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Systematic revision of the genus *Graphelmis* (Coleoptera: Elmidae) VIII. Three new species from the *Graphelmis marshalli* species group and distributional notes on *G. grouvellei*

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Čiampor Jr., F. 2005. Systematic revision of the genus Graphelmis (Coleoptera: Elmidae) VIII. Three new species from the Graphelmis marshalli species group and distributional notes on G. grouvellei. *Entomol. Probl.* 36(1): 13–20. – Additional three new species of the genus *Graphelmis* Delève, 1968 are described from Indonesia and Malaysia: *G. anulata* sp.nov., *G. merkli* sp.nov. and *G. hintoni* sp.nov., all belonging to the *G. marshalli* species group. Habitus and detailed drawings of characteristic structures are given and differential diagnosis of the species within the *G. marshalli* species group is provided. The additional material of *G. grouvellei* Delève, 1970 was revised, and the species is recorded from Malaysia for the first time.

Key words: Coleoptera, Elmidae, *Graphelmis*, taxonomy, distribution, Southeast Asia.

Introduction

Since 2000, sixty new species of *Graphelmis* have been described and the genus divided into nine, well distinguished species groups (Čiampor Jr, 2000, 2001, 2002, 2003, 2004, 2005a,b, Čiampor Jr & Kodada 2004). In spite of this considerable increase in the number of described species (the genus had 19 known species before revision), it is clear that this number is not final. This fact was supported by the recent study of new material, which revealed three new species from the *G. marshalli* species group and some new information on the distribution of some species.

Material and methods, as well as the acronyms and symbols used, follow Čiampor Jr. (2001).

Graphelmis anulata sp.nov.

Figs 1, 5–8

Type locality: Malaysia, Pahang, Taman Negara, Nusa Camp env. Tabong river, 13. VI. 2001.

Material examined. **Holotype** ♂ (NMW): "Malaysia, Pahang, Taman Negara, Nusa Camp env. Tabong river, 13. VI. 2001, J.F. Kočiam lgt.". **Paratypes** (NMW, CKB): 5♂♂, 6♀♀ with the same locality label as holotype; 1♀: "W Malaysia/Pahang, Taman Negara NP, Nusa Camp, Sungai Abai, 150m, 16.6.1994, stream in prim. forest, MA 6, Hendrich leg.".

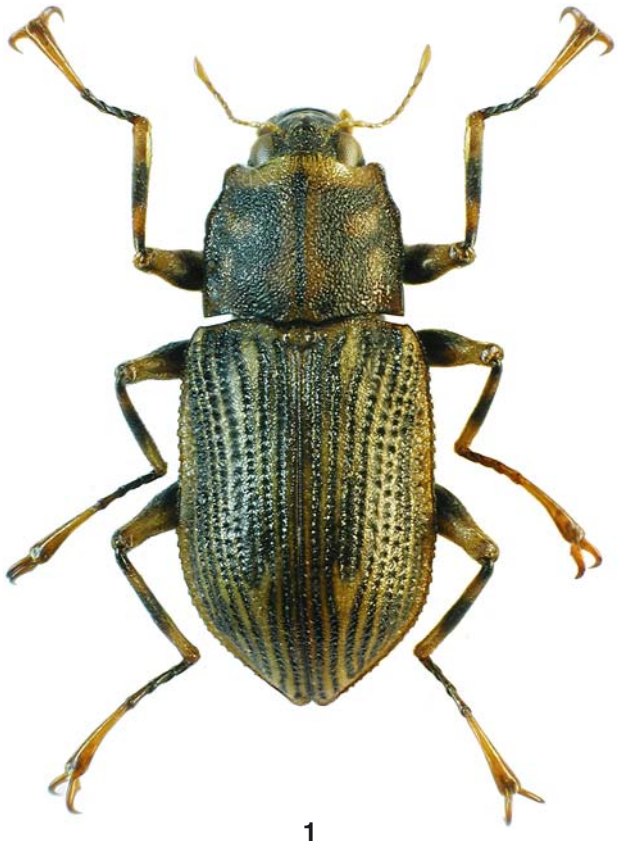
Diagnosis. Within the *G. marshalli* species group, *G. anulata* differs as follows: 1) yellowish elytral pattern formed of yellowish intervals and black striae, with paired more or less visible dark maculae on disc; 2) sides of pronotum uneven; 3) tibiae with dark brown ring in medial third; 4) pronotum very densely irregularly punctured, matt.

