (1998) can be supplemented with the following details.
Somatic characters of male: General colour yellowish brown (Figs 8-11), pronotum and facial part of head darker; eyes black. Surfaces smooth and lustrous, antennae with lustrous proximal 6-7 segments, remaining segments dull; pronotum and tegmina, mostly in proximal half, with distinct punctuation. Head as in Figs 9, 27, slightly longer than wide, with transverse impression between antennal sockets; ocellar spots small but distinct; distance between eyes about equal to eye length; distance between antennal sockets about 2.5 times scape length (~0.6 mm); approximate length ratio of 3rd-5th segments of maxillary palps 1.3 : 1.0 : 1.3. Pronotum as in Figs 8, 28. Tegmina and hind wings distinctly abbreviate, not reaching abdominal apex. Fore tibiae distinctly thickened distally (Fig. 29). Anterior margin of fore femora of armed type C, with single apical spine (Fig. 29). Tibial spines well developed. Structure of hind tarsus similar to that of *P. schwendingeri* sp. nov., but metatarsus slightly longer than other segments combined, distally bordered with pair of "additional spines"; 2nd and 3rd tarsal segments with "additional spines" on their outside; arolium distinct, smaller than one half of claw length. Fore and mid tarsi similar to hind tarsi, but segments comparatively shorter. Abdomen without visible glandular specializations; tergite VIII with distinct spiracle-bearing outgrowths (Figs 10-11, 30) and large medial membranous area; sternite VIII large, plate-like. Anal plate (tergite X) weakly sclerotized, very weakly asymmetrical (Figs 10, 30). Cerci short, with distinct segments (Figs 10, 30). Paraprocts of blaberi-type, similar to those of *P. schwendingeri* sp. nov. Hypandrium asymmetrical, irregularly sclerotized (Figs 11, 31-32), with caudal margin convex, hook at posterolateral angle well sclerotized (Fig. 32, *h.*); left stylus absent, right one in shape of wide plate.
Male genitalia (Figs 33-38): Right phallomere (*R+N*): caudal part of sclerite *R1T* well sclerotized, widely rounded (Fig. 33, *c.p.R1T*); bristles absent; *R1T* nearly straight; *R2* weakly curved; *R3* elongated, similar to that of *P. schwendingeri* sp. nov.; *R4* plate-like, not fused with other sclerites; *R5* elongated. Sclerite *L2D* (*L1*) divided into basal and apical parts (Fig. 35); basal part robust (Fig. 35, *b.L2D*); "apical sclerite" with recumbent bristles (Figs 34-35, *ap. scl.*); "dorsal outgrowth" weak (Figs 34-35, *d.o.*). Sclerite *L3* (*L2d*) with basal subsclerite (Figs 36-38, *b.L3*); "folded structure" present, without bristles (Figs 36-38, *f.s.*); apex of *L3* with "small tooth" (Figs 36-38, *s.t.*); groove *hge* absent. Sclerite *L4U* (*L3d*) divided into two parts (Fig. 36).

Measurements (in mm): Head length 3.4, head width 3.2; pronotum length 5.0, pronotum width 6.5; tegmen length 10.9, tegmen width 5.0.



Figs 12-26. *Pycnoscelus schwendingeri* sp. nov., male holotype. (12) Facial part of head. (13) Pronotum, dorsal view. (14) Right fore leg seen from anterior (below). (15) Hind tarsus, anterior view. (16) Abdominal apex, dorsal view. (17) Paraprocts and adjacent structures, ventral view. (18) Eighth abdominal sternite, ventral view. (19) Hypandrium, ventral view. (20) Hypandrium and genitalia, dorsal view. (21) Right phallomere, dorsal view. (22) Sclerite *R3*, ventral view. (23) Caudal part of sclerite *L2D*, lateral view. (24) Sclerite *L2D*, dorsal view. (25) Sclerites *L3* and *L4U*, dorsal view. (26) Apex of sclerite *L3*. Dotted areas show membranous parts. Abbreviations: *ap.scl.*, *b.L2D*, *c.p.R1T*, *d.o.*, *f.s.*, *h.*, *L4U*, *par.*, *R2*, *R3*, *R4*, *s.t.* - see paragraph "abbreviation used in figures"; for details see text. Scale bars 1 mm: a: 12, b: 13, c: 14, d: 15, e: 16-17, f: 18, g: 19, h: 20, i: 21-24, j: 25, k: 26.



Figs 27-38. *Pycnoscelus striatus* (Kirby, 1903), male from Batu Caves. (27) Facial part of head. (28) Pronotum, dorsal view. (29) Right fore leg seen from anterior (below). (30) Abdominal apex, dorsal view. (31) Hypandrium, ventral view. (32) Caudal part of hypandrium, dorsal view. (33) Right phallomere, dorsal view. (34) Caudal part of sclerite *L2D*, lateral view. (35) Sclerite *L2D*, dorsal view. (36) Sclerites *L3* and *L4U*, dorsal view. (37-38) Apex of sclerite *L3*. Dotted areas show membranous parts. Abbreviations: *ap.scl.*, *b.L2D*, *b.L3*, *c.p.R1T*, *d.o.*, *f.s.*, *h.*, *L4U*, *par.*, *R2*, *R3*, *R4*, *R5*, *s.t.* - see paragraph "abbreviation used in figures"; *VIII*, *IX*, *X* - abdominal tergites VIII-X; for details see text. Scale bars 1 mm: a: 27, b: 28, c: 29, d: 30, 32, e: 31, f: 33, g: 34-35, 37-38, h: 36.

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