

RESEARCH PAPER

New Oriental and Australasian taxa of Colobathristidae (Hemiptera: Heteroptera) in the collection of the State Natural History Museum Stuttgart

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Abstract. The Colobathristidae are a poorly studied family of Lygaeoidea distributed in the tropics and subtropics of Australasian, Neotropical, and Oriental biogeographic regions. *Phaenacantha* Horváth, 1904 is the largest genus of the family, with 33 described species. Here, two new species of *Phaenacantha* are described from Borneo (*P. grimmae* sp. nov. and *P. nigripina* sp. nov.) and one from New Caledonia (*P. paveli* sp. nov.), all of which represent the first record of the genus from these islands. Also, a specimen of genus *Symphylax* Horváth, 1904 from Borneo is described that has strong similarities to *S. handschini* Kormilev, 1953 from the same island, but differs from it in some minor features and is considered a new subspecies, *S. handschini kinabaluensis* subsp. nov.

Key words. Hemiptera, Heteroptera, Colobathristidae, new subspecies, *Phaenacantha*, *Symphylax*, new species, true bugs, Borneo, Indonesia, New Caledonia

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Introduction

Colobathristidae is a relatively small family of pentatomomorphan Heteroptera, with only 96 species (BERGROTH 1910, 1914; BREDDIN 1904; CARVALHO & HENRY 1986; COSCARÓN & DELLAPÉ 2003; GHOURI 1968; HORVÁTH 1904, 1908, 1912, 1914, 1916, 1922; HSIAO et al. 1977; KIRKALDY 1907; KORMILEV 1949a,b, 1951, 1953; ŠTYS 1966a, 1974, 1977a, ; ŠTYS & EXNEROVÁ 2013; ŠTYS & HENRY 2015; DELLAPÉ & HENRY 2019). These herbivore insects are slender middle-sized bugs with thin extremities, somewhat resembling Hymenoptera. They inhabit tropics and subtropics of the Australasian, Neotropical, Oriental and southeastern Palearctic Regions, where some are considered pests of sugarcane, maize, abacá (*Musa textilis* Née) (GHOURI 1968) and other monocotyledons (SWEET 2000). Most colobathristid genera are monotypic or include only a few species, but the Oriental-Australasian *Phaenacantha* Horváth, 1904, with 33 species, is the largest genus in the family. Despite their

economic relevance and existence of excellent keys for the genera in the Western (ŠTYS & HENRY 2015, HENRY et al. 2015) and Eastern Hemispheres (ŠTYS & EXNEROVÁ 2013), the biology of the species is poorly known. The last comprehensive review by HORVÁTH (1904) was in Latin, and without any genital or habitus illustrations. Even the latest species was described based on the single specimen collected a hundred years ago (ŠTYS & HENRY 2015); ŠTYS & HENRY (2015) also mention that fresh material of Colobathristidae is rare in European collections.

Thus the finding of recent (collected in 1990s to 2000s) specimens of *Phaenacantha* and one *Symphylax* Horváth, 1904 in the collection of the State Museum of Natural History Stuttgart is of interest. Most of the specimens were collected incidentally (W. Schawaller, pers. comm.) in Borneo (Sabah) by the staff of State Museum of Natural History Stuttgart, Wolfgang Schawaller and Dorothee Grimm, as was one in New Caledonia by Mauro Daccordi, judging by the fact that it is a single



specimen and the collector is a coleopterist. Species of *Phaenacantha* were not known from either Borneo or New Caledonia (although the genus is present on most of the neighbouring islands). Careful study of the available literature and type specimens revealed that this latest material represents three new species, which are described in the present article.

Material and methods

Measurements were taken using a Leica microscope with an eyepiece micrometer. Some specimens were remounted to make certain morphological features better visible; the specimens were relaxed and removed from the glue using a commercially available window cleaning agent. The genital segments were relaxed and softened in 10% solution of KOH overnight. The specimen of *P. paveli* with excessive amounts of glue, was soaked for several hours in acetone and then in 100% ethanol; this treatment was unsuccessful, but a subsequent bath in window cleaning agent removed the specimen from its card. It was then soaked for 3 hours in warm 0.5% solution of sodium triphosphate to restore the abdomen that was seriously deflated (after the method described in HANSON PRITCHARD & KRUSE 1983).

Digital photographs of whole specimens or their larger body parts were prepared on Leica Microscope DMC 5400 using the focus-stacking software LAS X and assembled with Helicon Focus 6.7.1. Photos of genitalia were taken with Keyence microphotography system VHX-5000; to hold the fine parts in place, the approach of SU (2016) using alcohol-based hand sanitizer was applied. The parameres were photographed as close to the natural position in lateral or median view *in situ* as possible. All photos were enhanced using Adobe Photoshop CS5.1.

The pronotum of Colobathristidae is considered tripartite, following ŠTYS & EXNEROVÁ (2013) and ŠTYS & HENRY (2015); consisting of anterior collar, middle lobe and posterior lobe. The declination angle of the scutellar spine is measured in relation to the meso- and metanotum, not to the body axis, since this can vary depending on factors as e.g. mounting condition. Homologization of veins is made for *Phaenacantha* after ŠTYS (1966b) and for *Symphylax* after ŠTYS & EXNEROVÁ (2013). Terminology of metathoracic glands and accompanying structures follows KMENT & VILÍMOVÁ (2010).

The following acronyms of the collections mentioned in the text are:

MMBC	Moravian Museum, Brno, Czech Republic;
SDEI	Senckenberg German Entomological Institute Müncheberg, Germany;
SMNS	Staatliches Museum für Naturkunde Stuttgart, Germany;
USNM	National Museum of Natural History, Smithsonian Institution, Washington, USA;
ZMHB	Museum of Natural History Berlin, Germany.

Where label texts are reproduced, a single slash (/) means a new line and a double slash (//) a new card; notes by the present author are given in square brackets.

Results

Phaenacantha grimmae sp. nov.

(Figs 1–11, 35–36, 41–42, 47)

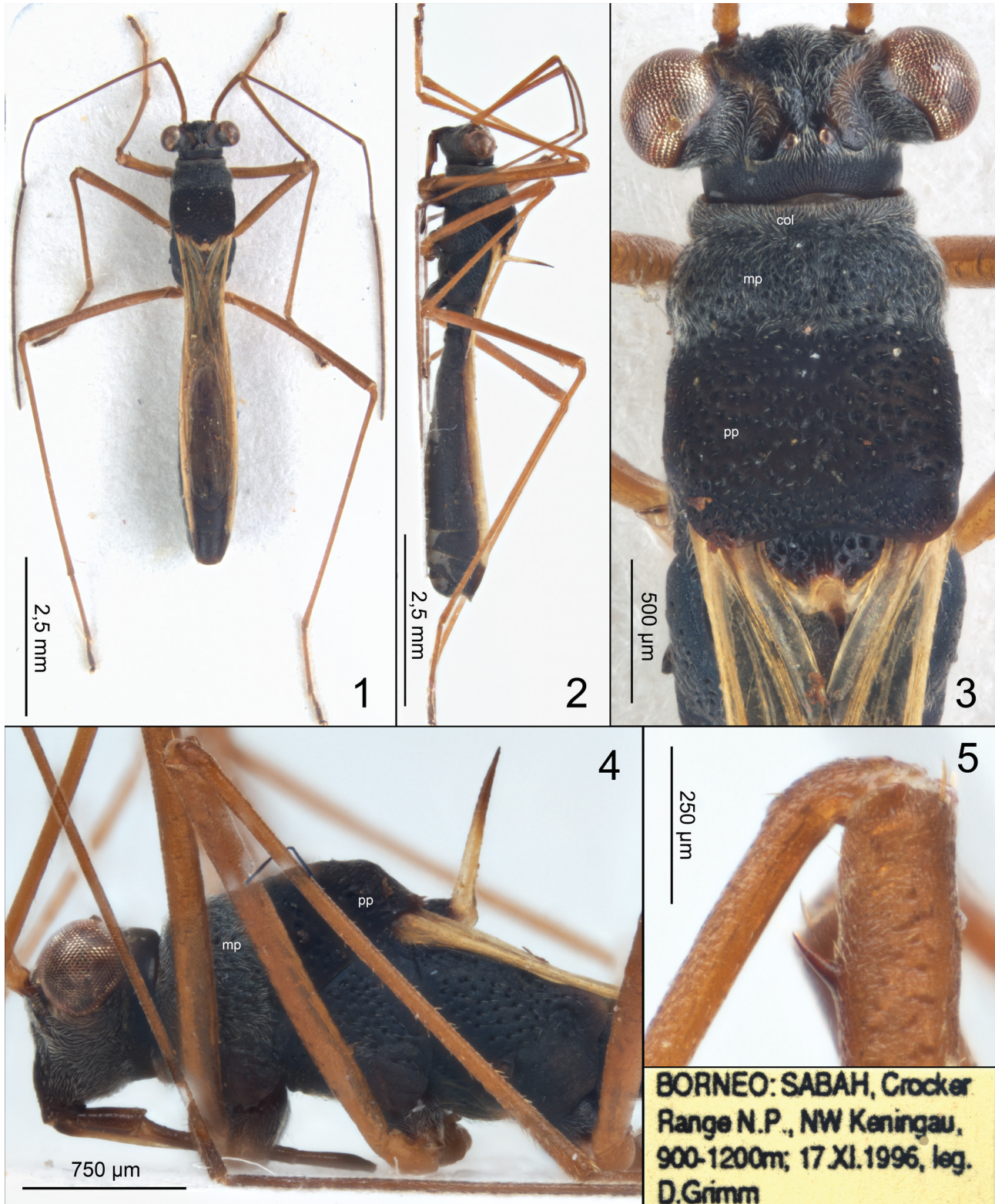
Type material. HOLOTYPE: ♂ (SMNS), collection number SMNS_HET_00005: “BORNEO: SABAH Crocker / Range N.P., NW Keningau, / 900–1200 m., 18.XI.1996, leg. / D. Grimm [printed in black ink on a yellow paper label]”; specimen mounted on a card, pygophore with genitalia (left paramere separated) dissected and stored in a plastic vial with glycerol attached to the same pin. PARATYPES: 2 ♂♂ (SMNS) (Figs 1–5), collection numbers SMNS_HET_00006 and SMNS_HET_00007: same collection information (except collection date, 17.XI.1996) and mounting as the holotype, pygophore and genitalia intact; 3 ♂♂ and 3 ♀♀ (Figs 6–11, 47) (1 ♂ 2 ♀♀ MMBC, 2 ♂♂ 1 ♀ USNM): “MALAYSIA, Sabah; Borneo / bog nr. km 56, Keningau / Hwy., montane forest / CL 2037 VIII-6-85 / J.T. & D.A. Polhemus [printed in black ink on a white label, s. insert in Fig. 6–11] // loan x gift / J. Polh. 90 [Pavel Štys’ handwriting in black ink on a white label]”; intact specimens mounted on triangles, found among the material left by late Professor Pavel Štys.

Differential diagnosis. Absence of the triangular cell in the wing (a character that occurs within Colobathristidae only in *Phaenacantha* and *Discocentrus* Horváth, 1922) and absence of a spine on the posterior lobe of the pronotum (that only *Discocentrus* possess) characterize the species as belonging to the genus *Phaenacantha*. A singular medial sulcus on the vertex in front of the ocelli places it in the nominotypical subgenus. Within the genus, *P. grimmae* (together with *P. nigrispina* described below) belongs to a small group of species (most of them from New Guinea) with a completely black pronotum (the middle lobe + collar – or anterior lobe, as it was seen by HORVÁTH (1904) – are black in almost all other *Phaenacantha*, whereas the posterior lobe is normally pale brown-yellowish). These are *P. ambigua* Horváth, 1904; *P. biroi* Horváth, 1904; *P. consobrina* Horváth, 1904; *P. distincta* (Distant, 1901); and *P. suturalis* Horváth, 1904. Only for *P. biroi* (the type species of the genus) is there data on the structure of genitalia, provided by GHOURI (1968). *Phaenacantha biroi* clearly differs from *P. grimmae* in the structure of hypandrium and parameres, but also in some somatic characters such as colour of femora (black in *P. biroi*, light brown in *P. grimmae*). Differences in other species named above are in the somatic characters: the head is almost completely black in *P. grimmae* (with only two brown stripes on the vertex each of which start at ocellus and end between the respective antennal tubercle and eye), whereas *P. ambigua*, *P. consobrina*, *P. distincta* and *P. suturalis* have only two dark stripes and in some cases also the bases of the clypeus and the gula are black; the pleura and sterna of the thorax are all dark in *P. grimmae*, whereas in the other species the supracoxal lobes, and peritremes of the metathoracic glands or metepimera are pale. *Phaenacantha grimmae* also differs from *P. distincta*, *P. consobrina* and *P. ambigua* by the dark brown abdomen with a yellowish connexivum (abdomen reddish-testaceous in the other species), the smaller body size (up to 7.5 mm) from *P. distincta*, *P. suturalis* and *P. ambigua* (8–9 mm), the posterior pronotal lobe being only twice as long as the collar + middle lobe (2.5 to 3.0 times as long in *P. ambigua*, *P. consobrina* and *P. suturalis*), the fourth antennomere being longer than the third in *P. grimmae*, and shorter than that in *P. ambigua*,

P. consobrina and *P. suturalis*. *Phaenacantha grimmae* also differs from *P. distincta* and *P. ambigua* by its subvertical scutellar spine (60° oblique in the two species).