Description. Body form obovate (Fig. 1); CL in ♂♂ (4.06–4.38 mm, Ø = 4.20 ± 0.12), in ♀♀ (4.13–4.50 mm, Ø = 4.38 ± 0.15); EW in ♂♂ (1.97–2.03 mm, Ø = 1.99 ± 0.03), in ♀♀ (1.95–2.15 mm, Ø = 2.05 ± 0.08), CL/EW in ♂♂ (2.04–2.22, Ø = 2.11 ± 0.07), in ♀♀ (2.06–2.22, Ø = 2.13 ± 0.06).

Colour pattern: pronotum with paler anterior margin, sides of median pronotal groove and flat sublateral tubercles; elytra without anterior yellow V-shaped marking, striae yellow, intervals dark; disc with pair of dark maculae.

Head. HW in ♂♂ (0.85–0.90 mm, Ø = 0.86 ± 0.02), in ♀♀ (0.85–0.94 mm, Ø = 0.89 ± 0.03); ID in ♂♂ (0.40–0.44 mm, Ø = 0.42 ± 0.02), in ♀♀ (0.43–0.47 mm, Ø = 0.44 ± 0.02); ED in ♂♂ (0.37–0.38 mm, Ø = 0.38 ± 0.01), in ♀♀ (0.38–0.41 mm, Ø = 0.39 ± 0.01); HW/ID in ♂♂ (1.93–2.15, Ø = 2.04 ± 0.08), in ♀♀ (2.00–2.07, Ø = 2.03 ± 0.03). Labrum glabrous, sparsely punctate; anterior half slightly paler with yellow setae; clypeus shorter than labrum, as well as frons and vertex densely irregularly punctured; eyes moderately large, oval in lateral view and convex in dorsal view, with raised inner margin.

Thorax. Pronotum wider than long, widest at base; PL in ♂♂ (1.19–1.25 mm, Ø = 1.23 ± 0.03), in ♀♀ (1.25–1.31 mm, Ø = 1.30 ± 0.03); PW in ♂♂ (1.49–1.59 mm, Ø = 1.55 ± 0.05), in ♀♀ (1.56–1.69 mm, Ø = 1.62 ± 0.06); AP in ♂♂ (0.90–0.97 mm, Ø = 0.93 ± 0.03), in ♀♀ (0.95–1.10 mm, Ø = 1.02 ± 0.06); lateral margins explanate, distinctly uneven; anterior angles produced, rounded; sublateral tubercles inconspicuously raised, flat; median groove narrow, very shallow; prebasal admedian pits vestigial; surface densely irregularly punctured. Proventrite irregularly puncrtured; lateral margins raised around coxae; posterior margin with flat median protuberance. Scutellum almost rounded, anterior margin straight; surface shiny. Mesoventrite with longitudinal groove for reception of proventrite; posterior third indistinctly plicate. Metaventrite with disc almost flat, sparsely setose in males; longitudi-



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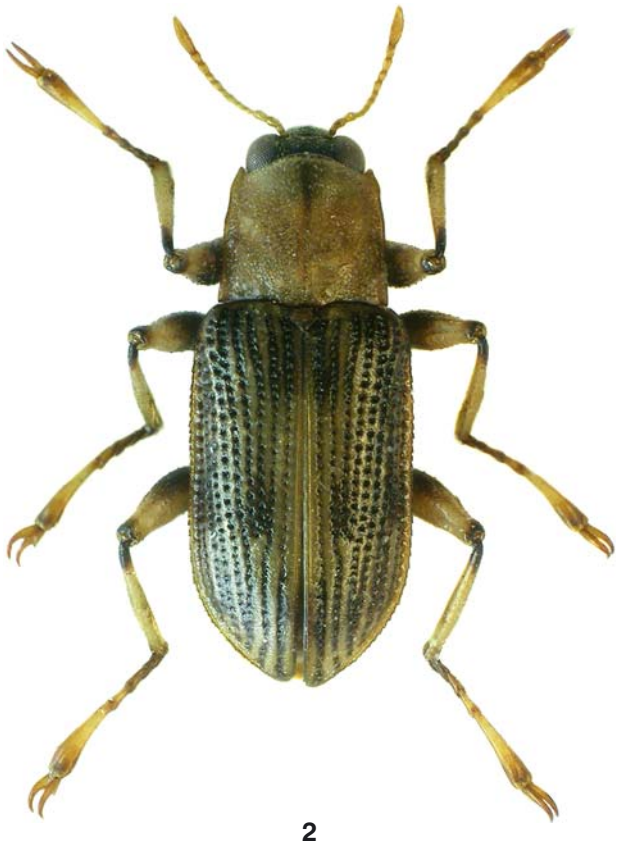

