

**New and little known Epilamprinae (Dictyoptera: Blaberidae)
from the collections of the Muséum d'histoire naturelle de Genève and
the Zoological Institute of Saint Petersburg. Part 1**

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Abstract: A new genus and species of cockroach, *Paracalolamprodes tioman* gen. et sp. nov., is described from Malaysia. Lectotypes of *Apsidopis cyclops* Saussure, 1895 and *Calolampra biolleyi* Saussure, 1895 are designated. A detailed morphological description of the new taxa, as well as a redescription of *A. cyclops*, *Aptera fusca* (Thunberg, 1784) and *Litopeltis biolleyi* (Saussure, 1895) are given.

Keywords: *Paracalolamprodes tioman* gen. et sp. nov. - *Apsidopis cyclops* - *Aptera fusca* - *Litopeltis biolleyi* - morphology.

INTRODUCTION

This work is the second in a planned series of papers devoted to dictyopterans in the collections of the Muséum d'histoire naturelle in Geneva.

The family Blaberidae Brunner von Wattenwyl, 1865 includes the most derived cockroaches. The most prominent characters of the family are the specialized type of oviposition – the ootheca incubated internally in the brood sac, and the derived type of the male genitalia – the sclerites form three main complexes lying separately in membranous sheaths. The subfamily Epilamprinae Brunner von Wattenwyl, 1865 is one of the most diverse of the family Blaberidae.

The lack of morphological studies, especially of the male and female genital structures, is the main impediment to a phylogenetic analysis of the Dictyoptera. The aim of this study is to provide morphological descriptions which are detailed enough for further phylogenetic investigations.

MATERIAL AND METHODS

The author follows the methods described in Anisutkin (2014a, b). The studied specimens were dried and pinned. In order to study structures of the male and female genital complexes, the specimens were subjected to the standard procedures (Anisutkin, 2014a, b). After investigation, the dissected parts are preserved in microvials (in 70% ethanol or in glycerol).

The author generally follows Rehn's (1951) interpretation of the venation of the tegmina and wings. Description of the anterior margin of 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 following the author's designations. The terminology of the female genital structures follows McKittrick (1964) and Klass (1998). The terms introduced by the author (in the present work and in Anisutkin, 2014a, b; Anisutkin *et al.*, 2013) are given in quotation marks.

All material studied, including the holotype of the new species, has been deposited in the Muséum d'histoire naturelle of Geneva, Switzerland (MHNG) or the Zoological Institute, Russian Academy of Sciences in Saint-Petersburg, Russia (ZIN).

Abbreviations used in figures

(see text for further details):

1pl. - 1st plical vein of the wing (*sensu* Rehn, 1951).

3pl. - 3rd plical vein of the wing (*sensu* Rehn, 1951).

VIII, IX, X - 8th-10th abdominal tergites respectively.

a.s. - "additional spines" - spines bordering euplantulae from inside and outside.

a.a. - anterior arch of second valvifer of the female genitalia.

Ant.R.rami - area of anterior branches of radius vein.

ap.scl. - "apical sclerite" of the sclerite L2D in the male genitalia.

bsv. - basivalvula of the female genitalia.

CuA - area of cubitus anterior vein branches.

CuP - cubitus posterior vein (= plical furrow *sensu* Rehn, 1951).

c.p.RIT - caudal part of sclerite R1T of the male genitalia.

- a.L2D* - apical part of sclerite L2D of the male genitalia.
b.L2D - basal part of sclerite L2D of the male genitalia.
b.L3 - basal subsclerite of the sclerite L3 in the male genitalia.
b.o. - “bent outgrowth” of basal part of the sclerite L2D in the male genitalia.
d.o. - “dorsal outgrowth” of apical part of the sclerite L2D in the male genitalia.
e.r. - exterior row of spines along lower margin of hind metatarsus.
f.s. - “folded structure” of the sclerite L3 in the male genitalia.
gg. - gonangulum of the female genitalia.
hge. - groove of the sclerite L3 in the male genitalia (*sensu* Klass, 1997).
hl. - hollow on sclerite R2 in the male genitalia.
i.r. - interior row of spines along lower margin of hind metatarsus.
int.tr. - intercalated triangle of wing (*sensu* Rehn, 1951).
m.o. - “membranous outgrowth” of sclerite L3 of the male genitalia.
par. - paraproct.
pl. - sclerotized lobes of the 2nd and 3rd pairs of valves in the female genitalia.
R+M - area of radius and media veins branches.
R1T, R2, R3, R4, R5 - sclerites of the male genitalia.
r.plm. - right phallomere of the male genitalia.
L3, L4U, R1T, R2, R3, R4, R5 - sclerites of the male genitalia.
s.t. - “small tooth” of apical part of the sclerite L3 in the male genitalia.
str.a. - area of fine striations on “upper triangular lobe”.
Sc - area of subcosta vein branches.
spi. - spinules located on metatarsal euplantula.
spr. - spiracle.
str. - striation on caudal part of sclerite R1T of the male genitalia.
teIX. - tergal process of the 9th abdominal tergite.
tr.l. - “upper triangular lobe” of right phallomere of the male genitalia.
v.I., v.II., v.III. - the 1st, 2nd and 3rd valves of ovipositor respectively.
vs. - vestibular sclerite in the female genitalia.

TAXONOMIC PART

Paracalolamprodes gen. nov.

Type species: *Paracalolamprodes tioman* sp. nov., designated here.

Differential diagnosis: The new genus differs from the vast majority of representatives of the subfamily Epilamprinae by a very characteristic structure of the tarsi: hind metatarsi with 2 unequal rows of spines along lower margin (Fig. 4). The single known epilamprine genus with a similar structure of

the tarsi is *Calolamprodes* Bey-Bienko, 1969. This genus includes 2 subgenera: *Calolamprodes* s. str. and *Brachycalolamprodes* Anisyutkin, 1999. Both subgenera are characterized with unequal rows of metatarsal spines and similar structure of the male genitalia (Bey-Bienko, 1969; Anisyutkin, 1999, 2006). *Paracalolamprodes* gen. nov. differs from *Calolamprodes* in strongly reduced tegmina in males (Fig. 2) and the structure of the male genitalia (compare Figs 8-15 of present paper, Figs 18-33 in Anisyutkin, 1999 and 15-41 in Anisyutkin, 2006): right phallomere (R+N) with caudal part of sclerite R1T more developed (Figs 9-10, *c.p.R1T*), R2 well sclerotized and distinctly curved, R3 more robust and shorter, R5 well sclerotized, closely associated with R2; sclerite L2D (L1) without outgrowths at caudal end of basal part (Figs 8, 11-12); sclerite L3 (L2d) caudally widely rounded, without developed “apical crest” (Figs 13-15).

The genera *Calolamprodes* and *Paracalolamprodes* gen. nov. are probably closely related. The possible synapomorphies are the structure of the tarsi (presence of unequal rows of metatarsal spines) and the male genital sclerites (caudal part of sclerite R1T weak, as compared with those structures of *Morphna* sp. and *Rhabdoblatta* sp. - Anisyutkin, 2014b, sclerite R4 partly membranous, fused with caudal part of sclerite R1T, apical part of sclerite L2D (L1) plate-like). It must be noted that structure of the right phallomere of *Paracalolamprodes* gen. nov. seems to be less advanced than that of *Calolamprodes*. The moderately developed caudal part of sclerite R1T, curved R2, and comparatively robust R3 are more similar to the general type of right phallomere in the Epilamprinae, than to the same structures in *Calolamprodes*.

Calolamprodes (*Brachycalolamprodes*) *gorochovi* Anisyutkin, 1999, the single known representative of the subgenus *Brachycalolamprodes* Anisyutkin, 1999, is characterized by shortened (only reaching 2nd abdominal tergite) and strongly sclerotized tegmina (Anisyutkin, 1999; 2006). The shortening of the tegmina and wings in *Paracalolamprodes* gen. nov. and *Brachycalolamprodes* is evidently convergent because of the clearly different structure of the male genitalia and the rather usual reduction of the tegmina and wings compared to other cockroaches (Bell *et al.*, 2007).

A similar structure of the tarsi, *i.e.* presence of two unequal rows of spines along lower margin of tarsal articles, was mentioned for representatives of *Macrostylopyga* Anisyutkin, Anichkin & Nguyen, 2013 and *Afrotylopyga* Anisyutkin, 2014 in Blattidae (Blattinae) (Anisyutkin *et al.*, 2013; Anisyutkin, 2014a). The similarity in these cases is undoubtedly due to convergence.

Included species: The type species only.

Etymology: The name means “cockroach distinct from, but analogous to *Calolamprodes*”.

***Paracalolamprodes tioman* sp. nov.**

Figs 1-15

Material examined: Holotype; MHNG; male; W. Malaysia, Tioman Island, above Japamala Resort (2°44'42.7"N, 104°07'27.7"E), 117 m, rainforest, sifting, 23-27.01.2012, leg. L. Monod. VMI-12/16.