Description. Male. Coloration. Head (Fig. 3) overall black, except for two brown or yellowish-brown stripes starting on each side at ocellus and ending between the

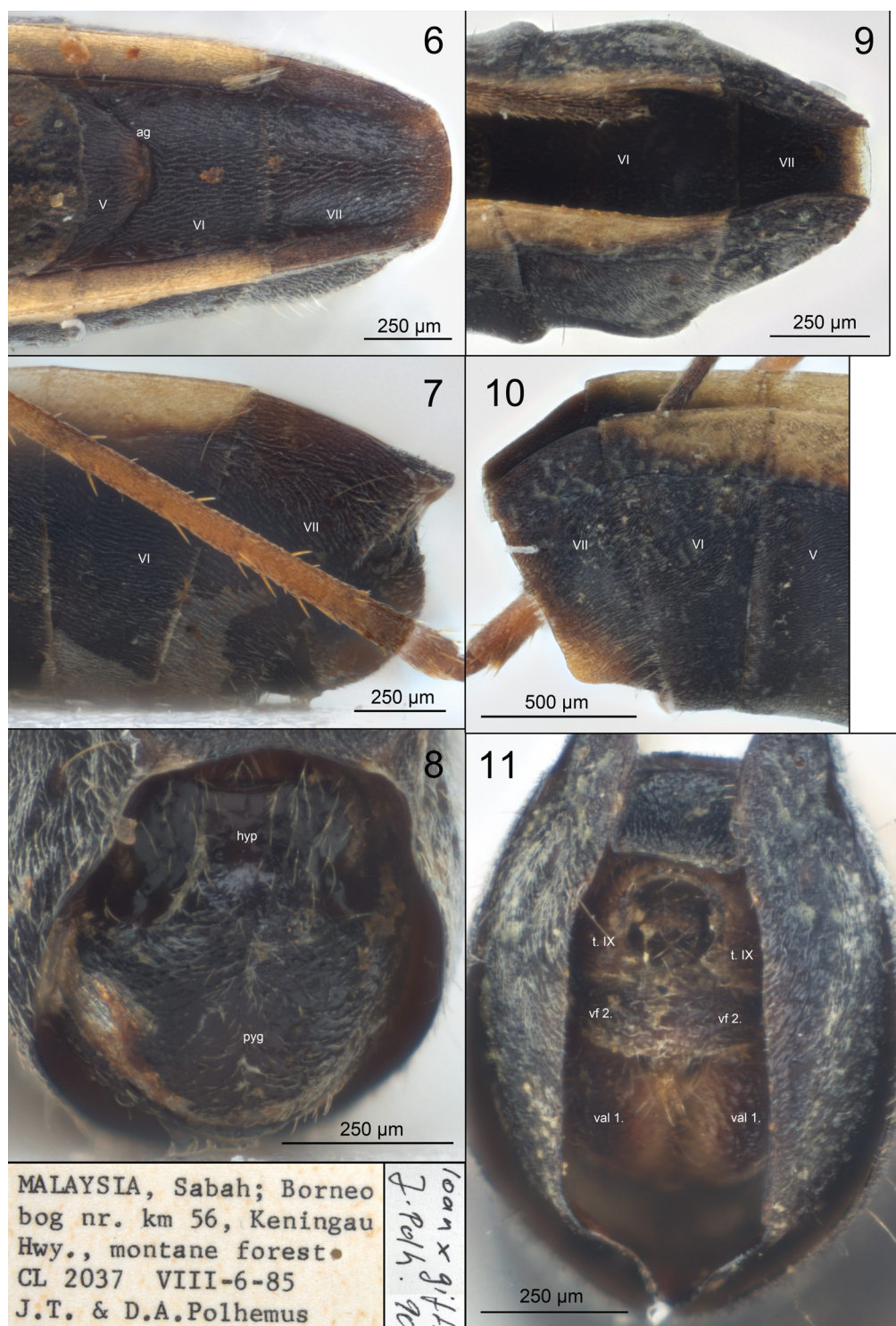
eye and antennal socket (adjacent parts sometimes dark brown instead of black), and very thin brown semicircular region adjacent to the frontomedial margin of the eye; ocelli red, eyes brown; labium dark brown, with tips of segments I to III paler and tip of the terminal segment black; antennae light brown, with the tip of antennomere



Figs 1–5. *Phaenacantha grimmae* sp. nov., paratype. 1 – habitus, dorsal view. 2 – habitus, lateral view. 3 – head and thorax, dorsal view. 4 – head and thorax, lateral view. 5 – right fore femur with the spine. Insert – specimen label. Abbreviations: col = pronotal collar, mp = middle lobe of the pronotum, pp = posterior lobe of the pronotum.

III and antennomere IV slightly darker; coxae (Fig. 4) with dark brown basis and yellowish brown tip, trochanter to tarsus yellowish brown, except for darker terminal tarsomere; posterior pronotal lobe dark brown, rest of the thorax greyish black, except yellowish-brown hind margin of scutellum (Fig. 3) and basal two thirds of scutellar spine (tip brown to black) and brown hind dorsal angle of metepimeron; fore supracoxal lobes (Fig. 4) purplish brown, middle supracoxal lobe purplish brown anteriorly

and greyish-black posteriorly, hind supracoxal lobes and the rest of the pleura and sternites greyish-black; peritreme of metathoracic gland dark brown; fore wings with yellowish-brown veins (veins in clavus, posterior margin of corium and Cu in the membrane somewhat darker) and very faintly yellowish regions between the veins; claval organ brown; hind wings almost completely transparent except the brown divergence point of R and M; abdomen (except connexiva) mostly dark brown, segments I and



Figs 6–11. *Phaenacantha grimmae* sp. nov., paratypes, abdomen with terminalia in situ. 6–8 – paratype male, 9–11 – paratype female. 6, 9 – dorsal view. 7, 10 – lateral view. 8, 11 – caudal view. Abdominal segments are indicated with Roman numbers. Insert – labels of the female paratype. Male paratype illustrated is the same as in Figs 1–5. Abbreviations: ag = dorsoabdominal gland, hyp = hypandrium, pyg = pygophore, t = tergite, val = valvula, vf = valvifer.

II black, tergites III and IV lighter brown and abdominal glands orifices (between segments III/IV, IV/V and V/VI) yellowish; connexiva yellow (Figs 6–7, 9–10) except in segments II and VII concolorous with rest of the segment; pygophore dark brown.

Vestiture and texture. Head (except the two symmetrical depressions posterolaterally of ocelli), pronotal collar and middle lobe as well as the propleura, prosternum and abdomen covered with short adhering silvery setae (Figs 3–4), relatively sparse on head and dense on the forementioned parts of prothorax (sometimes at least partly obliterated on the middle lobe of the pronotum). Pronotum punctate; punctures on posterior lobe of pronotum larger than on middle lobe and each with a short seta, but regions between punctures glabrous and shiny. Punctuation and vestiture of scutellum similar to that of pronotum. Meso- and metapleura and -sterna as densely punctate as posterior pronotal lobe with little vestiture, but not shiny due to mycoid microsculpture typical for evaporatoria covering thoracic region. Legs (Figs 4–5) with short adhering light-coloured setae easily visible on dark background but merging with it on yellowish tibiae; tibiae also with some slender short spines. Setae on antennae slightly darker and mostly very short. Wing veins with short, sparse, light setae. Pilosity overall on pygophore short (Figs 35–36, 41).

Structure. Head (Figs 3–4) with a median sulcus starting anteriad ocelli and reaching middle of vertex. Sulcus with a slim row of setae anteromedially not reaching posterior end of sulcus. Two other depressions on the head starting in front of ocelli and extending posterolaterad, symmetrical on each side, with hind margin sinuate and building a sharp edge and anterolateral slope being very smooth (Fig. 3). Ridges on the head not pronounced, only a tripartite elevation just behind antennal socket recognizable, median area of vertex convex. Eyes substylate. Angle between gula and clypeus sharp, gula oblique (Fig. 4). Labium almost reaching middle coxae. Antennae thin, longer than body (Figs 1–2), most segments (especially I and IV) slightly to moderately curved. Foremost part of pronotum (Fig. 3) forming a collar, the lowest and the thinnest part of pronotum. Middle lobe with convex lateral outline, broader than collar; posterior lobe with a weakly convex lateral outline, broader than the middle lobe. Middle and posterior lobe in the same plane, separated only by a shallow transverse impression; this plane's degree of ascension not steep. Hind third of posterior pronotal lobe sloped posteriad, building an obtuse angle with the rest of the pronotum. Hind margin of pronotum weakly bisinuate, concolorous with the rest of the pronotum. Scutellar spine subequal in length to posterior pronotal lobe (Fig. 4), slightly inclined anteriad (the angle to the plane of meso- and metanotum 90–100°), slightly curved posteriad. Legs as long as or longer than body, hind legs the longest; femora slightly bent. Fore femora with slightly curved spine subterminally (Fig. 5). Fore tibia thickened on tip, semicircularly incised medially and with a comb of setae. Fore and hind wings well developed (all specimens regardless of sex macropterous), but much shorter than abdomen (Fig. 6), often not reaching hind margin of tergite V (last abdominal

gland opening thus visible even with wings in repose), but sometimes almost reaching hind margin of tergite VI. Abdomen slimmest around segment II and thickest at segment V. Most abdominal segments clearly separate, only ventral border between segments IV and V indistinct, but dorsal border more distinctive; all segment borders smooth and not elevated. Lateral segment outlines straight or slightly and broadly convex at most (Fig. 1). Hind border of segment VII in lateral outline straight (Figs 7, 10). Segments VIII and IX (pygophore) sunken into segment VII, whereas small part of segment VIII still visible in lateral view (Fig. 7). Pygophore with hypandrium (Figs 35–36, 41) broadly elevated and expanded terminally, not building parandria; posterior margin of hypandrium broadly rounded, not angulate. Paramere (Fig. 42) oblong, of complicated relief, terminating in a process directed posteriad.

Female. Similar to male in coloration, vestiture, sculpture and structure. Differences in abdominal structure, with abdomen broadest at segment IV and not V as in male, maximal abdominal width also being slightly higher in female. Abdominal segment borders all clear, even between sternites IV and V; smooth except those between segments IV–V, V–VI and VI–VII slightly bulging (Fig. 9). Outlines of abdominal segments similar to male except segment IV clearly convex, segment V concave and segment VI bisinuate (all straight in male). Sternite VII broadly incised medially (Fig. 47). Valvula I long and broad, dark brown, but with paler median margins (Fig. 10). Valvula I indistinct in unprepared specimen. Valvifer II long and slim, uniformly brown as tergite IX. Other parts of genital apparatus sunken deep into segment VII, dark coloured and indistinct in intact specimen (Fig. 11).

Measurements. Body length ♂♂ 6.60–7.10 mm, ♀♀ 7.40–7.70 mm; head width (= max. body width) ♂♂ 1.23–1.37 mm, ♀♀ 1.30–1.34 mm. Total antennae length ♂♂ 9.01–10.37 mm (average segment ratios, I to IV: 1.00–1.45–1.72–2.15), ♀♀ 9.42–9.69 mm (average segment ratios, I to IV: 1.00–1.49–1.77–2.02). Ratio antenna : body 1.36–1.47 in ♂♂, 1.26–1.27 in ♀♀. Labium length ♂♂ 1.40–1.60 mm, ♀♀ 1.55–1.63 mm. Distance between ocelli ♂♂ 0.07–0.08 mm, ♀♀ 0.06–0.10 mm, between ocellus and eye ♂♂ 0.26–0.30 mm, ♀♀ 0.29–0.32 mm, ratio in ♂♂ 3.50–4.21, in ♀♀ 2.95–4.92. Length of collar+middle lobe of pronotum ♂♂ 0.50–0.52 mm, ♀♀ 0.48–0.54 mm; length of posterior pronotal lobe ♂♂ 0.77–0.97 mm, ♀♀ 0.90–1.05 mm, ratio of the two measurements 1.54–1.94 in ♂♂ and 1.67–2.10 in ♀♀. Scutellar spine length ♂♂ 0.84–1.08 mm, ♀♀ 0.86–0.96 mm; ratio to length of posterior pronotal lobe 0.92–1.20 in ♂♂ and 0.90–1.07 in ♀♀. Measurements of the hind tarsus (segments I / II / III, respectively): ♂♂ 0.90–1.16 / 0.19–0.24 / 0.27–0.32 mm, ♀♀ 1.04–1.07 / 0.20–0.22 / 0.30–0.33 mm, total length of the hind tarsus ♂♂ 1.39–1.70 mm, ♀♀ 1.57–1.62 mm. Maximum width of abdomen ♂♂ 0.87–0.95 mm, ♀♀ 1.20–1.23 mm, minimum width ♂♂ 0.60–0.65 mm, ♀♀ 0.65–0.71 mm, ratio 1.38–1.57 in ♂♂ and 1.72–1.85 in ♀♀.