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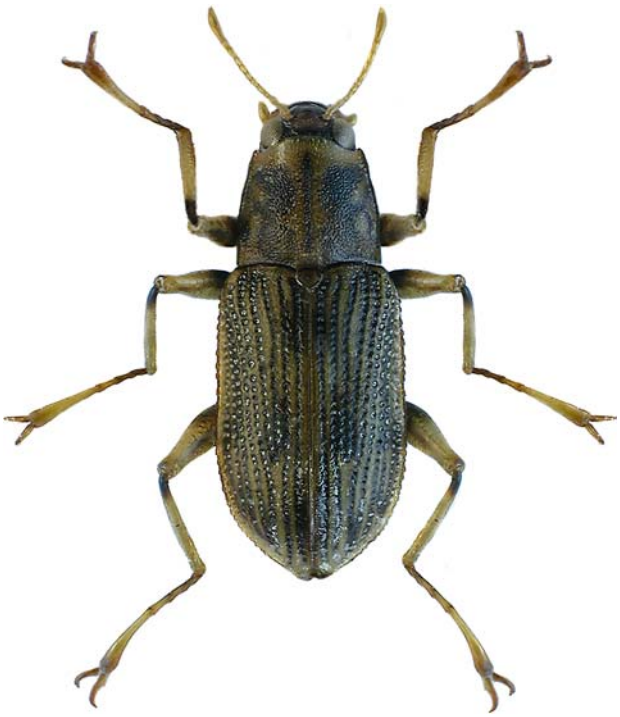

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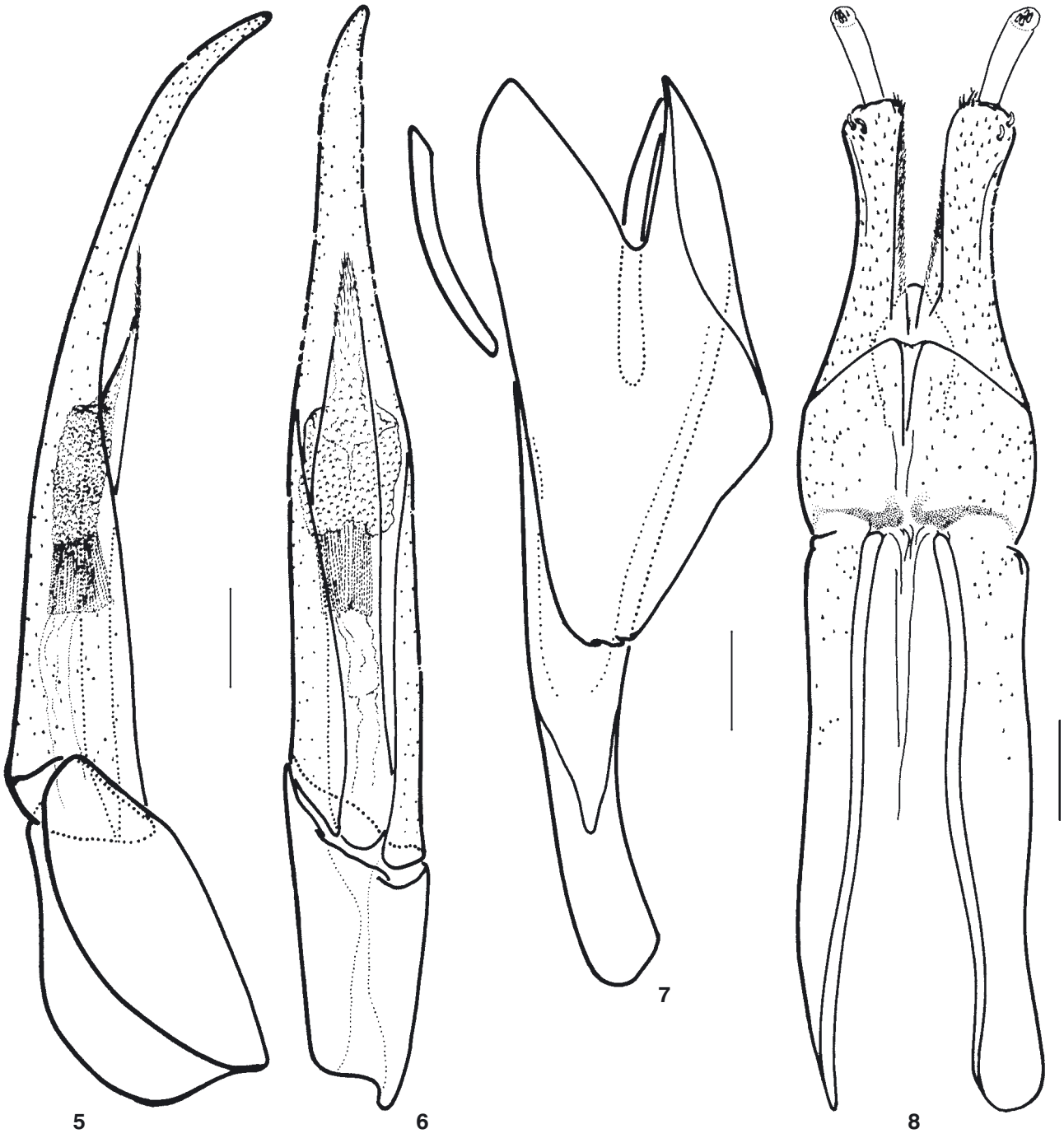
Figs 1–4 Habitus of: 1) *Graphelmis anulata* sp.nov.; 2) *G. merkli* sp.nov; 3) *G. hintoni* sp.nov; 4) *G. grouvellei* (W Malaysia).