Description of male (holotype): General colour dark reddish-brown. Epicranium (with exception of ocellar spots) and eyes black. Pronotum, tegmina, thoracal and abdominal tergites dark brown, reddish along with sides. Head with pale ocellar spots and yellow distal halves of clypeus and labrum. Antennae yellowish at base, darker (reddish-brown) towards apex. Maxillary palps pale. Thorax from below brown with indistinct yellow maculae. Abdominal sternites reddish brown with indistinct lighter (reddish) median stripe. Coxae reddish-brown; rest of legs, with exception of yellow tarsi, reddish. Cerci partly pale yellow. Surfaces smooth. Body from below, head and coxae with very weak punctation. Head as in Fig. 1; distance between eyes 1.3 times eye length; distance between antennal sockets 2 times scape length; approximate length ratio of 3rd-5th segments of maxillary palps 1 : 1 : 1.1. Pronotum campaniform, marginated, with anterior and lateral margins semicircular, posterior - nearly straight, postero-caudal angles weakly attenuate caudally (Fig. 2); meso- and metanotum with caudal margins straight (Fig. 2); metanotum with lateral margins rounded and postero-caudal angles attenuated caudally (Fig. 2). Tegmina strongly reduced (Fig. 2); wings vestigial. Anterior margin of fore femur armed as in the type B (*sensu* Bey-Bienko, 1950; Roth, 2003), with 5 spines, including 2 apical ones. Fore tibiae weakly thickened distally (Fig. 3). Structure of hind tarsi: metatarsus longer than other tarsal segments combined, with two unequal rows of spines along lower margin [exterior row (Fig. 4, *e.r.*) consists of 19-20, interior one (Fig. 4, *i.r.*) 22 spines]; 2nd and 3rd segment with 5-6/4-5 and 1-2/2 spines in exterior/interior rows respectively; metatarsus and 2nd-4th segments with apical euplantulae and 1-2 additional spines bordering euplantulae (Fig. 4, *a.s.*); claws symmetrical and simple; arolium present, about as long as half of claw length. Abdominal tergites without visible glandular specializations. Anal plate (X, ultimate tergite) widely rounded, with weak medial emargination (Figs 5-6). Paraprocts of blabrid-type, as in Fig. 6. Hypandrium asymmetrical, as in Figs 7, 8; styli cylindrical, right one basally curved.

Genitalia (Figs 8-15): Right phallomere (R+N): sclerite R1T well sclerotized, with moderately developed caudal part (Figs 9-10, *c.p.R1T*), densely covered with bristles; R2 distinctly curved and well sclerotized; R3 elongated, but not rod-like, forked caudally; R4 substituted with membranous lobe, fused with caudal part of sclerite R1T; R5 well sclerotized, closely associated with R2, not contacted with R3. Sclerite L2D (L1) divided into

basal and apical parts (Figs 8, 11-12); basal part strongly widened cranially, without any outgrowths (Fig. 8, *b.L2D*); apical part in shape of flattened sclerite, without additional sclerites (Figs 11-12, *a.L2D*); bristles absent. Sclerite L3 (L2d) without basal subsclerite, "folded structure" and bristles (Figs 13-15); apex of L3 with attenuated "small tooth" (Figs 13-15, *s.t.*); "apical crest" and groove *hge* absent. Sclerite L4U (L3d) weakly sclerotized, elongated (Fig. 8).

Females: unknown.

Measurements (in mm): Head length 2.6, head width 2.7; pronotum length 3.6, pronotum width 6.1; tegmen length 2.4, tegmen width 3.1.

Comparison: As given for the genus.

***Apsidopsis* Saussure, 1895**

Type species: *Apsidopsis cyclops* Saussure, 1895, by monotypy.

Remarks: This genus was initially monotypical comprising only the species *A. cyclops* Saussure, 1895. *Apsidopsis cyclops* was described from an unspecified number of males from "Borneo meridionalis" (Saussure, 1895). Later two species were added to the genus: *Epilampra oxyptera* Walker, 1868 and *A. wallacei* Shelford, 1907 (Shelford, 1910; Hanitsch, 1915; Bruijning, 1948). Both species were described based on material from Borneo, Sarawak.

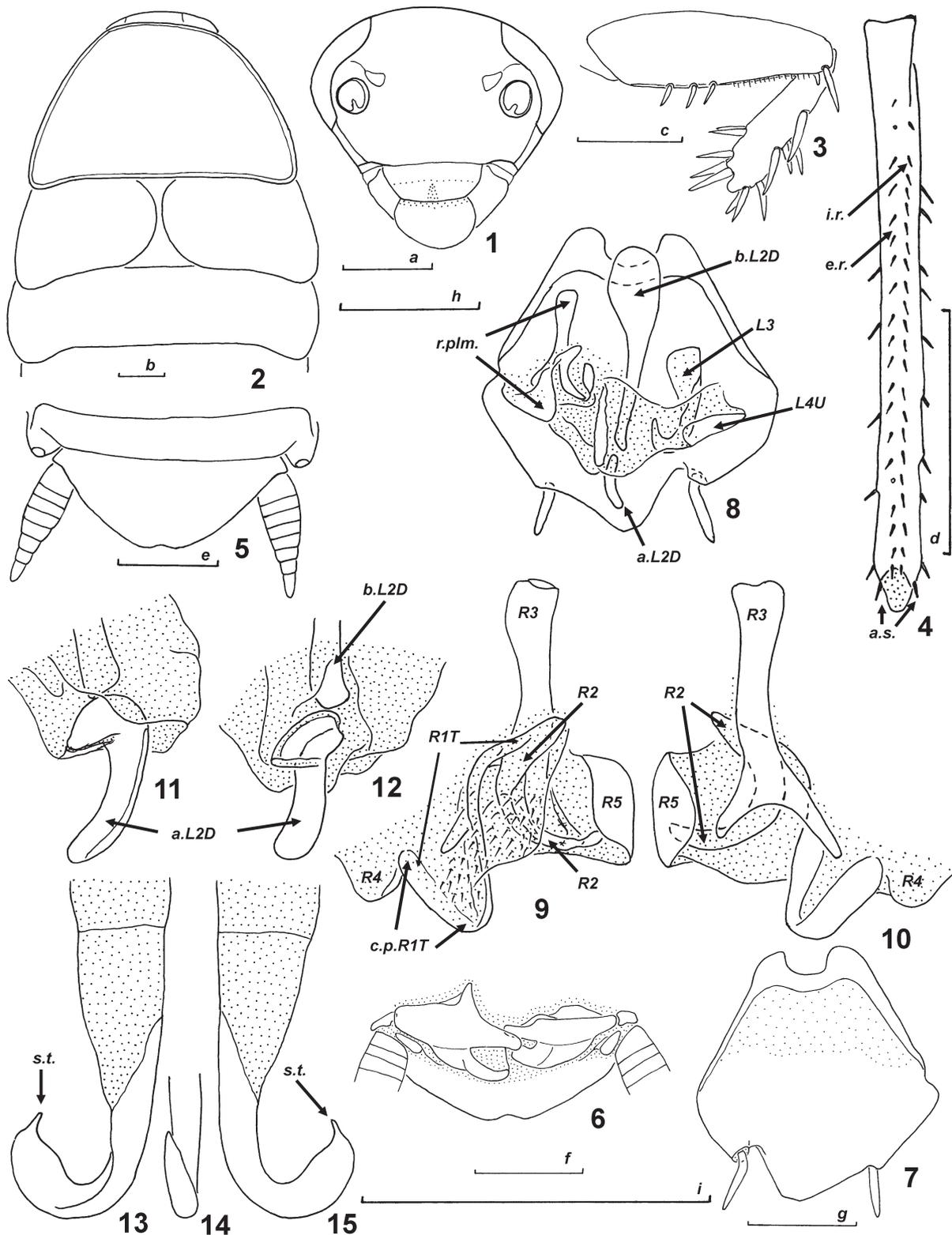
Apsidopsis cyclops was synonymized with *A. oxyptera* by Princis (1958: 65) as follows: "Walkers *oxyptera* (♀) und Saussures *cyclops* (♂) sind lediglich die beiden Geschlechter ein und derselben Art". It must be noted that the type of *A. oxyptera* was identified as a male in the original description (Walker, 1868: 199) and Hanitsch wrote: "This species [*A. oxyptera* - L.A.] seems to be known by three specimens only, *viz.* by the type, ♂, collected by Wallace in Sarawak and now in the British Museum; by a ♀ from Kuching, Sarawak, presented by R. Shelford to the Oxford Museum in 1900; and by a ♀ which I took on Bukit Timah, Singapore, July 1911" (Hanitsch, 1923: 424).

Apsidopsis cyclops differs from the insufficiently described *A. oxyptera* in the more dark colouration, the transverse pronotum, and the longer and narrower costal field of the tegmina (compare Figs 17, 50-51, 60 and plate 1 fig. 5 in Shelford, 1910). Taking this into account, it is safe to consider *A. cyclops* a valid species.