Etymology. The species is named after Dorothee Grimm (then SMNS), who first collected it in Borneo.

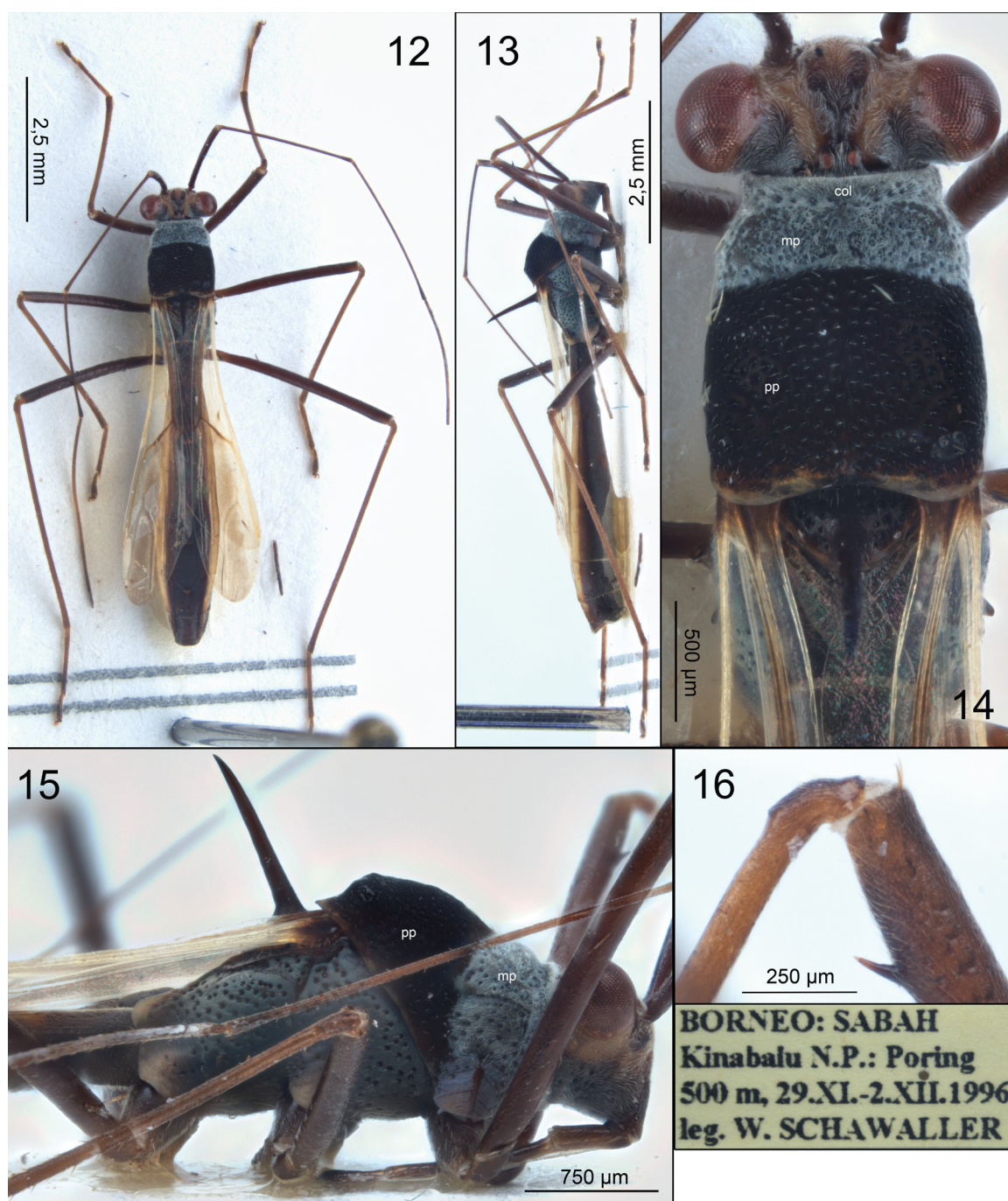
Distribution. Malaysia (Sabah).

***Phaenacantha nigrispina* sp. nov.**

(Figs 12–22, 37–38, 43–44, 48)

Type material. HOLOTYPE: ♂ (SMNS), collection number SMNS_HET_T00002: “BORNEO: SABAH / Kinabalu N. P.: Poring / 500m, 29.XI.-2.XII.1996 / leg. W. SCHAWALLER [printed in black ink on yellow label]”. Specimen glued to a card, pygophore with genitalia (left paramere separated) dissected and stored in a plastic vial with glycerol attached to the same pin. Terminal flagellomere on right antenna broken, the detached part glued to the same card with the specimen. PARATYPES: 1 ♀ (SMNS) (Figs 20–22, 48), collection number SMNS_HET_T00003: same collection data as the holotype. Intact specimen, glued to a triangle. 1 ♂ (SMNS), collection number SMNS_HET_T00004: same collection data as the holotype. Glued to a card; terminal flagellomere absent, left front terminal tarsomere detached and glued to the same card as the specimen; VII abdominal segment slightly damaged (genitalia intact).

Differential diagnosis. Characters demonstrating the affiliation to the nominotypical subgenus of the genus *Phaenacantha* are the same as in the case of *P. grammae*. The completely black scutellar spine is a unique character within the genus and discerns this species from all others. Also as in *P. grammae*, all three parts of pronotum are black, a rare character which immediately separates the two species from many others in the genus, including all described after HORVÁTH (1904) published his key to the genus. According to this key, the only species that seems to be close to *P. nigrispina* is *P. biroi* (they share the dark colouring of all parts of the pronotum and of the femora that, according to HORVÁTH (1904), are black in *P. biroi*



Figs 12–16. *Phaenacantha nigrispina* sp. nov., holotype. 12 – habitus, dorsal view. 13 – habitus, lateral view. 14 – head and thorax, dorsal view. 15 – head and thorax, lateral view. 16 – right fore femur with the spine. Insert – specimen label. Abbreviations: col = pronotal collar, mp = middle lobe of the pronotum, pp = posterior lobe of the pronotum.

but are dark brown in *P. nigrispina*). *Phaenacantha biroi* is easy to discern from *P. nigrispina* by the structure of the genitalia (GHAURI 1968), for example, the paramere with a posteriodorsal process in *P. nigrispina* and without such in *P. biroi*, the much more slender overall design of the paramere in *P. biroi*; parandria much more slender in *P. nigrispina* and directed dorsoanteromedial whereas in *P. biroi* each parandrium is directed laterad. Additional characters include the pronotum less elevated above the head in *P. nigrispina* than in *P. biroi* (compare the Fig. 15 in the present paper with the Fig. 1 from GHAURI 1968); distance between an ocellus and an eye is at least 4 times the distance between ocelli in *P. biroi* and 5–6 in *P. nigrispina* (although, as ŠTYS 1974 indicated in his note on *P. pallida* (Stål, 1870), this character is not very reliable in species with ocelli set very close to each other); third antennal segment twice as long as the first in *P. biroi* and longer than the first, but not so long in *P. nigrispina*; fourth segment is longer than the third in *P. nigrispina* and shorter than the third in *P. biroi* (characters assessed after GHAURI 1968).

The species differs from *P. grimmae* in many genitalic features: male terminalia little more protruding in *P. grimmae* (segment VIII clearly visible in lateral view, Fig. 8) than in *P. nigrispina* (segment VIII hardly visible in lateral view, Fig. 18); pilosity of pygophore long in *P. nigrispina* (Fig. 43) and short in *P. grimmae* (Fig. 41); hypandrium with well-developed parandria directed dorsoanteriad in *P. nigrispina* (Figs 37–38, 43) and without pronounced parandria in *P. grimmae* (Figs 35–36, 41); paramere much more slender in *P. grimmae* (Fig. 42) than in *P. nigrispina* (Fig. 44); posterior process of paramere directed posteriad in *P. grimmae* (Figs 36, 41) and dorsomedioanteriad in *P. nigrispina* (Figs 38, 43); female sternite VII with broad median incision in *P. grimmae* (Fig. 47) and without such an incision in *P. nigrispina* (Fig. 48); valvula I longer and with lighter coloured median margin in *P. grimmae* (Fig. 11), shorter and of uniform dark brown colour in *P. nigrispina* (Fig. 22); valvula II inconspicuous in unprepared specimens in *P. grimmae* (Fig. 11) and clearly visible in *P. nigrispina* (Fig. 22); valvifer II thinner, longer and uniformly brown in *P. grimmae* (Fig. 11) and shorter, broader and with lighter brown-coloured region bordering tergite IX in *P. nigrispina* (Fig. 22). Somatic characters separating the two species include the femora (dark brown in *P. nigrispina* and testaceous in *P. grimmae*, Figs 1 and 12), the posterior lobe of the pronotum (more highly elevated in *P. nigrispina* than in *P. grimmae*, Figs 4 and 15), the hind pronotal margin (completely black or dark brown in *P. grimmae*, and much paler in *P. nigrispina*, Figs 3 and 14); the hind margin of scutellum and the base of the scutellar spine (yellowish in *P. grimmae*, black in *P. nigrispina*, Figs 3 and 14).

Description. Male. Coloration. Head (Fig. 14) largely dark brown to black, except for two broad yellowish-brown stripes starting thin on each side at ocellus and becoming broader anteriorly, reaching anteromedial margin of eye and antennal socket and fusing with the yellowish-brown region at the base and sides of clypeus anteromedially; also parts of genae immediately ventrad and anteriad from eyes yellowish-brown. Ocelli red, eyes