nal suture narrow; admedian prebasal punctures vestigial, transverse; anterior and lateral margins of disc somewhat raised. Elytra slightly widened in anterior 0.6, then converging toward feebly produced apices; EL in ♂♂ (2.88–3.13 mm, Ø = 2.98 ± 0.09), in ♀♀ (2.88–3.19 mm, Ø = 3.08 ± 0.12); lateral margins explanate and serrate; strial punctures moderately deeply impressed, deeper on sides. Legs glabrous, sparsely setose; tibiae finely grooved; FT in ♂♂ (1.24–1.35 mm, Ø = 1.31 ± 0.04), in ♀♀ (1.21–1.35 mm, Ø = 1.30 ± 0.06); MT in ♂♂ (1.19–1.21 mm, Ø = 1.20 ± 0.01), in ♀♀ (1.15–1.24 mm, Ø = 1.21 ± 0.04); HT in ♂♂ (1.34–1.38 mm, Ø = 1.36 ± 0.02), in ♀♀ (1.31–1.35 mm, Ø = 1.34 ± 0.02); tarsomere 5 longer than combined length of tarsomeres 1–4.

Abdomen. Admedian keels of ventrite 1 inconspicuous, extending to middle of ventrite; ventrites covered by plastron structures except subtriangular portions on discs; apex of ventrite 5 with sides produced. Sternite 9 and spiculum gastrale (Fig. 7).

Aedeagus (Figs 5, 6). Penis elongate, with numerous small spines; in lateral view penis slightly curved, constricted in middle, with slender distal half; in ventral view parallel-sided in basal half, then constricted; apical third narrow; sides at base unequally long; fibula narrow with



Figs 5–8 *Graphelmis anulata* sp.nov.: 5) aedeagus lateral view; 6) aedeagus ventral view; 7) spiculum gastrale and sternite 9; 8) ovipositor. Scale bars: 0.1mm.

acuminate apex; membranous endophallus with numerous small spines and more sclerotized ring; phallobasis ca. 0.4 times as long as penis, slightly narrowed toward base.

Ovipositor (Fig. 8). Styli only slightly curved, ca. 0.23 times as long as coxite. Coxite divided ventrally, distal part ca. 1.3 times as long as basal part. Paraproct only slightly longer than combined length of coxite and styli; baculi feebly sinuate.

Sexual dimorphism. Males are usually recognized by smaller body size and fine setation on disc of metaventrite.

Distribution. Pahang (Malaysia).

Etymology: from Latin *anulus* ring, referring to the dark brown ring in the middle of tibiae.

***Graphelmis merkli* sp.nov.**
Figs 2, 9–11

Type locality: Indonesia, Kalimantan Barat, Gunung Palung National Park, Cabang Panti research site, 1°13'S 110°7'E, lowland rainforest.

Material examined. **Holotype** ♂ (NMW): "Indonesia, Kalimantan Barat, Gunung Palung Nat. Park, Cabang Panti research site, 1°13'S 110°7'E, lowland rainforest, at light, No.9, 18-26.VII. 1993, O. Merkl". **Paratype** (CCB): ♀ with the same locality label as holotype.