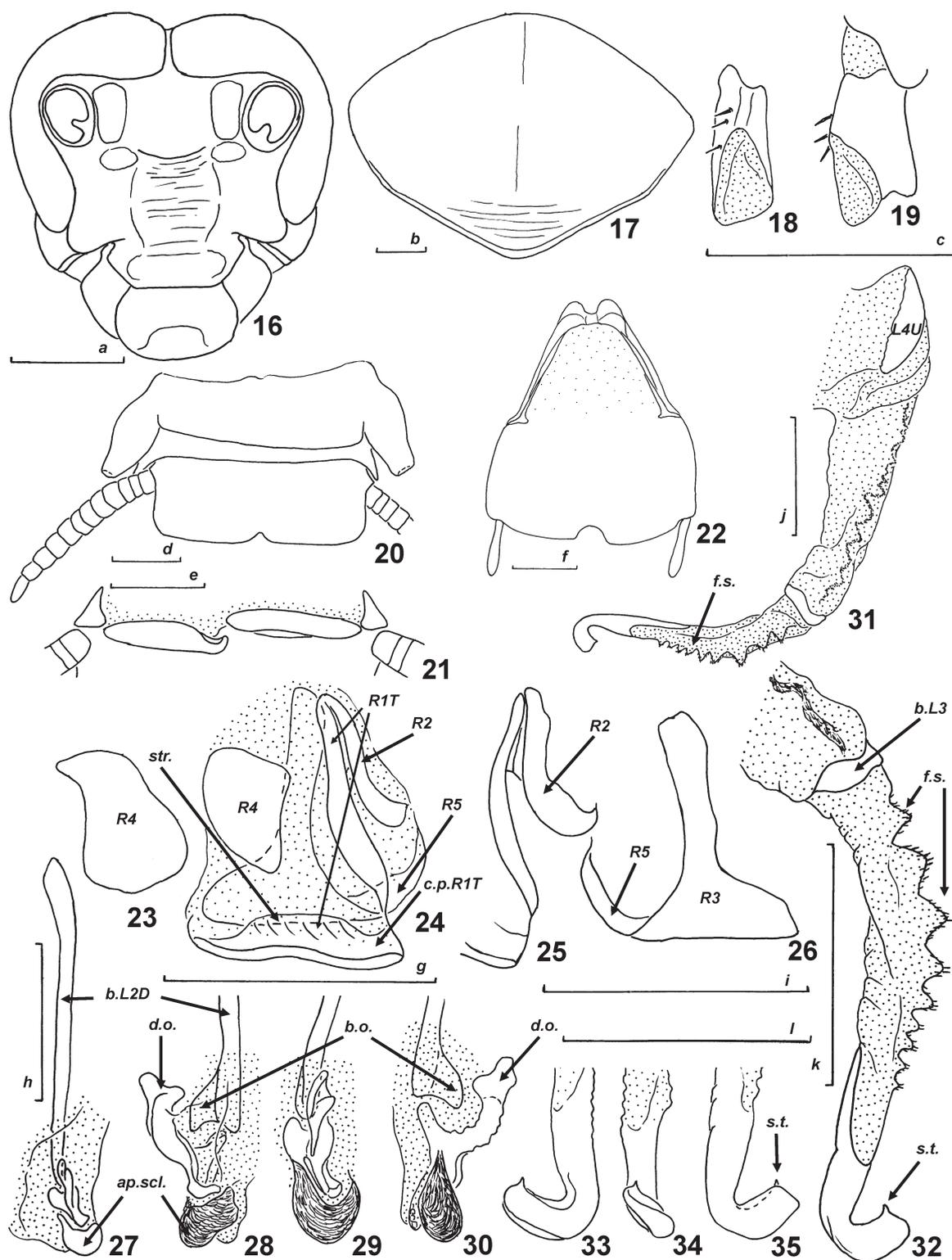
***Apsidopsis cyclops* Saussure, 1895**

Figs 16-35, 50-51, 60-61

Material examined: MHNG, ♂ lectotype, designated herewith; Borneo Is., "Epilampra cyclops ♂", "Sud Borneo", genital complex in prep. 150714/01.



Figs 1-15. *Paracalolamprodes tioman* gen. et sp. nov. (1) Facial part of head. (2) Head and thorax, dorsal view. (3) Fore tibia and femur seen from anterior. (4) Hind metatarsus, ventral view. (5) Abdominal apex, dorsal view. (6) Abdominal apex with hypandrium and genitalia removed, ventral view. (7) Hypandrium, ventral view. (8) Hypandrium and genitalia, dorsal view. (9) Right phallomere, dorsal view. (10) The same, ventral view. (11) Caudal part of sclerite L2D, seen from outside. (12) The same, dorsal view. (13, 15) Sclerite L3. (14) Apex of sclerite L3. Dotted areas show membranous parts. Abbreviations: *a.L2D*, *a.s.*, *b.L2D*, *c.p.R1T*, *e.r.*, *i.r.*, *L3*, *L4U*, *r.plm.*, *R1T*, *R2*, *R3*, *R4*, *R5*, *s.f.* - see chapter "abbreviation used in figures", for details see text. Scale bars 1 mm: a = 1, b = 2, c = 3, d = 4, e = 5, f = 6, g = 7, h = 8, i = 9-15.



Figs 16-35. *Apsidopsis cyclops* Saussure, 1895. (16) Facial part of head. (17) Pronotum, dorsal view. (18) Middle left metatarsus, ventral view. (19) The same seen from anterior. (20) Abdominal apex, dorsal view. (21) Paraprocts, ventral view. (22) Hypandrium, ventral view. (23) Sclerite R4, dorsal view. (24) Right phallomere, dorsal view. (25) Sclerites R1T (partly) and R2, seen from inside. (26) Sclerites R3 and R5, ventral view. (27) Sclerite L2d, dorsal view. (28, 30) Caudal part of sclerite L2D, seen from outside. (29) The same, dorsal view. (31) Sclerites L3 and L4U. (32) Apical part of sclerite L3. (33-35) Apex of sclerite L3. Dotted areas show membranous parts. Abbreviations: *ap.scl.*, *b.L2D*, *b.L3*, *b.o.*, *c.p.R1T*, *d.o.*, *f.s.*, *L4U*, *R1T*, *R2*, *R3*, *R4*, *R5*, *s.t.*, *str.* - see chapter "abbreviation used in figures", for details see text. Scale bars 1 mm: a = 16, b = 17, c = 18, 19, d = 20, e = 21, f = 22, g = 23-26, h = 27, i = 28-30, j = 31, k = 32, l = 33-35.

Redescription of male (holotype): General colour yellowish, eyes black, antennae and caudal part of pronotum brownish (Fig. 50). Surfaces lustrous; pronotum and tegmina in proximal half distinctly punctured. Head longer than wide (Fig. 16); ocellar spots large; facial part with distinct impressions between eyes and weak transverse wrinkles below impression; eyes large, nearly contiguous at vertex; distance between antennal sockets about 1.2 times the scape length (1.0 mm); approximate length ratio of 3rd-5th segments of maxillary palps 1.0 : 1.2 : 1.3. Pronotum as in Figs 17 and 50-51. Tegmina and wings completely developed, surpassing abdominal apex (Figs 50-51). Tegmina with weakly attenuate apex (Fig. 60); sclerotized in proximal half (especially in costal and anal fields), rest part membranous; venation distinct; costal field wide and short; *Sc* thickened (well visible on ventral side of tegmen); *R* and *M* stems not separated; *CuP* distinct. Wings mostly membranous, only with weakly sclerotized area of anterior rami of *R* (Fig. 61, *Ant.R.rami*); *Sc* long and simple; *RA* long, with anterior veins (Fig. 61, *Ant.R.rami*); *RS* distinct; *M* long and simple; *CuA* pectinate with 4 complete (reaching to wing margin) veins; behind *CuA* situated long and simple vein (Fig. 61, *lpl.*), probably corresponding to 1st plical vein *sensu* Rehn (1951) or *CuP* [probably *CuP* + *Al* *sensu* Bey-Bienko (1950)]; next long and simple vein proximally incassated, probably corresponding to 3rd plical vein *sensu* Rehn (1951) (Fig. 61, *3pl.*); between 1st and 3rd plical veins a short reduced vein, probably corresponding to 2nd plical vein *sensu* Rehn (1951); anal fan consisting of 12-13 veins reaching margin of wing; 1-2 possibly jugal veins situated behind anal fan. Fore tibiae not thickened distally. Anterior margin of fore femora armed type B (*sensu* Bey-Bienko, 1950; Roth, 2003), with 3 spines, including 1 apical one. Tibial spines well developed. Hind tibiae in the studied specimens broken off; only left metatarsus present on middle legs. Middle metatarsus short, with large euplantula and 3 laterally displaced spines along lower margin (Figs 18-19). Fore tarsi with claws symmetrical and simple; arolium large, slightly shorter than claw length. Abdomen without visible glandular specializations. Anal plate (tergite X) nearly rectangular, caudal margin with small medial incision (Fig. 20). Cerci with distinct segments (Fig. 20). Paraprocts of blaberid-type (Fig. 21). Hypandrium symmetrical, caudal margin with large median incision; styli slightly flattened and widened distally (Fig. 22).