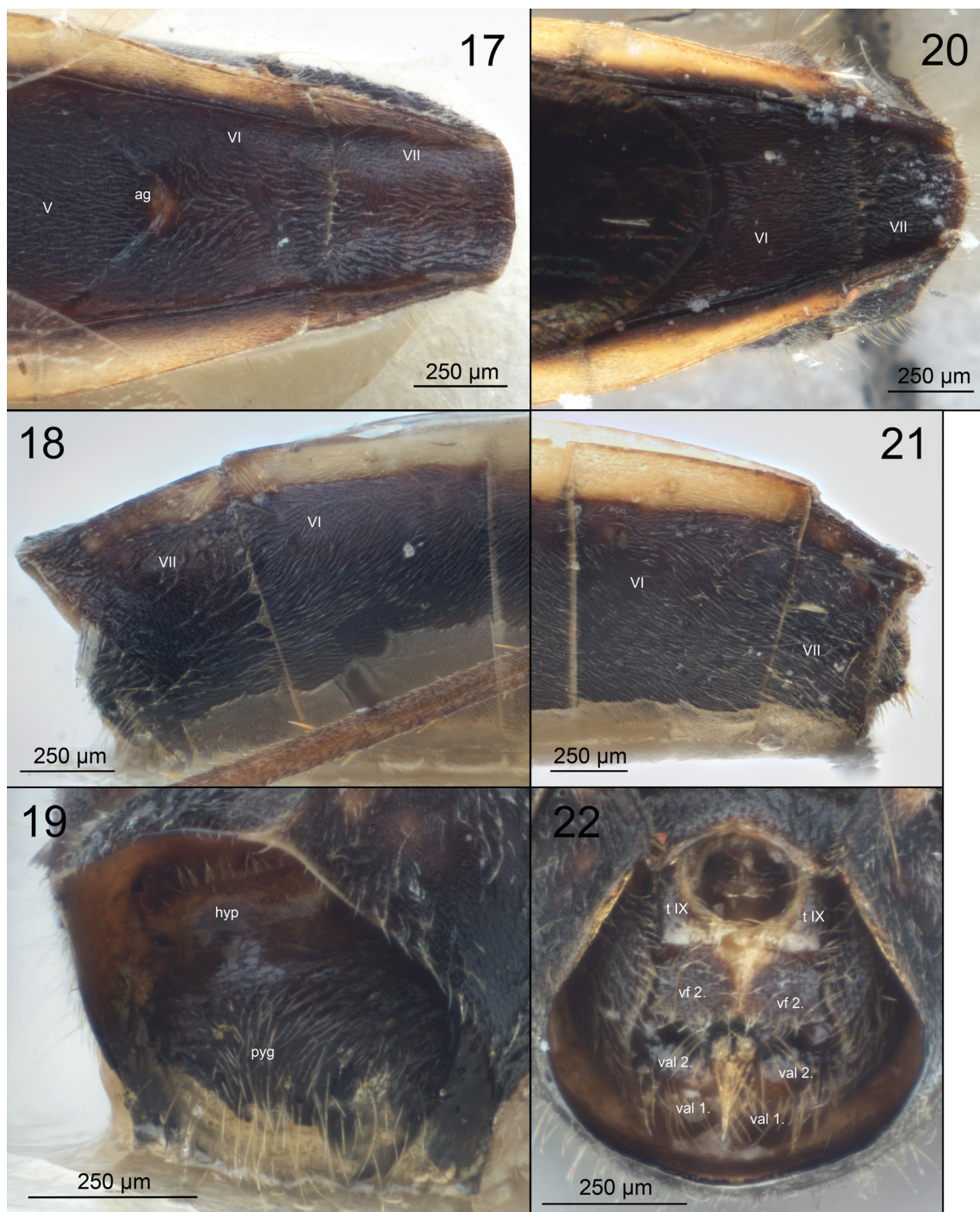
brown; labium brown (Fig. 15), with tips of segments I to III paler and tip of terminal segment black; antennae and legs brown (Figs 12–13), first antennomeres and femora darker than more distal parts; terminal tarsomeres concolorous with more proximal ones; thorax almost completely black to purplish black (including scutellar spine), except hind margin of pronotum (brown to transparently whitish) (Fig. 14), posterior halves of fore and middle supracoxal lobes as well as hind supracoxal lobes and metepimera yellowish brown, peritreme of metathoracic gland dark brown (Fig. 15); fore wings brown at the very base (Fig. 14) with yellowish-brown veins on corium and clavus (somewhat darker on clavus and posterior margin of corium), regions between the veins transparent on corium and clavus and with brownish hue in membrane, and the veins (developed as folds) brown and with the immediate borders whitish; hind wings almost completely transparent except the divergence point of R and M brown and the membrane brownish as in the fore wing; abdominal sternites (Fig. 13) dark brown, tergites dark brown in the middle and reddish-brown on lateral margins (tergites I and II almost black); segments III and IV slightly paler (sternite IV in the female paratype with large yellow spot in the middle) and abdominal gland orifices (between segments III/IV, IV/V and V/VI) paler brown (Fig. 17); connexivum yellow except segments II (concolorous with the rest of the segment) and VII yellowish only anteriorly, but for the most part concolorous with rest of the segment (Figs 17–18, 20–21); pygophore and segment VIII dark brown (Fig. 19).

Vestiture and texture. Head (except two symmetrical depressions posterolaterally of ocelli), pronotal collar and middle lobe as well as propleura and prosternum covered with short silvery setae (Fig. 14), relatively sparse on head and dense on forementioned parts of pronotum. Pronotum punctate; punctures on posterior lobe of pronotum larger than on middle lobe and each with short seta on the bottom, with regions between punctures glabrous and shiny. Punctuation and vestiture of scutellum similar to that. Meso- and metapleura and sterna (Fig. 15) as densely punctate as posterior pronotal lobe, with as little vestiture, but not shiny due to mycoid microsculpture typical of evaporatoria. Other body regions except wings with short adhering light-coloured setae easily visible on dark background but merging with it, e.g., on yellowish connexivum (Figs 17–22). Tibiae also with short slender spines, more numerous distally and almost absent proximally (Fig. 16).

Structure. Head (Figs 14–15) with a median sulcus starting anteriad of the ocelli and reaching middle of vertex. The sulcus with a slim row of setae anteromedially not reaching posterior end of sulcus. Two other symmetrical depressions on each side of head, with the hind margin sinuate and building a sharp edge and with anterolateral slope smooth. Two symmetrical ridges starting at each ocellus, running parallel anteriad on both sides of sulcus, diverging, and almost reaching respective antennal socket where meeting another ridge coming from anteromedial eye margin and ending at

clypeus. Area of vertex bordered by the ridges flat or even slightly concave. Eyes substylate. Angle between gula and clypeus sharp, gula oblique (Fig. 15). Labium reaching middle coxae. Antennae thin, longer than body, most segments (especially I and IV) slightly to moderately curved (Figs 12–13). Collar the lowest and the thinnest part of pronotum (Fig. 14). Middle lobe with convex lateral outline, broader than collar; posterior lobe with a weakly sinuate lateral outline, broader than middle lobe. Middle and posterior lobe not quite in the same plane (posterior lobe convex in dorsal outline,

middle one straight), separated by a shallow transverse impression (Fig. 15); posterior lobe elevated high above the head. Hind third of posterior pronotal lobe sloped posteriad, building an obtuse angle with the rest of the pronotum. Hind margin of pronotum weakly bisinuate. Scutellar spine subequal in length to posterior pronotal lobe, vertical (to the plane of meso- and metanotum), slightly curved posteriad. Legs as long or longer than body, hind legs the longest; femora slightly bent (Figs. 12–13). Fore femora (Fig. 16) with a curved subterminal spine. Fore tibia thickened on tip, semicircularly incised,



Figs 17–22. *Phaenacantha nigrispina* sp. nov., holo- and paratype, abdomen with terminalia in situ. 17–19 – holotype male, 20–22 – paratype female. 17, 20 – dorsal view. 18, 21 – lateral view. 19, 22 – caudal view. Abbreviations: ag = dorsoabdominal gland, hyp = hypandrium, pyg = pygophore, t = tergite, val = valvula, vf = valvifer. Abdominal segments are indicated with Roman numbers.

with a terminal comb of setae. Fore and hind wings well developed (all specimens regardless of sex macropterous), somewhat shorter than abdomen, reaching the middle of tergite VI (last abdominal gland opening not visible with wings in repose) (Figs 17, 20). Abdomen thinnest around segment II and broadest at segment V. No abdominal segments fused, segment borders smooth and not elevated. Lateral segment outlines straight or slightly and broadly convex at most. Hind border of segment VII in lateral outline slightly concave (Figs 18, 21). Segments VIII and IX (pygophore) sunken into segment VII, segment VIII indistinct in lateral view (Fig. 18). Ventral pilosity on pygophore long (Figs 19, 43). Hypandrium broadly elevated and expanded terminally, building short parandria directed dorsoanteriorly (Figs 37–38, 43); posterior margin of hypandrium in lateral view broadly rounded, not angulate. Paramere with an expanded middle part, terminating in a process directed dorsoposteriomedially (Figs 38, 43–44).

Female. Very similar to male in coloration, vestiture, sculpture and structure. Differences in abdominal structure, with abdomen broadest at segment IV and not V as in male, maximal abdominal width also being slightly higher in female. Abdominal segment borders (Fig. 20) smooth except for slight bulging between segments VI–VII. Outlines of abdominal segments similar to male except segment IV and V convex and segment VI concave (all straight in male). Sternite VII without medial incision, ventral side of the segment being ca. as long as the dorsal one (Fig. 48). Valvula I short, dark brown, valvula II well visible, dark brown to black (Fig. 22). Valvifer II short and broad, brown, but the median margins testaceous as neighbouring parts of tergite IX.

Measurements. Body length ♂♂ 7.80–7.90 mm, ♀ 8.50 mm; head width (= max. body width) ♂♂ 1.34–1.38 mm, ♀ 1.50 mm. Total antenna length ♂♂ 9.06–10.20 mm, ♀ 10.54–10.62 mm (average segment ratios for both sexes together, I to IV: 1.00–1.46–1.72–1.98). Ratio antenna : body 1.16–1.29 in ♂♂, 1.24 in ♀. Labium length ♂♂ 1.75–1.86 mm, ♀ 2.13 mm. Distance between ocelli ♂♂ 0.05–0.06 mm, ♀ 0.06 mm, between ocellus and eye ♂♂ 0.30–0.31 mm, ♀ 0.35 mm, ratio in ♂♂ 5.08–6.10, in ♀ 5.75. Length of collar+middle lobe of pronotum ♂♂ 0.46–0.47 mm, ♀ 0.50 mm; length of posterior pronotal lobe ♂♂ 0.94–1.00 mm, ♀ 1.10 mm, ratio of the two measurements in ♂♂ 2.00–2.17 and in ♀ 2.20. Scutellar spine length ♂♂ 0.96–1.04 mm, ♀ 1.12 mm; ratio to length of posterior pronotal lobe in ♂♂ 0.96–1.11 and in ♀ 1.02. Measurements of the hind tarsus (segments I / II / III, respectively): ♂♂ 1.17–1.27 / 0.20 / 0.29–0.30 mm, ♀ 1.22 / 0.21 / 0.30 mm, total length of the hind tarsus ♂♂ 1.66–1.77 mm, ♀ 1.73 mm. Maximum width of abdomen ♂♂ 1.13–1.17 mm, ♀♀ 1.37 mm, minimum width ♂♂ 0.52 mm, ♀♀ 0.60 mm, ratio in ♂♂ 2.17–2.25 and in ♀♀ 2.28.

Etymology. The specific epithet is derived from the Latin *niger* (black) and *spina* (spine), referring to the coloration of the scutellar spine in this species, which is unique among the known *Phaenacantha* species; noun in apposition.

Distribution. Malaysia (Sabah).

Phaenacantha paveli sp. nov.

(Figs 23–34, 39–40, 45–46)

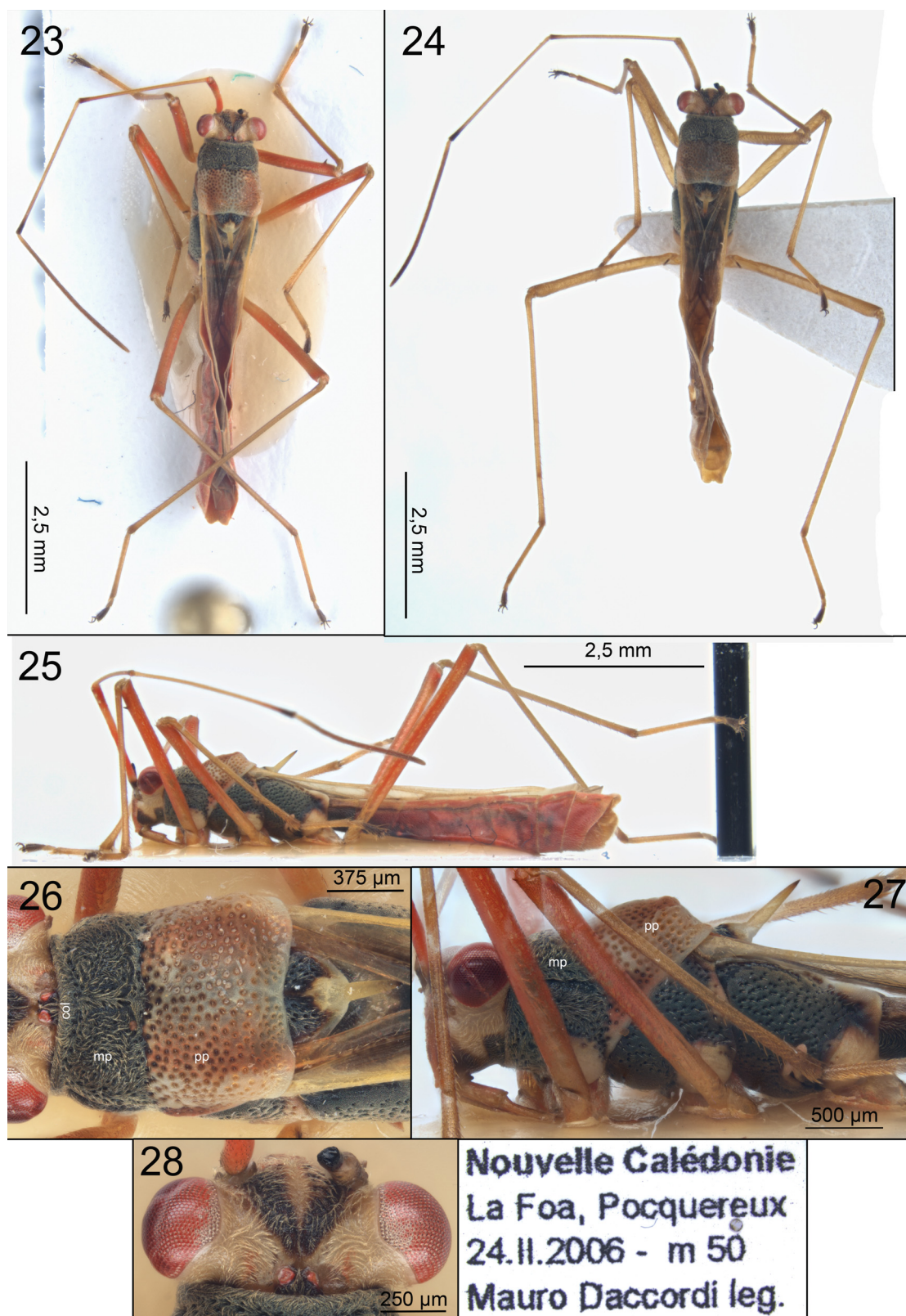
Type material. HOLOTYPE: ♂ (SMNS), collection number SMNS_HET_T00001: “Nouvelle Calédonie / La Foa, Pocquereux / 24.II.2006 – m 50 / Mauro Daccordi leg. [printed in black ink on white card]”. Three terminal segments of the right antenna missing, abdomen strongly deflated and distorted, the wall of the abdomen damaged because of distortion. Initially mounted on a rectangular card, now on a triangle; abdominal segment VIII and pygophore with genitalia (left paramere separated) and the 8th abdominal segment dissected and stored in a plastic vial with glycerol attached to the same pin.