Diagnosis. Within the *G. marshalli* species group, *G. merkli* differs as follows: 1) body slender; 2) entire pronotum yellow, except dark anterior half of median longitudinal groove; 3) ventral side glabrous without distinct plication or punctures; 4) penis slender, fibula with rounded apex.

Description. Body form elongate (Fig. 2); CL in ♂ 2.92 mm, in ♀ 3.08 mm; EW in ♂ 1.21 mm, in ♀ 1.31 mm, CL/EW in ♂ 2.43, in ♀ 2.35.

Colour pattern: pronotum yellow, anterior half of median pronotal groove brown; elytra with indistinct yellow V-shaped marking in anterior half and yellowish carinae in posterior third.

Head dark brown to black. HW in ♂ 0.65 mm, in ♀ 0.71 mm; ID in ♂ 0.32 mm, in ♀ 0.34 mm; ED in ♂ 0.32 mm, in ♀ 0.35 mm; HW/ID in ♂ 2.00, in ♀ 2.09. Labrum glabrous, sparsely setose; anterior margin paler; clypeus slightly shorter than labrum, as well as frons and vertex densely irregularly punctured; eyes large, oval in lateral view and convex in dorsal view, with raised inner margin.

Thorax. Pronotum subquadrat, slightly wider than long, widest at base; PL in ♂ 0.82 mm, in ♀ 0.87 mm; PW in ♂ 0.90 mm, in ♀ 0.97 mm; AP in ♂ 0.69 mm, in ♀ 0.77 mm; lateral margins feebly explanate; anterior angles produced, subacuminate; sublateral tubercles inconspicuous; median groove narrow, feebly impressed; prebasal admedian pits vestigial; surface with dense shallowly impressed punctures, interstices shiny. Proventrite subglabrous indistinctly plicate; prosternal process with lateral margins almost flat; posterior margin with distinct median protuberance. Scutellum with anterior margin straight, shiny. Mesoventrite shiny, with oblique finely microreticulate carinae. Metaventrite with disc almost flat, with sparse moderately long yellow setae; longitudinal suture darkened, narrow; admedian prebasal punctures indistinct; anterior and lateral margins of disc almost flat. Elytra parallel-sided in anterior 0.7, then converging toward feebly produced apices; EL in ♂ 2.10 mm, in ♀ 2.21 mm; lateral margins explanate and serrate; strial punctures moderately deeply impressed, deeper on sides. Legs glabrous with sparse setae; FT in ♂ 0.91 mm, in ♀ 0.85 mm; MT in ♂ 0.87 mm, in ♀ 0.81 mm; HT in ♂ 0.94 mm, in ♀ 0.91 mm; tarsomere 5 longer than combined length of tarsomeres 1–4.

Abdomen. Admedian keels of ventrite 1 indistinct curved reaching posterior margin of ventrite in male and extending to middle of ventrite in female; abdominal intercoxal process and mesal portion of remaining ventrites glabrous; lateral portions of ventrites covered by plastron structures; apex of ventrite 5 moderately widely excavated.

Aedeagus (Figs 9, 10). Penis elongate, slender, with numerous small spines; in lateral view penis slightly curved, parallel-sided; in ventral view parallel-sided; fibula parallel-sided with rounded apex; membranous endophallus with numerous small spines and short, more sclerotized ring; phallobasis ca. half as long as penis.

Ovipositor (Fig. 11). Styli almost straight, relatively robust, ca. 0.25 times as long as coxite. Coxite divided ventrally, distal part ca. 1.7 times as long as basal part. Paraproct ca. 1.2 times as long as combined length of coxite and styli; baculi feebly sinuate.

Sexual dimorphism. Male is very similar to female, but has slightly longer setae on disc of metaventrite.

Distribution. So far known only from the type locality.

Etymology. Named in honour of Dr. Otto Merkl from the Natural History Museum in Budapest (Hungary).