Genitalia (Figs 23-35): Right phallomere (R+N): sclerite R1T well sclerotized, caudal part weakly sinuate caudally, with striations (Fig. 24, *str.*); R2 slightly rounded (Figs 24-25); R3 elongated, subtriangular (Figs 24, 26); R4 large, plate-like (Figs 23-24); R5 small, closely associated with R3 (Fig. 26). Sclerite L2D (L1) divided into basal and apical parts (Figs 27-30); basal part rod-like, with “bent outgrowth” at caudal end (Figs 28,

30, *b.o.*); “apical sclerite” cap-like, rounded, densely covered with recumbent bristles (Figs 27-30, *ap.scl.*); “dorsal outgrowth” large and crest-like, directed cranially (Figs 27-30, *d.o.*). Sclerite L3 (L2d) with distinct basal subsclerite (Fig. 32, *b.L3*), “folded structure” and bristles (Figs 31-32, *f.s.*); apex of L3 with attenuated “small tooth” (Figs 31-35, *s.t.*); “apical crest” and groove *hge* absent. Sclerite L4U (L3d) distinct, plate-like (Fig. 31).

Measurements (in mm): Head length 2.9, head width 2.6; pronotum length 6.0, pronotum width 8.4; tegmen length 19.5, tegmen width 6.8.

Note: *Apsidopis cyclops* is similar to representatives of the genus *Pseudophoraspis* Kirby in structure of the head (presence of a distinct impression between the eyes – compare Fig. 16 and figs 79, 84-85, 87-90 in Anisyutkin, 1999) and the male genitalia (shape of “apical sclerite” and strongly developed “dorsal outgrowth” of sclerite L2D – compare Figs 27-30 and figs 106-107, 111-112, 123-124, 130-131, 139-145 in Anisyutkin, 1999).

Aptera Saussure, 1864

Type species: *Blatta fusca* Thunberg, 1784.

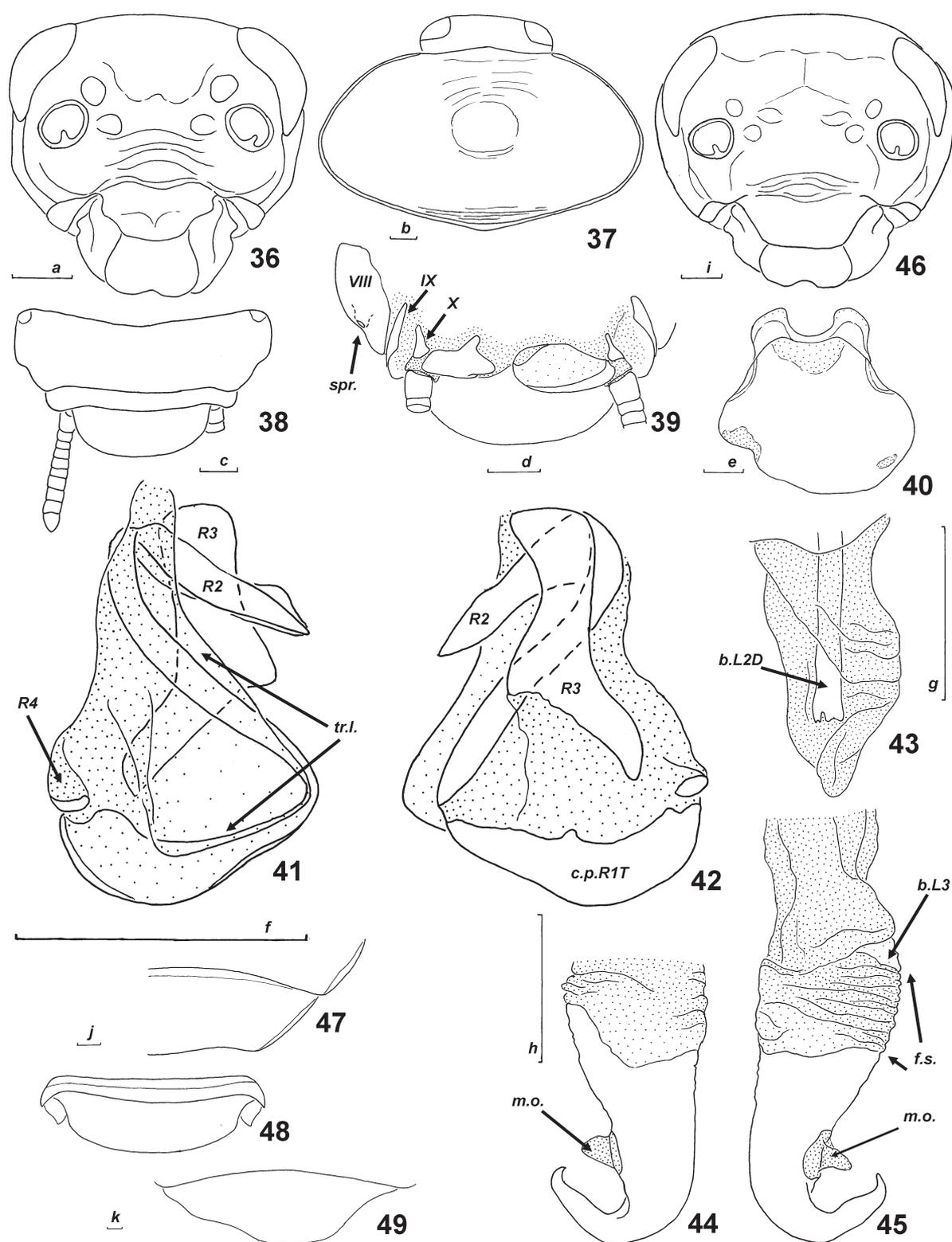
Remarks: This genus was initially monotypical including only *A. lenticularis* Saussure, 1864. Later, the genus *Oncercorypha* Stål, 1871 was described for the single species *Perisphaeria cingulata* Burmeister, 1838. *Aptera lenticulata* was synonymized with *A. cingulata* and the genus *Oncercorypha* with *Aptera* by Saussure & Zehntner (1895). *Aptera cingulata* was synonymized with *A. fusca* by Princis (1963). At the present time, the genus *Aptera* includes two species, *A. fusca* and *A. munda* (Walker, 1868) (Beccaloni, 2007).

Aptera fusca (Thunberg, 1784)

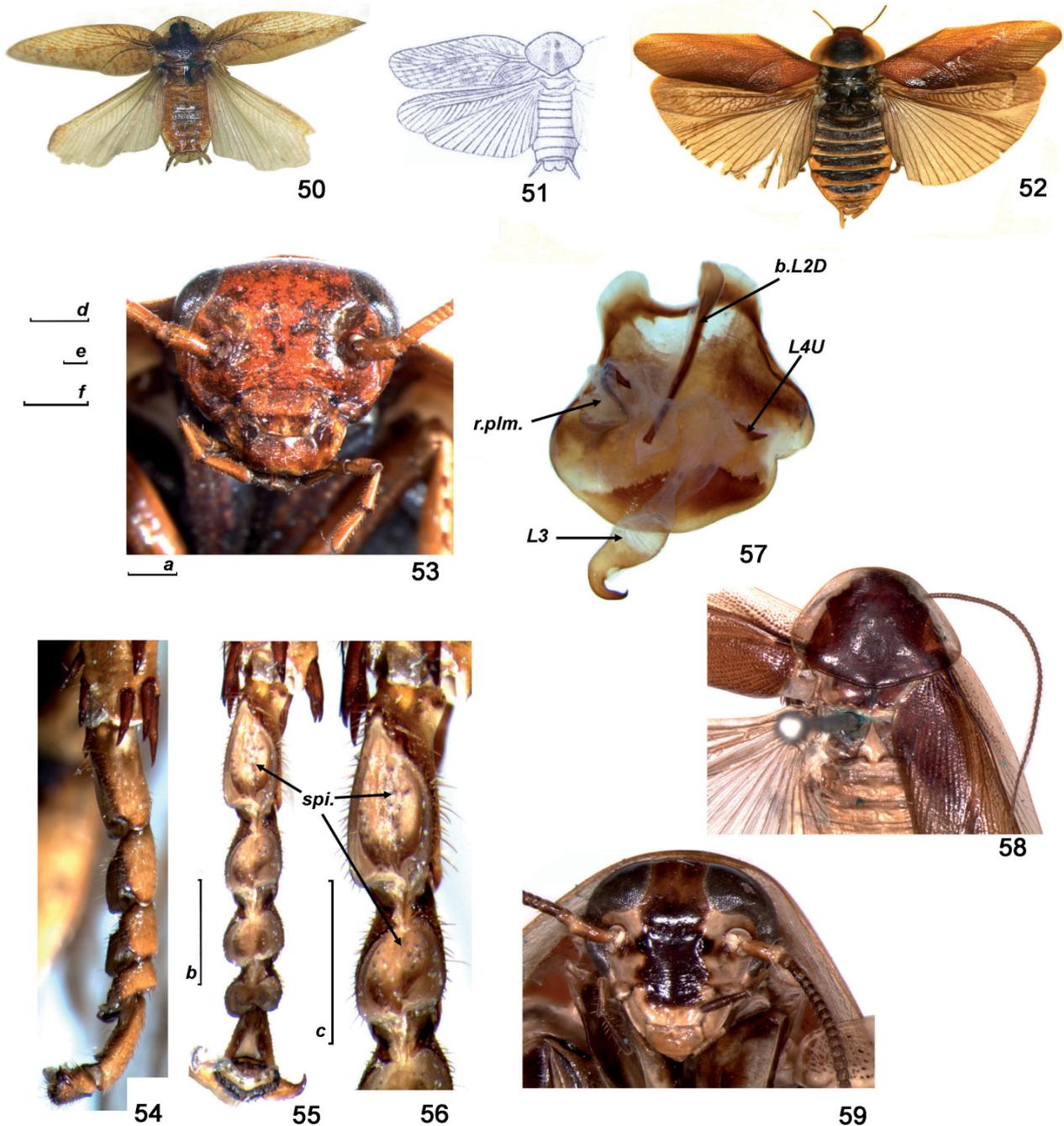
Figs 36-49, 52-57, 62-63

Material examined: MHNG; 1 ♂; “620 73 Africa or. Mr. Brady”, “Afrq. austr. Brady.”, genital complex in prep. 150714/02. – ZIN; 1 ♀; 620 73 Africa or. Mr. Brady”, “Afrq. austr. by Brady”, “No 131-97.”, “*Aptera cingulata* ♀ Burm”, “Saussure det.”. – ZIN; 1 larva; “*Oncercorypha cingulata* Burm. Cap. d. g. H”, “Brunner v. W. det.”.