Differential diagnosis. Same characters as for the two aforementioned species demonstrate the affiliation of *P. paveli* to the nominotypical subgenus of the genus *Phaenacantha*. The differences to the known *Phaenacantha* species were estimated using the key from HORVÁTH (1904) and species descriptions therein, as well as subsequent descriptions of *Phaenacantha* species by HORVÁTH (1908, 1914), KIRKALDY (1908) and BERGROTH (1914). The key by HORVÁTH (1904) groups the new species, due to the bicolorous pronotum, subvertical scutellar spine, 4th antennomere longer than the third and body size under 8 mm together with *P. conviva*, *P. mehelyi* and *P. sedula*; *Phaenacantha* species described after HORVÁTH's (1904) key was published are *P. androgyna* Bergroth, 1914, *P. australiae* Kirkaldy, 1907, *P. dignota* Horváth, 1914, *P. marcida* Horváth, 1914, *P. soror* Horváth, 1914 and *P. trilineata* Horváth, 1908. *Phaenacantha australiae* is the only species for which genital structure is described (ŠTYS 1966b), along with many characters relevant for genus or family level but not for comparison with other *Phaenacantha*, such as proportions of the pronotal lobes, relative length of antennal segments etc. Parameres in *P. paveli* and *P. australiae* are not dissimilar, although the anterior lobe is more rectangular in *P. paveli* and the posterior lobe forms a more obtuse angle in it compared to *P. australiae* (cf. the present Fig. 46 with Figs 13 and 14 from ŠTYS 1966b). Especially striking is the difference in the structure of hypandrium which bears two small pointed parandria in *P. australiae* and two paddle-like large parandria in *P. paveli* (Figs 39–40, 45). Diagnostic characters that discern *P. paveli* from other species listed above include: body length just 6.70 mm in *P. paveli* (at least 7.40 mm in *P. mehelyi*, 7.60 mm in *P. sedula*, 10.00 mm in *P. dignota*, 8.25 mm in *P. marcida* and 7.75 in *P. soror* and *P. trilineata*); distance between ocellus and eye ca. 7 times larger than that between ocelli in *P. paveli* (4 to 5 times larger in *P. mehelyi*, *P. sedula*, *P. dignota*, *P. marcida*, *P. soror* and *P. trilineata*); posterior lobe of the pronotum being only 1.35 the length of the middle lobe + collar (twice as long in *P. conviva*, *P. mehelyi*, *P. sedula*, *P. androgyna*, *P. marcida* and *P. soror*); antenna being 1.35 the length of the body in *P. paveli* (1.50 in *P. conviva* and *P. mehelyi*, 2.00 in *P. dignota*, 1.20 in *P. marcida* and shorter than the body in *P. trilineata*); scutellar spine being subvertical in *P. paveli* (oblique at 60° in *P. androgyna* and *P. dignota* and 45° in *P. marcida*, *P. soror* and *P. trilineata*); scutellar spine being ca. 0.73 of the length of the posterior pronotal lobe in *P. paveli* (equal to it or even slightly longer in *P. conviva*, *P. mehelyi*, *P. sedula* and *P. dignota*); three

fuscous longitudinal stripes on the posterior pronotal lobe absent in *P. paveli*, but present in *P. androgyna*, *P. soror* and *P. trilineata*; posterior part of the posterior pronotal lobe building an angle to the rest of the segment in *P. paveli*, but lying in the same plane in *P. conviva*, *P. mehelyi* and *P. soror*; fourth antennomere being clearly longer than the

third in *P. paveli* (subequal to it in *P. conviva* and *P. mehelyi* or shorter than that in *P. dignota*); the head with black longitudinal stripes on the vertex and black gula in *P. paveli* and without any black pattern in *P. conviva*; scutellum is mostly black in *P. paveli* and rufous-testaceous in *P. marcida*.

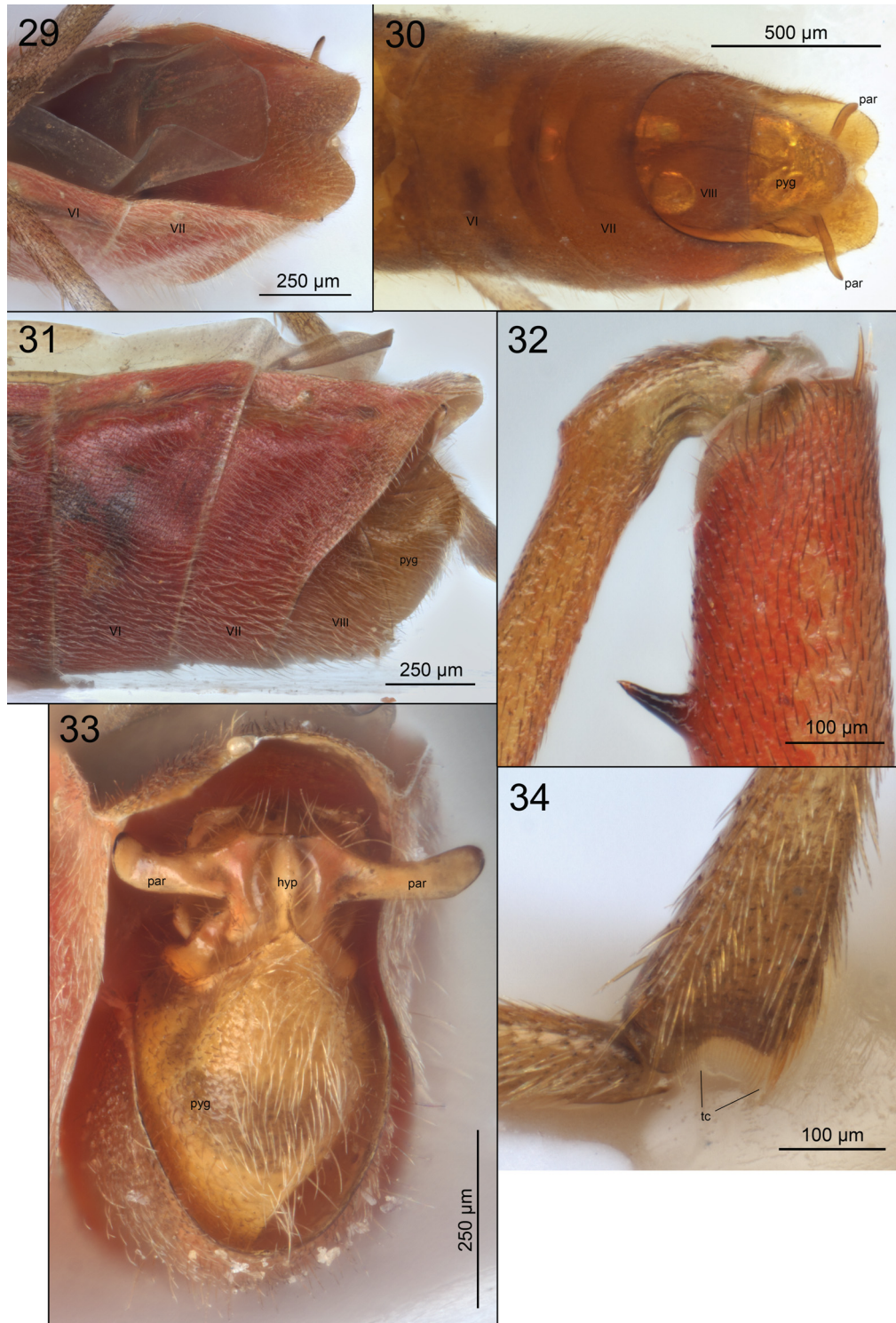
Reddish hue of any body parts, although a striking



Figs 23–28. *Phaenacantha paveli* sp. nov., holotype. 23 – habitus, dorsal view, untreated. 24 – habitus, dorsal view, after treatment with sodium phosphate. 25 – habitus, lateral view, untreated. 26 – thorax, dorsal view, untreated. 27 – head and thorax, lateral view, untreated. 28 – head, dorsal view, untreated. Insert – specimen label. Abbreviations: col = pronotal collar, mp = middle lobe of the pronotum, pp = posterior lobe of the pronotum.

feature of *P. paveli* before treatment with sodium triphosphate, was not used as a diagnostic character, since the colour was not stable and thus could have been present also in *Phaenacantha* individuals from other species and subsequently become lost in the dry specimens. However, this character should be tested on new material, since no other *Phaenacantha* specimens that were surveyed in different collections demonstrated such coloration.

Genital structure separates *P. paveli* well from the Bornean species described above – for instance, the medial concavity of the 7th tergite (Figs 29–30), the male segment VIII protruding even more than in *P. grimmae* (cf. Figs 7 and 31) the large paddle-like parandria (Figs 30, 33, 39–40, 45) or the paramere with a broad dorsal surface (Fig. 46). Somatic characters as e.g. smaller body size, generally lighter coloured body, posterior pronotal lobe



Figs 29–34. *Phaenacantha paveli* sp. nov., holotype, abdomen with terminalia in situ and other details of morphology. 29 – abdomen tip, dorsal view, untreated. 30 – abdomen tip, ventral view, in sodium phosphate solution. 31 – abdomen tip, lateral view, untreated. 32 – right fore femur with the spine. 33 – abdomen tip, caudal view, untreated. 34 – right front tibia with the comb. Abbreviations: hyp = hypandrium, par = parandrium, pyg = pygophore, tc = tibial comb. Abdominal segments are indicated with Roman numbers.

yellowish-brown and not dark, scutellar spine not curved and clearly shorter than the prosterior pronotal lobe help discerning this species from *P. grimmae* and *P. nigrispina*.