Redescription of male: General colour brownish, partly black (Figs 52-57); facial part of head reddish (Fig. 53); eyes black; antennae and mouthpart yellowish; pronotum blackish in central part, lateral part yellow; tegmina reddish-brown; meso-, metathorax, coxae and most part of abdomen blackish; femora reddish-brown; tibiae and tarsi yellowish; abdominal tergites bordered with yellow along posterior and lateral sides; abdominal sternites black, bordered with yellow along



Figs 36-49. *Aptera cingulata* (Burmeister, 1838), male (36-45) and female (46-49). (36, 46) Facial part of head. (37) Head and pronotum, dorsal view. (38, 48) Abdominal apex, dorsal view. (39) The same, ventral view, hypandrium and the male genitalia removed. (40) Hypandrium, ventral view. (41) Right phallomere, dorsal view. (42) The same, ventral view. (43) Caudal part of sclerite L2D, dorsal view. (44, 45) Apical part of sclerite L3. (47) Lateral parts of abdominal tergites 7 and 8, dorsal view. (49) Genital plate, ventral view. Dotted areas show membranous parts. Abbreviations: IX, X, b.L2D, b.L3, c.p.R1T, f.s., m.o., R2, R3, R4, tr.l. - see chapter "abbreviation used in figures", for details see text. Scale bars 1 mm: a = 36, b = 37, c = 38, d = 39, e = 40, f = 41, 42, g = 43, h = 44, 45, i = 46, j = 47, 48, k = 49.



Figs 50-59. *Apsidopis cyclops* Saussure, 1895 (50-51), *Aptera cingulata* (Burmeister, 1838) (52-57), and *Litopeltis biolleyi* (Saussure, 1895) (58-59). (50-52) Habitus (wingspan: 50 = 46 mm; 52 = 64 mm). (53, 59) Head from below. (54) Left hind tarsus seen from anterior. (55) The same, ventral view. (56) 1st and 2nd tarsal segments, ventral view. (57) Hypandrium and genitalia, dorsal view. (58) Anterior part of body, dorsal view. Fig. 51 after Saussure, 1895. Abbreviations: *b.L2D*, *L3*, *L4U*, *r.plm.*, *spi.* - see chapter "abbreviation used in figures", for details see text. Fig. 51 not to scale. Scale bars 1 mm: a = 53, b = 54-55, c = 56, d = 57, e = 58, f = 59.

lateral sides. Surfaces smooth and lustrous, distal parts of antennae (approximately from 9-10th segments) dull; punctuation present in facial part of head, pronotum and proximal parts of tegmina; facial part of head rugose, with transverse wrinkles above clypeus. Head about as long as wide (Figs 36, 53); ocellar spots

small; facial part with weak impressions between eyes; distance between eyes 1.4 times eye length; distance between antennal sockets 1.8 times of the scape length (1.2 mm); approximate length ratio of 3rd-5th segments of maxillary palps 1.1 : 1.0 : 1.1. Pronotum transverse (Figs 37, 52); lateral carinae on ventral side

absent. Tegmina and wings completely developed, surpassed abdominal apex (Fig. 52). Tegmina with rounded apex (Figs 52, 62); coriaceous, membranous in distal half; venation distinct, reticulate, sometimes irregular; costal field long and narrow; *Sc* thickened (well visible on ventral side of tegmen), fused with *R*; *R*, *M* and *CuA* stems separated; *CuP* distinct. Wings mostly membranous, only with weakly sclerotized area of anterior rami of *R* (Fig. 63, *Ant.R.rami*); intercalated triangle distinct (Fig. 63, *int.tr.*); *Sc* long and simple; *RA* long, with anterior veins (Fig. 63, *Ant.R.rami*); *RS* distinct; *M* long and simple; *CuA* pectinate with 2 or 3 complete (reaching to wing margin) veins; behind *CuA* situated long and simple, distinct only in basal half vein, bordered anteriorly intercalated triangle (Fig. 63, *Ipl.*), probably corresponding to 1st plical vein *sensu* Rehn (1951) or *CuP* [probably *CuP* + *A1 sensu* Bey-Bienko (1950)]; next long and simple vein bordered posteriorly intercalated triangle, probably correspond to 3rd plical vein *sensu* Rehn (1951) (Fig. 63, *3pl.*); these veins fused and incrassated basally; anal fan consisting of 8-9 veins reaching margin of wing; 3 possibly jugal veins situated behind anal fan. Anterior margin of fore femora armed according to the type C (*sensu* Bey-Bienko, 1950; Roth, 2003), with single apical spine. Fore tibiae not thickened distally. Tibial spines weak. Structure of hind tarsi: metatarsus distinctly shorter than other segments combined, with euplantula large, more than 3/4 of segment length (Figs 54-56); euplantulae of 2nd-4th segments large; euplantulae of 1st-4th segments with small, irregularly placed spinules (Figs 55-56, *spi.*); spines along lower margins of tarsal segments absent; claws symmetrical, simple; arolium large. Abdomen without visible glandular specializations; spiracle-bearing outgrowths of tergite VIII weakly expressed (Figs 38-39), spiracles displaced from outgrowths apices (Fig. 39, *spr.*). Anal plate (tergite X) nearly rectangular, caudal margin nearly straight (Fig. 38). Cerci with distinct segments (Fig. 38). Paraprocts of blaberid-type (Fig. 39). Hypandrium asymmetrical, caudally rounded; styli absent (Figs 40, 57). *Genitalia* (Figs 41-45, 57): Right phallomere (R+N): sclerite R1T well sclerotized, with caudal part rounded caudally (Figs 41-42, *c.p.R1T*), covered with "upper triangular lobe" (Fig. 41, *tr.l.*); "upper triangular lobe" covered with bristles (not shown in Fig. 41); R2 short and nearly straight; R3 short and triangular; R4 small, closely associated with caudal part of R1T; R5 absent. Sclerite L2D (L1) not divided into basal and apical parts (Fig. 57), widened cranially; "apical sclerite" absent, membranous lobe surrounding caudal part of L2D without bristles or sclerites (Figs 43, 57). Sclerite L3 (L2d) with distinct basal subsclerite (Fig. 45, *b.L3*), "folded structure" weak (Figs 44-45, *f.s.*), with "membranous outgrowth" opposite to hook (Figs 44-45, *m.o.*); apex of L3 with attenuated apex; "apical crest" and groove *hge* absent. Sclerite L4U (L3d) distinct, triangular in shape (Fig. 57).

Redescription of female: Body ovoid and convex; completely apterous. Head transverse, eyes and ocellar spots smaller compared to male (Fig. 46); distance between eyes 1.8 times eye length; distance between antennal sockets 2.3 times of the scape length (1.5 mm); maxillary palps in the studied specimen broken off. Abdominal tergites without row of orifices along furrow at anterior margin (Fig. 47). Anal plate (tergite X) transverse, caudal margin widely rounded (Fig. 48). Cerci strongly shortend, one-segmented, traces of segmentation visible only on ventral side (Fig. 48). Genital plate caudally projected (Fig. 49).

The structures of the female genitalia of the specimen studied are lost because they were eviscerated before being mounted.

Redescription of larva: Similar to female, but smaller in size and head more globular. Fore tibiae not thickened distally.

Measurements (in mm): Head length: male 4.7, female 6.5; head width: male 4.7, female 7.2; pronotum length: male 6.2, female 9.3; pronotum width: male 11.2, female 16.5; tegmen length: male 23.3; tegmen width: male 8.6.

Litopeltis Hebard, 1920

Type species: *Calolampra bispinosa* Saussure, 1893, by monotypy.