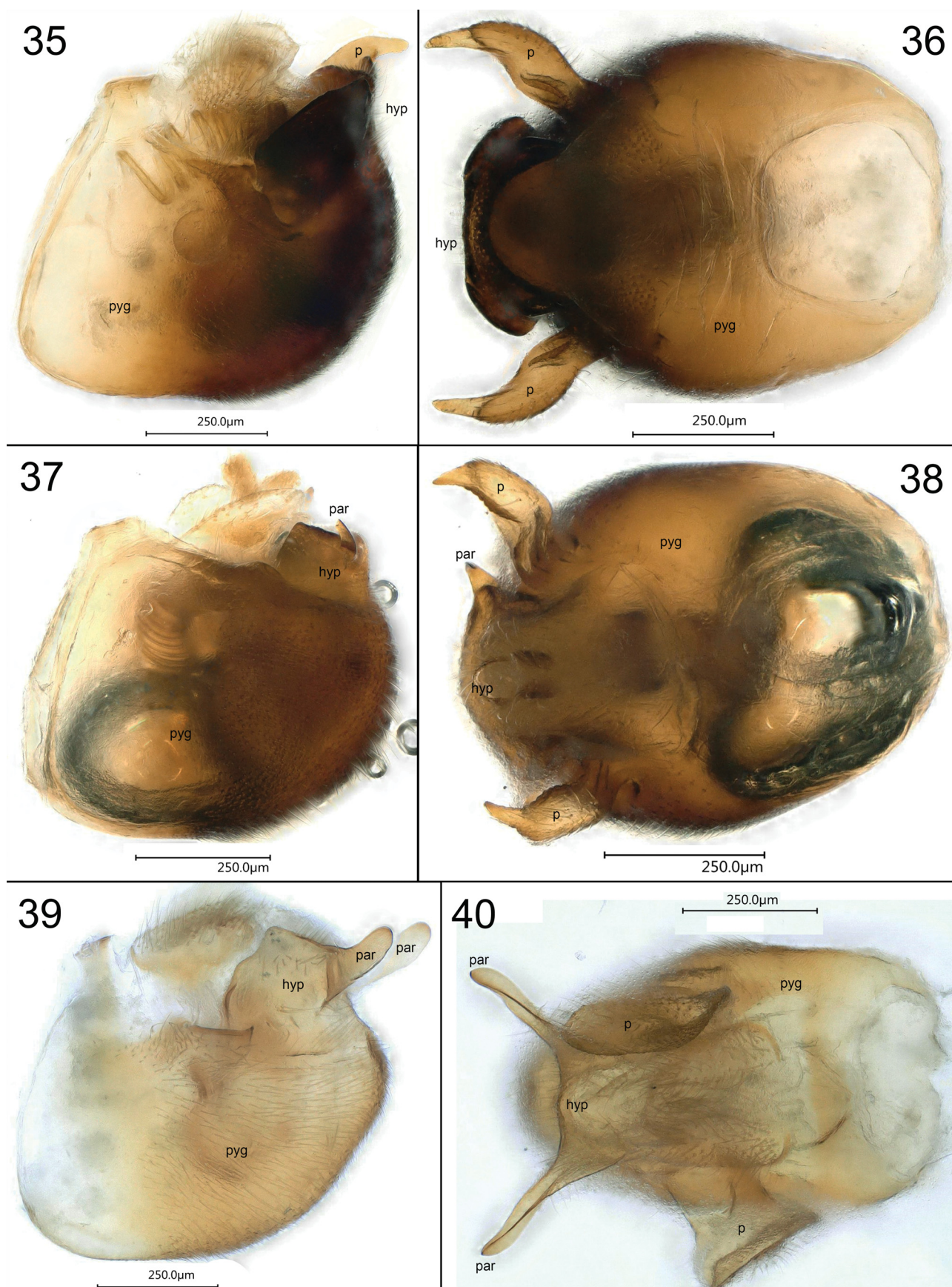
Description. Male. Coloration. Initially, as seen in figures 23, 25–28 and 29–34, a strong reddish hue was present in many lighter coloured body parts of the specimen such as extremities, abdomen or head. The treatment in solution of sodium triphosphate, while reinflating the abdomen and making many morphological traits accessible, led to disappearance of the reddish hue, so that the specimen is now looking as in the Fig. 24. The coloration before the sodium triphosphate treatment is described, with notes on changes after the treatment in brackets.

Head (Fig. 28) yellowish brown, with only several regions dark brown: between and behind ocelli; two median stripes reaching from ocelli to antennae; gula, bucculae and neighbouring part of genae. Ocelli and eyes red (Fig. 28); labium yellowish brown with tip black; first antennomere (Fig. 25) reddish (yellow after sodium triphosphate treatment), antennomeres II–III yellowish-brown with dark tips, antennomere IV infuscate; femora reddish (yellow after the treatment), coxae, trochanters, tibiae and tarsi (except the dark brown terminal tarsomeres) yellowish-brown; collar and middle lobe of prothorax (Fig. 26) black, posterior lobe whitish medially and reddish-testaceous laterally (brown after treatment) with punctuation partly dark, partly concolorous; hind margin whitish; scutellum black, except for apex and posterior margin yellowish (transitional regions dark brown), scutellar spine yellowish with black tip; thoracic pleura and sternites (Fig. 27) black, with supracoxal lobes, dorsoposterior margin of mesopleuron, metepimera and peritreme of metathoracic gland yellowish. Fore wings (accessed after treatment) with most veins yellowish, except Cu, Pcu and the branch connecting Cu and R brown, claval organ orange, veins in membrane (formed as folds) brownish and set off against the very slightly yellowish-transparent membranous parts as well as on the clavus. Hind wings weakly yellowish-transparent except the light brown divergence point of R and M. Abdomen (except connexivum; Figs 25, 29–31) with segments I–II black, segment III partly brownish partly reddish and segments IV to VII almost completely reddish (all reddish parts becoming yellowish-brown after the treatment); connexivum yellowish in segments II and III and concolorous in others; pygophore yellowish (Fig. 33).

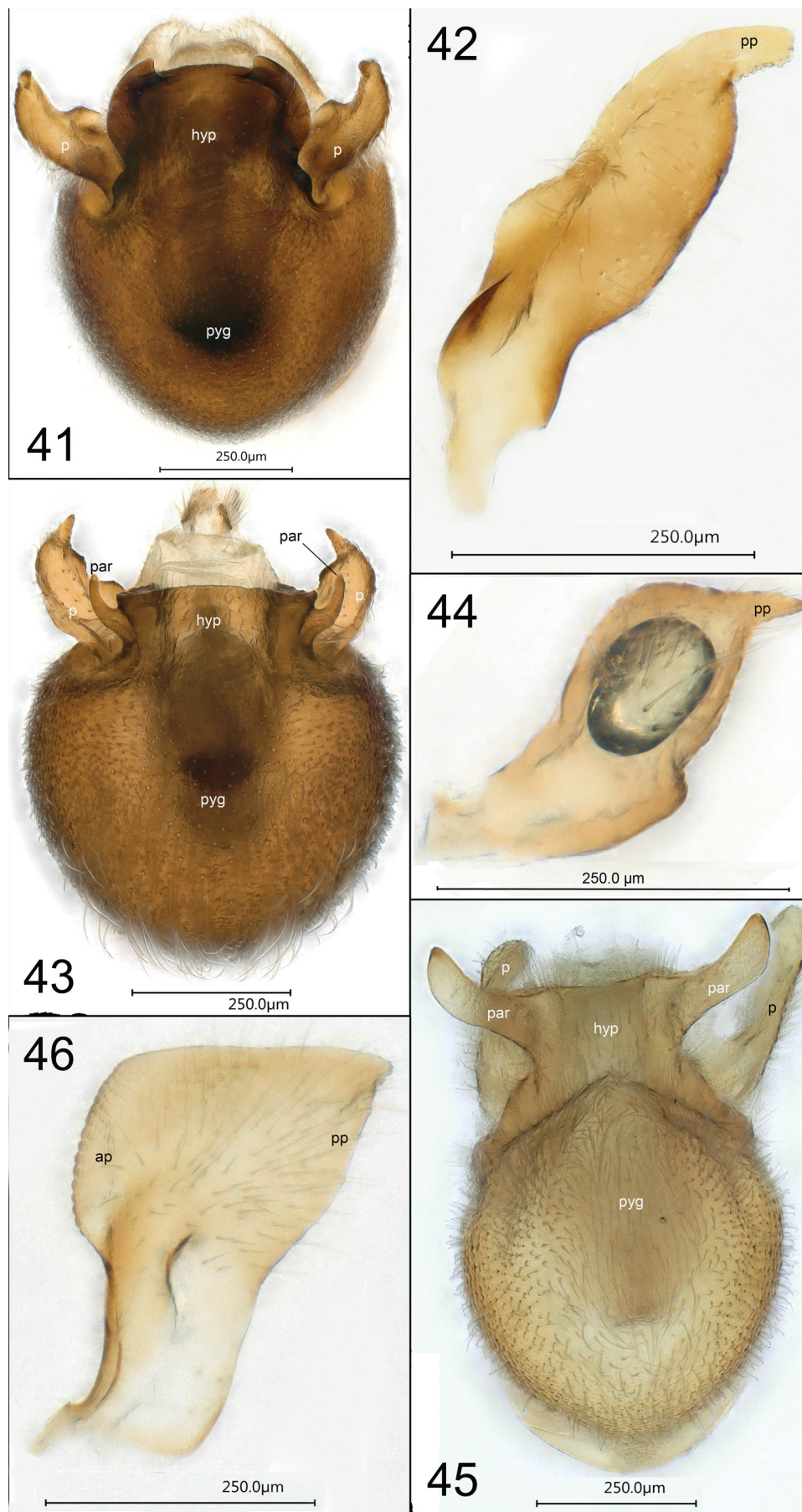
Vestiture and texture. Head (except two symmetrical depressions posterolaterally of ocelli) (Fig. 28), pronotal collar and middle lobe as well as propleura and prosternum (Fig. 26) covered with short adhering yellowish setae, relatively sparse on head and somewhat denser on the forementioned parts of pronotum. Pronotum punctate (Fig. 26); punctures on posterior lobe larger and with a short seta (vestiture of punctuation on middle lobe more variable), regions between punctures glabrous but dull. Punctuation and vestiture of scutellum similar to that of middle pronotal lobe, with setae not limited to punctures. Meso- and metapleura and -sterna (Fig. 27) as densely punctate as posterior pronotal lobe and with as little vestiture, but also mycoid microsculpture typical for evaporatoria covering

them. Antennae and legs with dense seta cover, darker and shorter on basal antennomere and femora and lighter and longer on more distal parts. Abdomen with adhering light vestiture except pygophore (incl. hypandrium) with much longer setae posteromedially (Figs 33, 45).

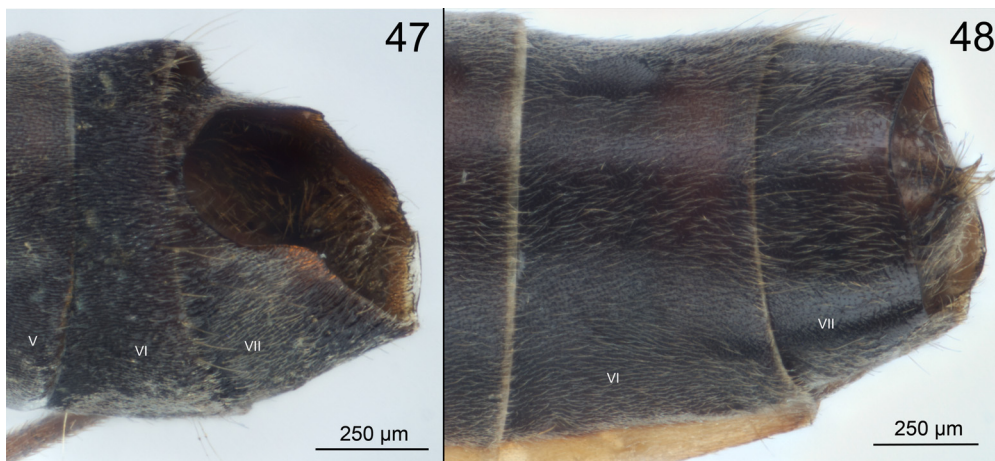
Structure. Head (Fig. 28) with a median sulcus starting anterior of ocelli and reaching middle of vertex. Sulcus with slim row of setae anteromedially, not quite reaching posterior end of sulcus. Two other depressions on the head, symmetrical on each side, with the hind margin bisinuate and building a sharp edge, anterolateral slope smooth. Weak ridges reaching from each side of sulcus to respective antennal socket, more recognizable on a row of setae than elevation; median part of vertex convex. Eyes substylate. Angle between gula and clypeus sharp, gula subparallel to horizontal (Fig. 27). Labium reaching base of middle coxae. Antennae thin, longer than body, most segments (especially I and IV) slightly to moderately curved. Middle lobe of pronotum (Fig. 26) with convex lateral outline, broader than collar; posterior lobe with almost straight lateral outline, broader than middle lobe. Middle and posterior lobe not quite in the same plane (Fig. 27), both lobes slightly convex in dorsal outline, separated by a shallow transverse impression; posterior lobe not much elevated above head. Hind third of posterior pronotal lobe sloped posteriad, building almost right angle with rest of the lobe. Hind margin of pronotum weakly bisinuate (Fig. 26). Scutellar spine clearly shorter than posterior pronotal lobe (Fig. 27), vertical (the angle to the plane of meso- and metanotum ca. 90°), almost straight. Legs as long as or longer than body, hind legs the longest (Figs 23–25); femora slightly bent. Fore femora subterminally with curved spine (Fig. 32). Fore tibia thickened on tip, semicircularly incised and carrying a comb of setae (Fig. 34). Fore and hind wings well developed (specimen macropterous), fore wings almost reaching tip of the abdomen (Figs 29–31). Abdomen strongly deflated in dry condition (Figs 23–24), with connexiva almost touching each other dorsally at segment V; while inflated under sodium triphosphate treatment, all abdominal segments appearing of similar width. Borders between abdominal segments clear, except ventrally between IV and V that are almost unrecognizable; segment borders smooth and not elevated. Lateral segment outlines straight or almost straight in reinflated condition under sodium triphosphate. Tergite VII with a broad median incision (Figs 29–30). Hind border of segment VII in lateral outline clearly sinuate, sternite being much shorter ventrally than dorsally (Figs 30–31). Segments VIII and IX (pygophore) sunken into segment VII, but less than in, e.g., Bornean species: large part of segment VIII visible (Fig. 31). Posteroven-tral pilosity on pygophore long (Fig. 33). Hypandrium broadly elevated and expanded terminally, building large paddle-like parandria directed laterad (Figs 33, 39–40, 45); pygophore forming an angle caudally under hypandrium (Fig. 45); posterior margin of hypandrium almost building an angle (Fig. 39). Paramere (Fig. 46) spade-like, with broad dorsal margin, without anterior/posterior processes.