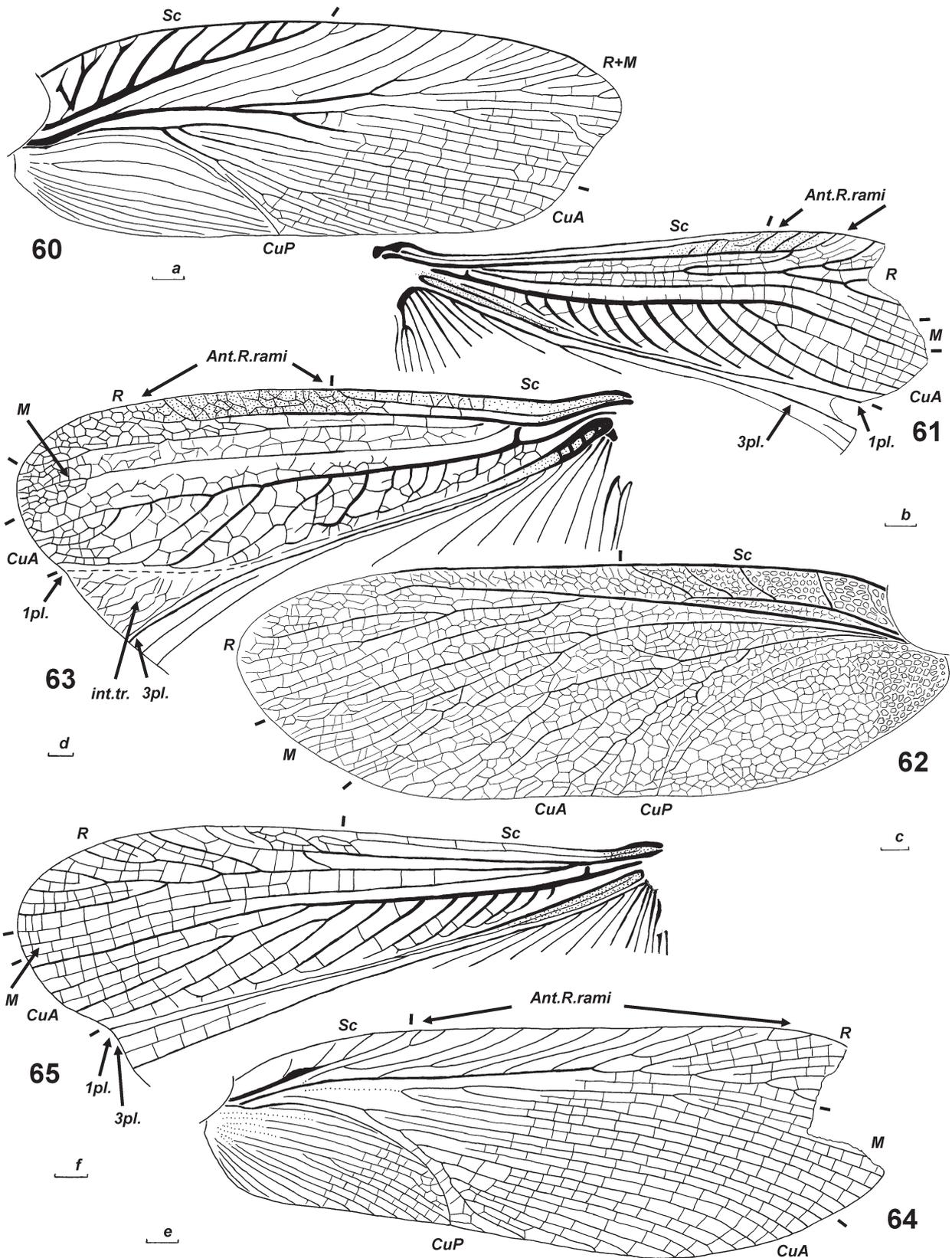
Remarks: The genus *Litopeltis* was recently discussed by Oliveira & Lopes (2014). *Litopeltis biolleyi* (Saussure, 1895) was described in the genus *Calolampra* Saussure, 1893 and transferred to *Litopeltis* by J.A.G. Rehn (1928).

Litopeltis biolleyi (Saussure, 1895)

Figs 58-59, 64-65, 66-90

Material examined: MHNG; ♀; Lectotype of *Calolampra biolleyi*, designated herewith; "San José. Amer. cent. 111r ["111r" - illegible inscription - L.A.] H. de Saussure", "Musee San José No 3.", "Calolampa Biolleyi Sss ♀", genital complex in prep. 150714/04. - MHNG; 1 ♂, "620 Costa-Rica 76 Amer. cent.", "126. Lallisca 1100 n G. Biolley [? - illegible inscription in pencil - L.A.]" "Calolampa Biolleyi Sss ♂", genital complex in prep. 150714/03.

Redescription of male: General colour yellowish, partly brown (Figs 58-59); facial part of head with large dark brown macula (Fig. 59); eyes black; lateral sides of epicranium, 2 proximal segments of antennae and mouthparts yellowish; rest parts of antennae and maxillary palps brownish; pronotum with large central brown spot and yellowish lateral parts (Fig. 58); tegmina brown in basal part, rest part light yellowish



Figs 60-65. *Apsidopsis cyclops* Saussure, 1895 (60-61), *Aptera cingulata* (Burmeister, 1838) (62-63), and *Litopeltis biolleyi* (Saussure, 1895) (64-65). (60, 62, 64) Tegmen from above. (61, 63, 65) Wing from above. Dotted areas show sclerotized parts. Abbreviations: 1pl., 3pl., Ant.R.Rami, CuA, CuP, int.tr., R, M, R+M, Sc - see chapter "abbreviation used in figures", for details see text. Scale bars 1 mm: a = 60, b = 61, c = 62, d = 63, e = 64, f = 65.

(Fig. 58); legs yellowish with brown maculae; abdomen dirty yellowish, darker from below, bordered with yellow along lateral sides. Surfaces smooth and lustrous, distal parts of antennae (approximately from 9-10th segments) and 5th segment of maxillary palps dull; punctation present on pronotum, proximal parts of tegmina and, very weakly, facial part of head. Head slightly longer than wide (Figs 59, 66); ocellar spots distinct; facial part with very weak impressions between eyes and above clypeus; distance between eyes 0.5 times eye length; distance between antennal sockets 1.9 times the scape length (0.8 mm); approximate length ratio of 3rd-5th segments of maxillary palps 1.2 : 1.0 : 1.6. Pronotum as in Figs 58 and 67. Tegmina and wings completely developed, surpassing abdominal apex. Tegmina mostly membranous, only proximal part slightly sclerotized (Fig. 64); venation distinct; costal field short and narrow; *Sc* thickened (well visible on ventral side of tegmen); *R* with numerous anterior rami (Fig. 64, *Ant.R.rami*); *M* and *CuA* branches pectinate; *CuP* distinct. Wings membranous (Fig. 65); intercalated triangle absent; *Sc* simple; *RA* long, with anterior veins (Fig. 65); *RS* indistinct; *M* long and simple; *CuA* pectinate with 4 complete (reaching to wing margin) veins; behind *CuA* situated 2 long and simple veins probably corresponding to 1st and 3rd plical veins respectively (Fig. 65, *1pl.*, *3pl.*); these veins fused and incrassated basally; anal fan consisting of 13 veins reaching margin of wing; 2 possibly jugal veins situated behind anal fan. Fore tibiae very weakly thickened distally. Anterior margin of fore femora armed according to the type C (*sensu* Bey-Bienko, 1950; Roth, 2003), with single apical spine. Tibial spines well developed. Structure of hind tarsi (Figs 68-69): metatarsus about as long as other segments combined, with euplantula small and apical; euplantulae of 2nd-4th segments distinct; metatarsus with 2 more or less equal rows of spines along lower margin; "additional spines" bordering euplantulae from inside and outside present; claws symmetrical, simple; arolium distinct, but shorter than half of claw length. Metatarsal euplantulae of mid tarsi larger, as compared with those of hind legs, but shorter than one half of metatarsus length. Abdomen without visible glandular specializations (Fig. 70). Anal plate (tergite X) nearly rectangular and long; with weak median incision on caudal margin (Fig. 70). Cerci short, but segments distinct (Fig. 70). Paraprocts of blabrid-type (Fig. 71). Hypandrium asymmetrical; styli short, equal in size and cylindrical (Fig. 72).