Figs 35–40. Male genitalia of the new *Phaenacantha* species. 35, 37, 39 – pygophore in left lateral view, with the left paramere detached to make the hypandrium better visible. 36, 38, 40 – pygophore with intact parameres in dorsal view. 35–36 – *P. grimmae* sp. nov., holotype. 37–38 – *P. nigrispina* sp. nov., holotype. 39–40 – *P. paveli* sp. nov., holotype. Abbreviations: hyp = hypandrium, p = paramere, par = parandrium, pyg = pygophore.



Figs 41–46. Male genitalia of the new *Phaenacantha* species. 41, 43, 45 – pygophore in caudal view, parameres intact. 42, 44, 46 – outer surface of the left paramere. 41–42 – *P. grimmae* sp. nov.; 43–44 – *P. nigrispina* sp. nov.; 45–46 – *P. paveli* sp. nov. Abbreviations: hyp = hypandrium, p = paramere, par = parandrium, pyg = pygophore.



Figs 47–48. Female abdomen tip in new *Phaenacantha* species, ventrolateral (oblique) view; note the deep broad semi-circular median incision of the 7th sternite in 47. 47 – *P. grimmae* sp. nov. 48 – *P. nigrispina* sp. nov. Abdominal segments are indicated with Roman numbers.

Measurements. Body length 6.70 mm; head width (= max. body width) 1.16 mm. Total antenna length 9.10 mm (segment ratios, I to IV: 1.00–1.41–1.61–1.75). Ratio antenna : body 1.36; labium length 1.34 mm. Distance between ocelli 0.04 mm, between ocellus and eye 0.28–0.29 mm, ratio of the two measurements 7.16. Length of collar + middle lobe of pronotum 0.55 mm; length of posterior pronotal lobe 0.75 mm, ratio of the two measurements 1.36. Scutellar spine length 0.55 mm; ratio to length of posterior pronotal lobe 0.73. Measurements of the hind tarsus (segments I / II / III, respectively): 1.17 / 0.18 / 0.30 mm, total length of the hind tarsus 1.65 mm. Width of abdomen not measured because of its strong deflation and distortion.

Etymology. I dedicate this first *Phaenacantha* known from New Caledonia to the late Professor Pavel Štys, who greatly promoted the study of Colobathristidae, among many other fields. We initially planned to describe this species together.

Distribution. New Caledonia.

***Symphylax handschini kinabaluensis* subsp. nov.**

(Figs. 49–62)

Type material. HOLOTYPE: ♂ (SMNS), collection number SMNS_HET_00008: “BORNEO: SABAH, Kinabalu / N. P., Poring, 450–700m; / 30.XI.1996, leg. D. Grimm [printed in black ink on yellow label]”. Mounted on a triangle; pygophore with genitalia (left paramere separated) are dissected and stored in a plastic vial with glycerol attached to the same pin.

Differential diagnosis. With the key from ŠTYS & EXNEROVÁ (2013) the specimen is clearly identified as a *Symphylax* Horváth, 1904 and with the key from ŠTYS (1977b) as *Symphylax handschini* Kormilev, 1953, based on the structure of genitalia. However, although the hypandrium of the SMNS specimen is very much alike that of the holotype (and the only described specimen) of *S. handschini*, the structure of paramere shows distinct differences. The concavity on the dorsal surface seems to be closer to the posterior margin than in *S. handschini*, and the posterior lobe is less well developed than in *S. handschini*. Although the type specimen of *S. handschini* was not available, KORMILEV’s (1953) description of *S. handschini* shows also differences in somatic characters

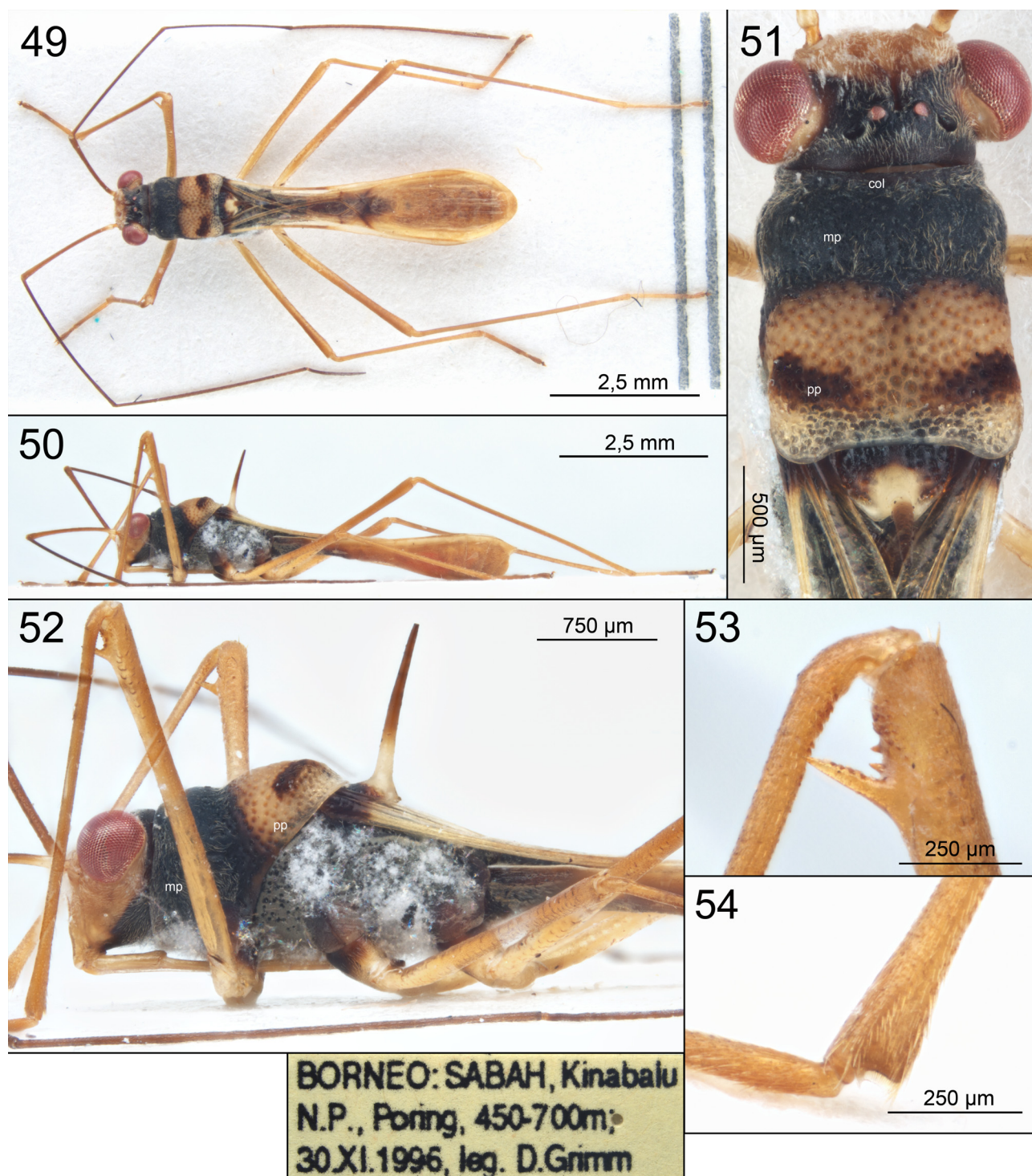
from the SMNS specimen: “the hind border” of the head is black in the holotype, according to KORMILEV (1953), but in the SMNS specimen the head is black as far anterior as the front margin of the eye (Fig. 51); supracoxal lobes are whitish-yellow in the holotype but brown in the SMNS specimen (Fig. 52); the color of abdomen is orange anteriorly and yellow-brown or reddish-brown posteriorly in the holotype but brown to blackish anteriorly and yellowish posteriorly with some reddish hue medially in the SMNS specimen; labium “almost reaches the middle coxae” (KORMILEV 1953) in the holotype (ŠTYS 1977b corrects: “reaches apices of mesocoxae”) and reaches beyond middle coxae in SMNS specimen.

Description. Male. Coloration. Head (Fig. 51) black dorsally from hind margin to anterior margin of eyes, gula black, rest of head yellow with some irregular light brown pattern. Ocelli and eyes red; labium (Fig. 52) yellow with black tip; antennae brown, with first antennomere lighter than the others, its base being almost yellow (Figs 49–50). collar and middle lobe of pronotum black (Fig. 51), posterior lobe yellow except small brownish black macula medially on front margin indicating a start of longitudinal stripe present in some other species; two dark brown maculae on humeral angles; posterior margin of pronotum whitish-transparent. Punctuation concolorous on collar, middle pronotal lobe and scutellum and dark on posterior pronotal lobe. Scutellum black at base, getting brown closer to top and yellow on top, as well as base of scutellar spine, its apical two thirds light to dark brown (Fig. 52). Meso- and metapleura and sternites greyish black (initially covered by dried rests of metathoracic gland secretion), supracoxal lobes dark brown anteriorly and lighter brown posteriorly, peritreme of metathoracic gland brownish black. Bases of fore wings (Figs 49, 51) dark brown, rest of fore wings mostly light-coloured: veins yellowish brown, except dark brown distal parts of Cu and Pcu, claval organ, proximal part of RP and distal part of dividing vein; membranous parts transparent. Coxae dark brown at base anteriorly and lighter brown posteriorly, yellow at apex; other leg segments yellowish brown with distal parts of middle and hind tibiae and all tarsi darker brown (Figs 49–50, 52). Abdomen yellowish for most part, except segments I and II greyish black to brown, sternite

and tergite III with large dark brown medial area and sternite IV and tergite IV with dark brown area medioanteriorly; connexivum yellow (Figs 55–56) except segment II dark brown. Pygophore yellow (Fig. 57).

Vestiture and texture. Head (except the two symmetrical depressions posterolaterally of ocelli and medial sulcus anterior of them), pronotal collar and middle lobe as well as propleura and prosternum covered by short, relatively sparse, adhering, yellowish setae (Fig. 51). Pronotum with

punctures, smaller on collar and middle lobe and larger on posterior lobe where each also with a short seta, surface between punctures glabrous. Punctuation of scutellum similar to that of posterior lobe, setae missing. Meso- and metapleura and sterna (Fig. 52) as densely punctate as posterior pronotal lobe and with as little vestiture, but also carrying mycoid microsculpture typical of evaporatoria (such sculpture also present on abdominal sternite II (greyish coloured area)). Antennae and legs with sparse