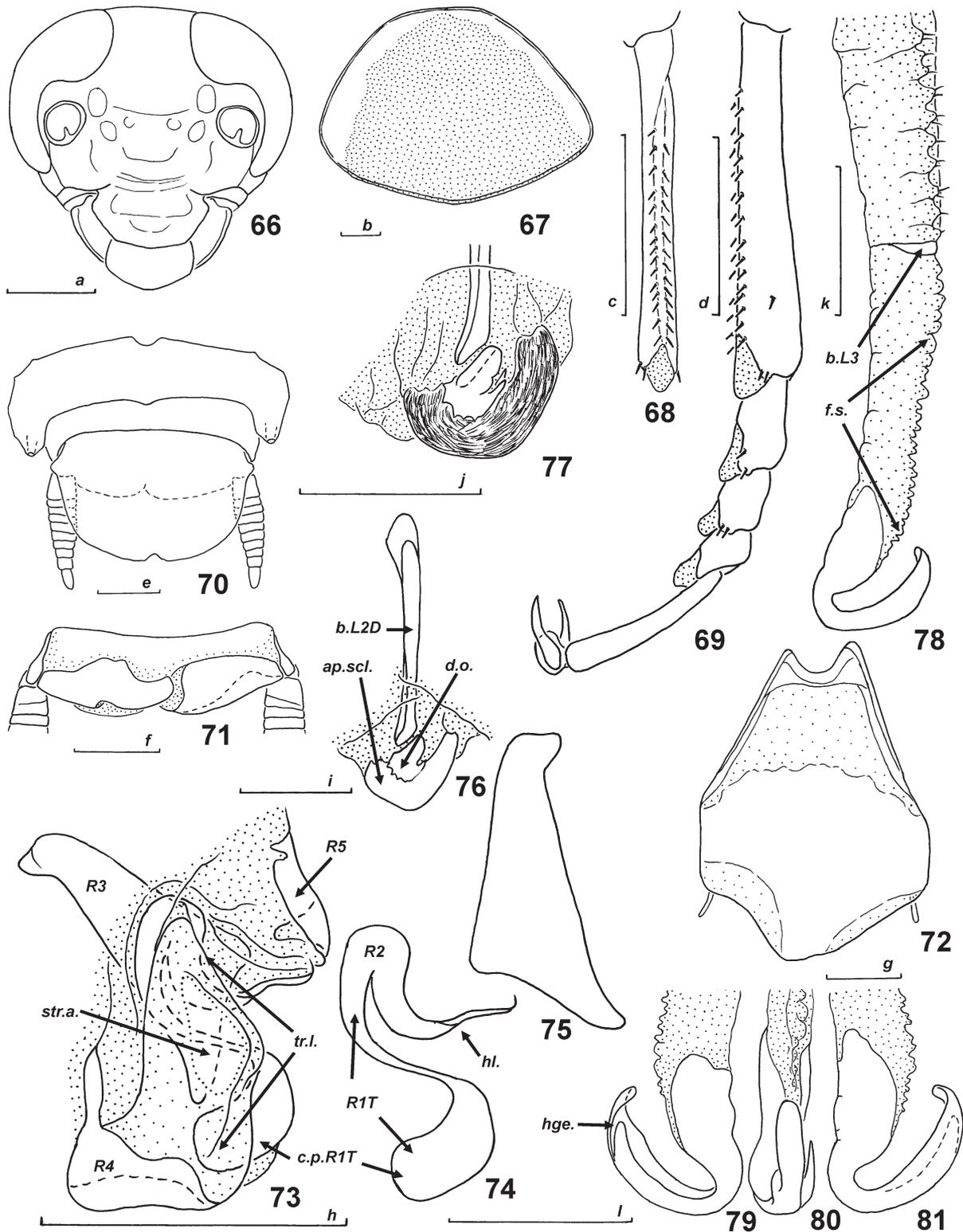
Genitalia (Figs 73-81): Right phallomere (R+N): sclerite R1T well sclerotized and curved, with caudal part short and robust (Figs 73-74, *c.p.R1T*), bristles absent; R1T and partly R2 covered with "upper triangular lobe" (Fig. 73, *tr.l.*), with area of fine striations in centre of "upper triangular lobe" (Fig. 73, *str.a.*); R2 curved, with weak hollow (Fig. 73-74, *hl.*); R3 triangular (Fig. 75); R4 large, displaced to caudal part of phallomere; R5 small,

tray-like. Sclerite L2D (L1) divided into basal and apical parts; basal part rod-like, weakly widened cranially (Fig. 76, *b.L2D*); apical part densely covered with recumbent bristles (Fig. 76-77, *ap. scl.*); "dorsal outgrowth" flat (Fig. 76-77, *d.o.*). Sclerite L3 (L2d) with distinct basal subsclerite (Fig. 78, *b.L3*), "folded structure" distinct, with bristles (Fig. 78, *f.s.*); apex of L3 with attenuated apex; "apical crest" absent, groove *hge* present (Figs 79-81, *hge.*). Sclerite L4U (L3d) present, weakly sclerotized.

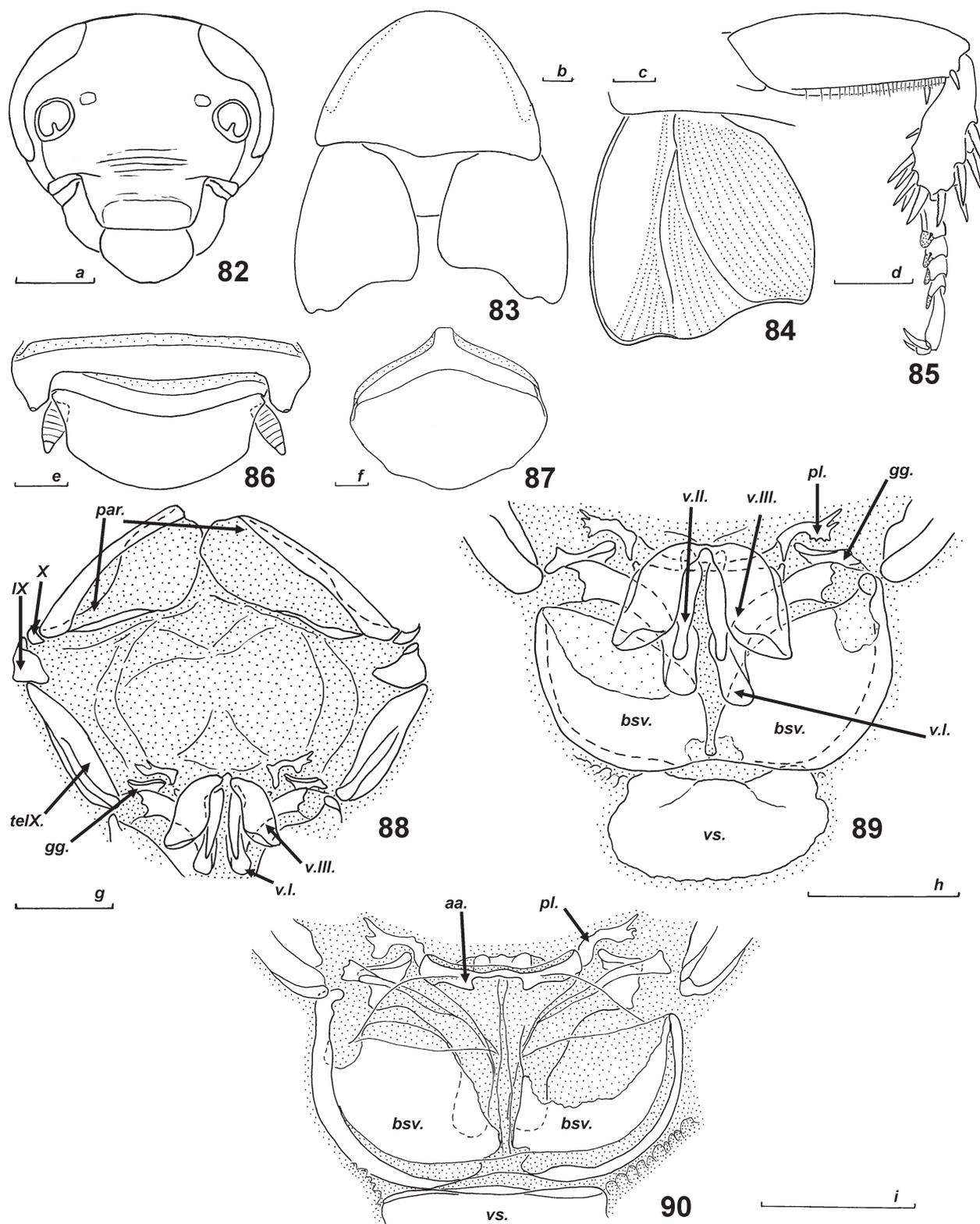
Redescription of female (lectotype): Brachypterous (Fig. 83), body convex, surfaces of abdomen strongly sclerotized. General colour darker than male, reddish-brown; pronotum with pair of yellow spots on anterolateral margin (Fig. 83); legs lighter, yellowish. Head with eyes and ocellar spots smaller (Fig. 82) as compared with male; distance between eyes 0.8 times eye length; distance between antennal sockets 2.4 times the scape length (0.8 mm); approximate length ratio of 3rd-5th segments of maxillary palps 1.0 : 1.0 : 0.9. Pronotum campaniform, as in Fig. 83. Tegmina strongly abbreviated, as in Figs 83-84; venation obsolete, only *R* and *CuP* distinct, *Sc* thickened (visible on ventral side of tegmen). Wings vestigial. Anterior margin of fore femora armed according to the type C, with single apical spine (Fig. 85). Fore tibiae thickened distally (Fig. 85). Tibial spines well developed. Tarsal structures similar to those of male. Abdomen without visible glandular specializations (Fig. 86). Anal plate (tergite X) transverse, with caudal margin widely rounded (Fig. 86). Cerci shorter, as compared with those of male, with segments solidly connected (Fig. 86). Paraprocts medially membranous (Fig. 88, *par.*). Genital plate as in Fig. 87.

Ovipositor and adjacent structures (Figs 88-90): Intercalary sclerite absent; tergal processes of abdominal segment VIII reduced; tergal processes of abdominal segment IX completely developed (Fig. 88, *teIX.*). Gonangulum distinct, well sclerotized (Figs 88-89, *gg.*). First valves of ovipositor large and membranous at apex (Figs 88-89, *v.I.*), with setae (not shown in Figs 88-89) along inner side. Base of 2nd and 3rd pairs of valves as in Fig. 90, sclerotized lobes of complicated shape (Figs 89-90, *pl.*). Anterior arch of second valvifer as in Fig. 90, *a.a.* 2nd valves of ovipositor small (Fig. 89, *v.II.*). 3rd valves of ovipositor (gonoplacs) wide, partly membranous (Figs 88-89, *v.III.*). Basivalvulae in shape of asymmetrical widely rounded sclerotized plates with reflexed outer margin (Figs 89-90, *bsv.*). Vestibular sclerite plate-like, strongly sclerotized (Figs 89-90, *vs.*). Brood sac well developed.

Measurements (in mm): Head length: male 3.1, female 3.6; head width: male 3.0, female 3.2; pronotum length: male 4.8, female 5.2; pronotum width: male 7.0, female 7.2; tegmen length: male <20.0 (apices are broken off), female 5.2; tegmen width: male 5.5, female 5.5.



Figs 66-81. *Litopeltis biolleyi* (Saussure, 1895), male. (66) Facial part of head. (67) Pronotum, dorsal view. (68) Right hind metatarsus, ventral view. (69) Left hind tarsus, dorsal view. (70) Abdominal apex, dorsal view. (71) Paraprocts, ventral view. (72) Hypandrium, ventral view. (73) Right phallomere, dorsal view. (74) Sclerites R1T and R2, dorsal view. (75) Sclerite R3, ventral view. (76) Sclerite L2D, dorsal view. (77) Caudal part of sclerite L2D, dorsal view. (78) Sclerite L3. (79-81) Apical part of sclerite L3. Dotted areas show dark colour (67) or membranous parts (68-69, 71-73, 76-81). Abbreviations: *ap.scl.*, *b.L2D*, *b.L3*, *c.p.R1T*, *d.o.*, *f.s.*, *hge.*, *hl.*, *R2*, *R3*, *R4*, *R5*, *str.a.*, *tr.l.* - see chapter "abbreviation used in figures", for details see text. Scale bars 1 mm: a = 66, b = 67, c = 68, d = 69, e = 70, f = 71, g = 72, h = 73-75, i = 76, j = 77, l = 79-81.



Figs 82-90. *Litopeltis biolleyi* (Saussure, 1895), female. (82) Facial part of head. (83) Anterior part of body, dorsal view. (84) Left tegmen, dorsal view. (85) Left fore leg, anterior view. (86) Abdominal apex, dorsal view. (87) Genital plate, ventral view. (88) Paraprocts and structures of ovipositor, ventral view. (89) Ovipositor and adjacent structures, ventral view. (90) Basal part of ovipositor, view from within. Dotted lines show yellow maculae (83) or obsolete venation (84). Dotted area shows membranous parts. Abbreviations: *IX*, *X*, *aa.*, *bsv.*, *gg.*, *par.*, *pl.*, *telX.*, *vI.*, *vII.*, *vIII.*, *vs.* - see chapter "abbreviation used in figures", for details see text. Scale bars 1 mm: a = 82, b = 83, c = 84, d = 85, e = 86, f = 87, g = 88, h = 89, i = 90.

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REFERENCES

- Anisyutkin L.N. 1999. Cockroaches of the subfamily Epilamprinae (Dictyoptera, Blaberidae) from the Indochina Peninsula. *Entomological Review* 79(4): 434-454.
- Anisyutkin L.N. 2006. Notes on the genus *Calolamprodes* Bey-Bienko, with descriptions of four new species (Dictyoptera: Blaberidae: Epilamprinae). *Cockroach Studies* 1: 3-14.
- Anisyutkin L.N. 2014a. New and little known Blattidae (Dictyoptera) from the collection of the Muséum d'histoire naturelle de Genève. *Revue suisse de Zoologie* 121(1): 33-50.
- Anisyutkin L.N. 2014b. On cockroaches of the subfamily Epilamprinae (Dictyoptera: Blaberidae) from South India and Sri Lanka, with descriptions of new taxa. *Zootaxa* 3847(3): 301-332.
- Anisyutkin L.N., Anichkin A.E., Nguyen V.T. 2013. *Macrostylopyga* gen. nov., a new genus of cockroaches (Dictyoptera: Blattidae), with description of two new species. *Zootaxa* 3635(5): 520-532.
- Beccaloni G.W. 2015. Blattodea species file online. Version 1.2/4.0. Available online at <http://Blattodea.SpeciesFile.org> (accessed 31 July 2014).
- Bell W. J., Roth L.M., Nalepa, C.A. 2007. Cockroaches, Ecology, Behaviour, and Natural History. *The John Hopkins University Press, Baltimore*, 230 pp.
- Bey-Bienko G.Y. 1950. Cockroach insects. Fauna USSR, New Series, 40. *Nauka, Moscow and Leningrad*, 343 pp.
- Bey-Bienko G.Y. 1969. New genera and species of cockroaches (Blattoptera) from tropical and subtropical Asia. *Entomologicheskoe Obozrenie* 48(4): 831-862.
- Bruijning C.F.A. 1948. Studies on Malayan Blattidae. *Zoologische Mededeelingen* 29: 1-174.
- Brunner von Wattenwyl C. 1865. Nouveau système des Blattaires. *Charles Überreuter, Wien*, 426 pp.
- Burmeister H. 1838. Handbuch der Entomologie. Band. 2, Abteilung 2. *Berlin*, 397-1050.
- Grandcolas P. 1996. The phylogeny of cockroach families: a cladistic appraisal of morpho-anatomical data. *Canadian Journal of Zoology* 74(3): 508-527.
- Hanitsch R. 1915. Malayan Blattidae. Part I. *Journal Straits Branch Royal Asiatic Society* 69: 17-178.
- Hanitsch R. 1923. Malayan Blattidae. Part II. *Journal Straits Branch Royal Asiatic Society* 1: 393-474.
- Hebard M. 1920. The Blattidae of Panama. *Memoirs of the American Entomological Society* 1919 4: 1-148.
- Klass K.-D. 1997. The external male genitalia and the phylogeny of Blattaria and Mantodea. *Bonner Zoologische Monographien* 42: 1-341.
- Klass K.-D. 1998. The ovipositor of Dictyoptera (Insecta): homology and ground-plan of the main elements. *Zoologischer Anzeiger* 236: 69-101.
- McKittrick F.A. 1964. Evolutionary Studies of Cockroaches. *Cornell University Agricultural Experiment Station Memoir* 389: 1-197.
- Oliveira L.C.S. de, Lopes S.M. 2014. A new species of *Litopeltis* Hebard, 1920 from Rio de Janeiro, Brazil (Blattodea, Blaberidae, Epilamprinae) with a key to males and geographical distribution of the remaining species of the genus. *ZooKeys* 420: 41-49.
- Princis K. 1958. Revision der Walkerschen und Kirbyschen Blattarietypen im British Museum of Natural History, London. II. *Opuscula entomologica* 23(1-2): 59-75.
- Princis K. 1963. Blattariae. Revision der südafrikanischen Blattarienfaua (pp. 9-318). In: Hanström P., Brinck P., Rudebeck G. (eds). South African Animal life. *Results of the Lund University Expedition in 1950-1951* 9: 1-318.
- Rehn J.A.G. 1928. New or little known Neotropical Blattidae (Orthoptera) (Number one). *Transactions of the American Entomological Society* 54(2): 125-194.
- Rehn J.W.H. 1951. Classification of the Blattaria as Indicated by Their Wings (Orthoptera). *Memoirs of the American Entomological Society* 14: 1-134.
- Roth L. M. 2003. Systematics and phylogeny of cockroaches (Dictyoptera: Blattaria). *Oriental Insects* 37: 1-186.
- Saussure H. de 1864. Blattarum novarum species aliquot. *Revue de Zoologie pure et appliquée* 16: 305-326.
- Saussure H. de 1893. De quelques genres de Blattes. *Societas Entomologica* 8: 57-58.
- Saussure H. de 1895. Revision de la tribu des Panesthiens et de celle des Epilampriens (Ortoptères de la Famille des Blattides). *Revue suisse de Zoologie et Annales du Musée d'Histoire Naturelle de Genève* 3: 299-364.
- Saussure H. de, Zehntner L. 1895. Revision de la tribu des Périssphaeriens (Insectes Ortoptères de la Famille des Blattides). *Revue suisse de Zoologie* 3: 1-59.
- Shelford R. 1907. On some new species of Blattidae in the Oxford and Paris Museum. *Annals and Magazine of Natural History* 19: 25-49.
- Shelford R. 1910. Orthoptera. Fam. Blattidae. Subfam. Epilamprinae. *Genera Insectorum* 101: 1-21.
- Stål C. 1871. Orthoptera quaedam africana. *Öfversigt af Kongliga Vetenskaps-Akademiens förhandlingar* 3: 375-401.
- Thunberg C.P. 1784. Dissertatio entomologica novae insectorum species sistens. Part. 4. *Upsaliae*, 1-130.
- Walker F. 1868. Catalogue of the specimens of Blattariae in the collection of the British Museum. *London*, 239 pp.