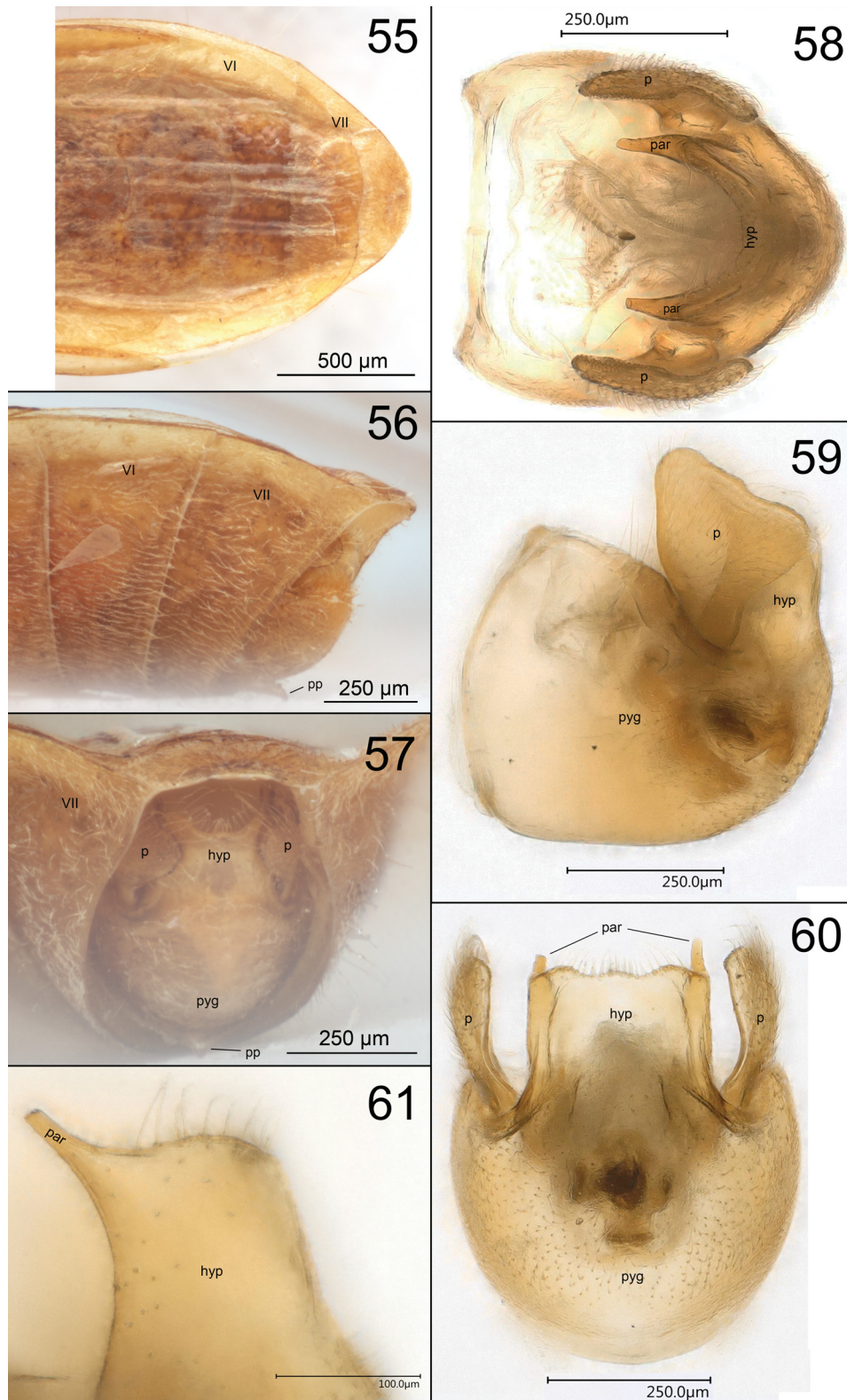


Figs 49–54. *Symphylax handschini kinabaluensis* subsp. nov., holotype. 49 – habitus, dorsal view. 50 – habitus, lateral view. 51 – head and thorax, dorsal view. 52 – head and thorax, lateral view; meso- and metapleura covered by rests of dried metathoracic gland secretion. 53 – right fore femur with the spine. 54 – right fore tibia with a comb of setae. Insert – specimen label. Abbreviations: col = pronotal collar, mp = middle lobe of the pronotum, pp = posterior lobe of the pronotum.

cover of short light setae getting slightly longer and darker on tarsi; sparse short setae on veins. Abdomen with adhering light longer setae on distal segments and especially on hypandrium (Figs 56–57, 61).

Structure. Head (Fig. 51) of a length comparable to *Phaenacantha* species, with a median sulcus starting

anteriad of ocelli and reaching middle of vertex. Two other depressions on the head, lateroposteriad of each ocellus, posterior margin being steep and anterior slope smooth, symmetrical on each side; other relief on head not pronounced. Eyes substylate. Angle between gula and clypeus almost right, gula subparallel to horizontal (Fig.



Figs 55–61. *Symphylax handschini kinabaluensis* subsp. nov., holotype, genitalia. 55 – abdomen tip, dorsal view. 56 – abdomen tip, lateral view. 57 – abdomen tip, caudal view. 58 – pygophore with genitalia, dorsal view. 59 – pygophore with genitalia, lateral view. 60 – pygophore with genitalia, caudal view. 61 – hypandrium, lateral view. Abbreviations: hyp = hypandrium, p = paramere, par = parandrium, pp = posterior process of sternite VIII, pyg = pygophore. Abdominal segments are indicated with Roman numbers.

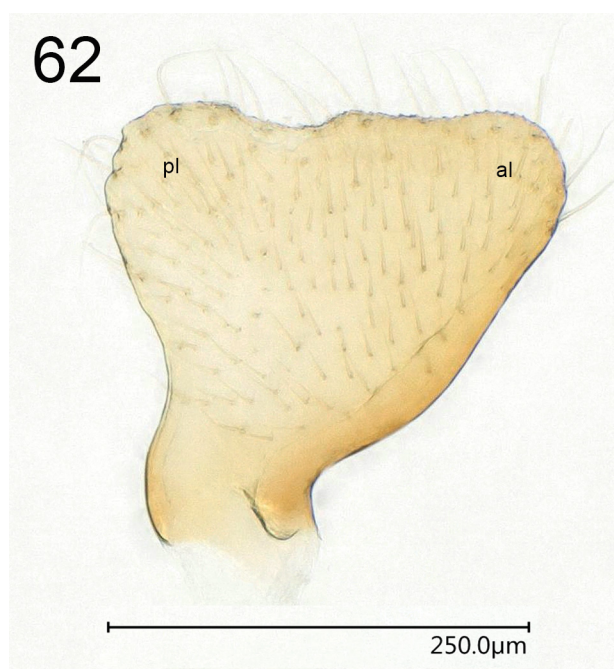


Fig. 62. *Symphylax handschini kinabaluensis* subsp. nov., holotype, left paramere, inner view. Abbreviations: al = anterior lobe, pl = posterior lobe.

52). Labium reaching beyond middle coxae. Antennae thin, much longer than body, most segments (especially I and IV) slightly to moderately curved, left antennomere IV vestigial (Fig. 49). Pronotum with collar similar to that in *Phaenacantha* species (Fig. 51). Middle lobe of pronotum with convex lateral outline, broader than collar; posterior lobe with almost straight lateral outline, same width as middle lobe. Middle and posterior lobe ca. in the same plane (Fig. 52), both lobes clearly convex in dorsal outline, separated by a deep transverse impression; posterior lobe only slightly elevated above the head. Hind third of posterior pronotal lobe gradually roundedly sloped posteriorly; hind margin with weakly concave median part and two small rounded lateral lobes (Fig. 51). Scutellar spine clearly longer than posterior pronotal lobe, slightly inclined anteriorly (the angle to the plane of meso- and metanotum $95\text{--}100^\circ$), somewhat curved posteriorly. Legs generally at least as long as or longer than body, hind legs the longest (Figs 49–50); femora slightly bent and widened distally, fore femora distally with a long straight spine and two small accessory spinules (Fig. 53). Fore tibiae widened distally, with a median groove carrying terminally a comb of setae (Fig. 54). Fore and hind wings well developed (specimen macropterous), fore wings ending very close to tip of abdomen. Abdomen slimmest at segments II and III and broadest at V, difference between broadest and thinnest part larger than in studied *Phaenacantha* species (Fig. 49). Borders between abdominal segments clear, segment borders smooth and not elevated. Lateral segment outlines straight or almost straight to slightly convex. Posterior border of segment VII in lateral outline almost straight (Fig. 56). Segments VIII and IX (pygophore) sunken into segment VII, sternite VIII with posterior median process sticking out (Figs 56–57). Pilosity on pygophore short, except setae on dorsal region of hypandrium (Figs 58–61). Hypandrium

building sharply ending parandria directed dorsoanteriorly (Figs 58, 60–61); pygophore rounded posteriorly (Fig. 59); posterior margin of hypandrium in lateral view almost building an angle (Fig. 61). Paramere (Figs 59, 62) spade-like, with broad dorsal margin with a concavity slightly posteriorly from the middle, not forming processes, with anterior and posterior lobes well developed.

Measurements. Body length 6.80 mm; head width (= max. body width) 1.31 mm. Total antenna length 10.47 mm (average segment ratios, I to IV: 1.00–1.49–1.52–1.98). Ratio antenna : body 1.54. Labium length 2.01 mm. Distance between ocelli 0.12 mm, between ocellus and eye 0.22 mm, ratio 1.83. Length of collar + middle lobe of pronotum 0.47 mm; length of posterior pronotal lobe 0.82 mm, ratio of the two measurements 1.74. Scutellar spine tip broken, therefore the length not measurable. Measurements of the hind tarsus (segments I / II / III, respectively): 0.93 / 0.17 / 0.25 mm, total length of the hind tarsus 1.35 mm. Maximum width of abdomen 1.23 mm, minimum width 0.43 mm, ratio 2.86.

Etymology. The name of this subspecies refers to Kinabalu National Park where this specimen was collected; adjective.

Distribution. Malaysia (Sabah).

Discussion

Genus *Phaenacantha*, whose 33 representatives described to date were recorded from Southern India and Shandong Province of China to New Guinea, Australia and Fiji, was not previously known from Borneo or New Caledonia. It is no surprise to find representatives on these islands, but still this fills some gaps in yet very incomplete knowledge of this taxon. It is interesting that morphologically both *P. grimmae* and *P. nigrispina* from Borneo and *P. paveli* from New Caledonia have affinities mostly to species from New Guinea: *P. ambigua*, *P. biroi*, *P. consobrina*, *P. distincta* and *P. suturalis*, in case of the species from Borneo; and *P. conviva*, *P. mehelyi* and *P. sedula*, in case of *P. paveli*. Of all these species, only *P. ambigua* is known from Ceylon and *P. sedula* from Burma, Singapore and Sumatra; the rest were described from New Guinea. This information might be useful for future workers trying to hypothesize phylogenetic relationships of the genus.

Patterns of speciation that led to the diversity of *Phaenacantha* are poorly studied (as are many other aspects of the family Colobathristidae). This genus includes species with large geographic ranges, e.g., *Phaenacantha* (*Anorygma*) *lobulifera* Horváth, 1916, that was initially described from Shandong Province in China and was later found in Fujian, Guangxi and Yunnan (HSIAO 1977) or even Thailand (material viewed at MMBC) – along with species occurring almost sympatrically, as e.g. many species known from New Guinea or *P. nigrispina* and *P. grimmae*, whose type localities are within the same mountain range, separated by only about 100 kilometers. It would be interesting to learn what features of biology allow some species maintain their unity across thousands of kilometers (if they are indeed single species and not complexes of cryptic species), whereas others obviously experienced speciation events on much smaller spatial scale. The third dimension

– elevation above the sea level – might play a role. New Guinea, the island with the highest known *Phaenacantha* diversity, is famous for its mountains. The type localities of *P. nigrispina* (500 m above sea level) and *P. grimmiae* (900–1200 m) in Borneo clearly differ in elevation. Host specificity might also influence speciation.

Phaenacantha may include many more undescribed species, as the survey of museum collections at SDEI, MMBC, SMNS or ZMHB has demonstrated. In contrast to the statement of ŠTYS & HENRY (2015), it was found that at least the collections visited by the author do contain dozens of quite fresh *Phaenacantha* specimens (as does the collection in National Museum, Prague – P. Kment, pers. comm.) – although in most cases Colobathristidae were collected only incidentally, as, e.g., the specimens found in Borneo by Wolfgang Schawaller and Dorothee Grimm. The collection at SMNS harbours two more specimens of *Phaenacantha*, a female from Borneo and a male from New Guinea. Both most likely belong to new species, but it was decided not to describe them until Horváth's type specimens and more fresh material from Borneo (possibly including males) can be examined.

Symphylax is the second most diverse Oriental genus of Colobathristidae, with nine described species. In contrast to *Phaenacantha* where no representatives were known from Borneo, several species of *Symphylax* are recorded for the island. The specimen from SMNS looks similar to one of them, *S. handschini* (see the differential diagnosis above), but at the same time there is a number of differences in the structure of parameres, coloration or the length of labium. Bearing in mind some cases of intraspecific character variation reported by ŠTYS (1977a) that especially concern coloration and length of labium and allopatric occurrence of the SMNS specimen (Kinabalu NP, northern part of Sabah, Malaysia) and the holotype of *S. handschini* (Pelawan Besar in Kalimantan Timur, Indonesia, some 300 kilometers to the south across a mountain range), it was concluded that the SMNS specimen most likely belongs to a new subspecies of *S. handschini*. Careful study of the holotype along with any fresh material from Borneo would be helpful to clarify the status of this taxon further.

Trichocentrus Horváth, 1904 is the third best represented colobathristid genus (after *Phaenacantha* and *Symphylax*) in the collections visited in preparation for this study. SMNS material also includes a specimen of *Trichocentrus* similar to *T. gibbosus* Horváth, 1904.

It is worth noting for later studies on *Phaenacantha* (and most likely other Colobathristidae as well) that the restoration technique of deflated specimens using sodium triphosphate (e.g., HANSON PRITCHARD & KRUSE 1983) might lead to the loss of original coloration of the animals, as happened to the holotype of *P. paveli* in the present study – although the foregoing incubation in acetone and alcohol might have had an impact, too.

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