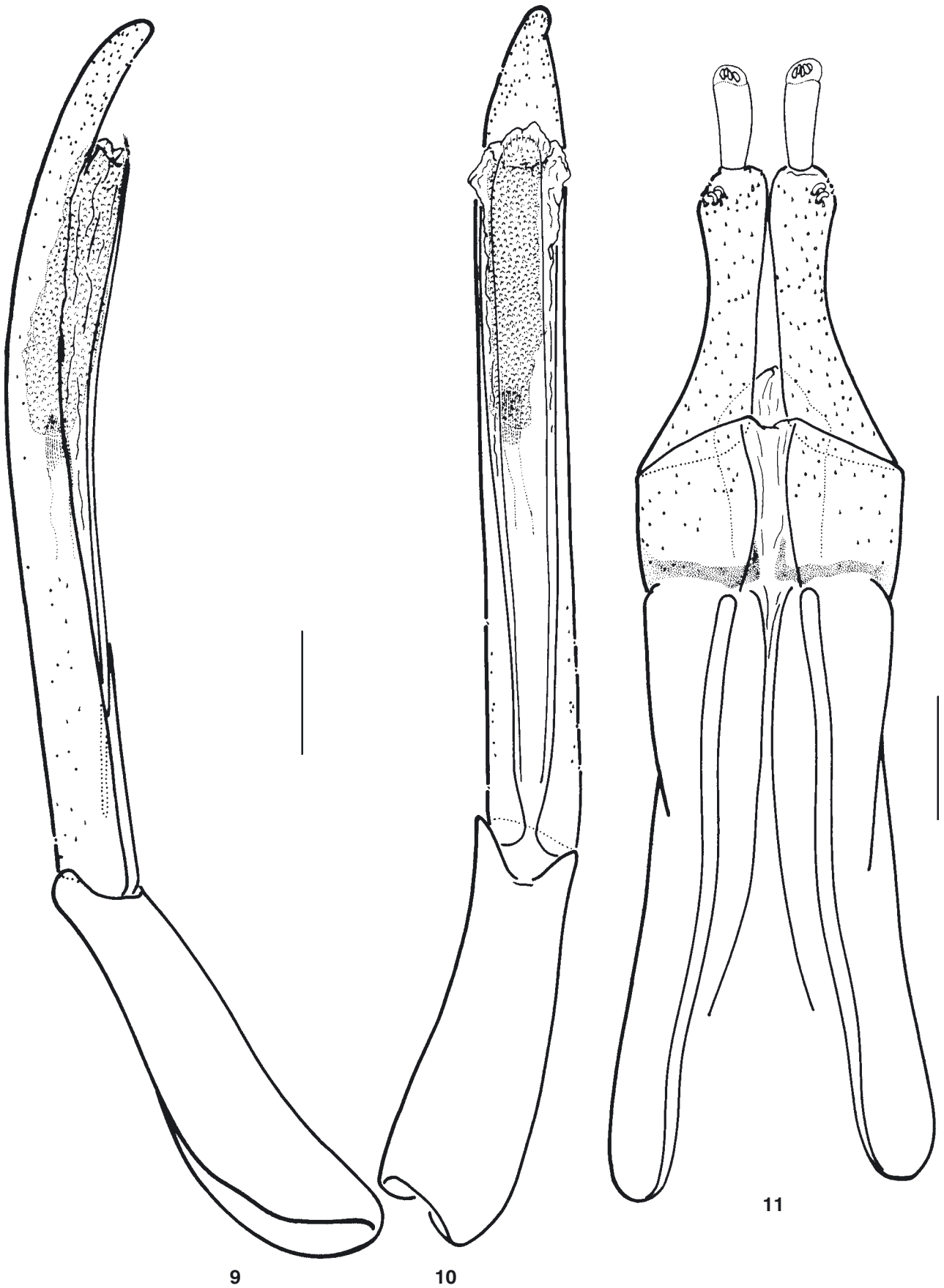
***Graphelmis hintoni* sp.nov.**
Figs 3, 12–14

Type locality: Malaysia, Sabah, Sipitang.

Material examined. **Holotype** ♂ (NMW): "Malaysia, Pahang, Taman Negara, Nusa Camp env. Tabong river, 13. VI. 2001, J.F. Kočiam lgt.". **Paratypes** (NMW, CKB): 5♂♂, 6♀♀ with the same locality label as holotype; 1♀: "W Malaysia/Pahang, Taman Negara NP, Nusa Camp, Sungai Abai, 150m, 16.6.1994, stream in prim. forest, MA 6, Hendrich leg.".

Diagnosis. Within the *G. marshalli* species group, *G. hintoni* differs as follows: 1) dorsal surface distinctly shiny; 2) yellowish elytral pattern distinct, bright yellow; 3) elytra yellow in anterior and posterior third, yellow parts connected by yellow stripe along suture in median third; 4) legs long; 5) dark colouration of distal end of femora reduced; 5) tarsi yellow except darkened distal ends.

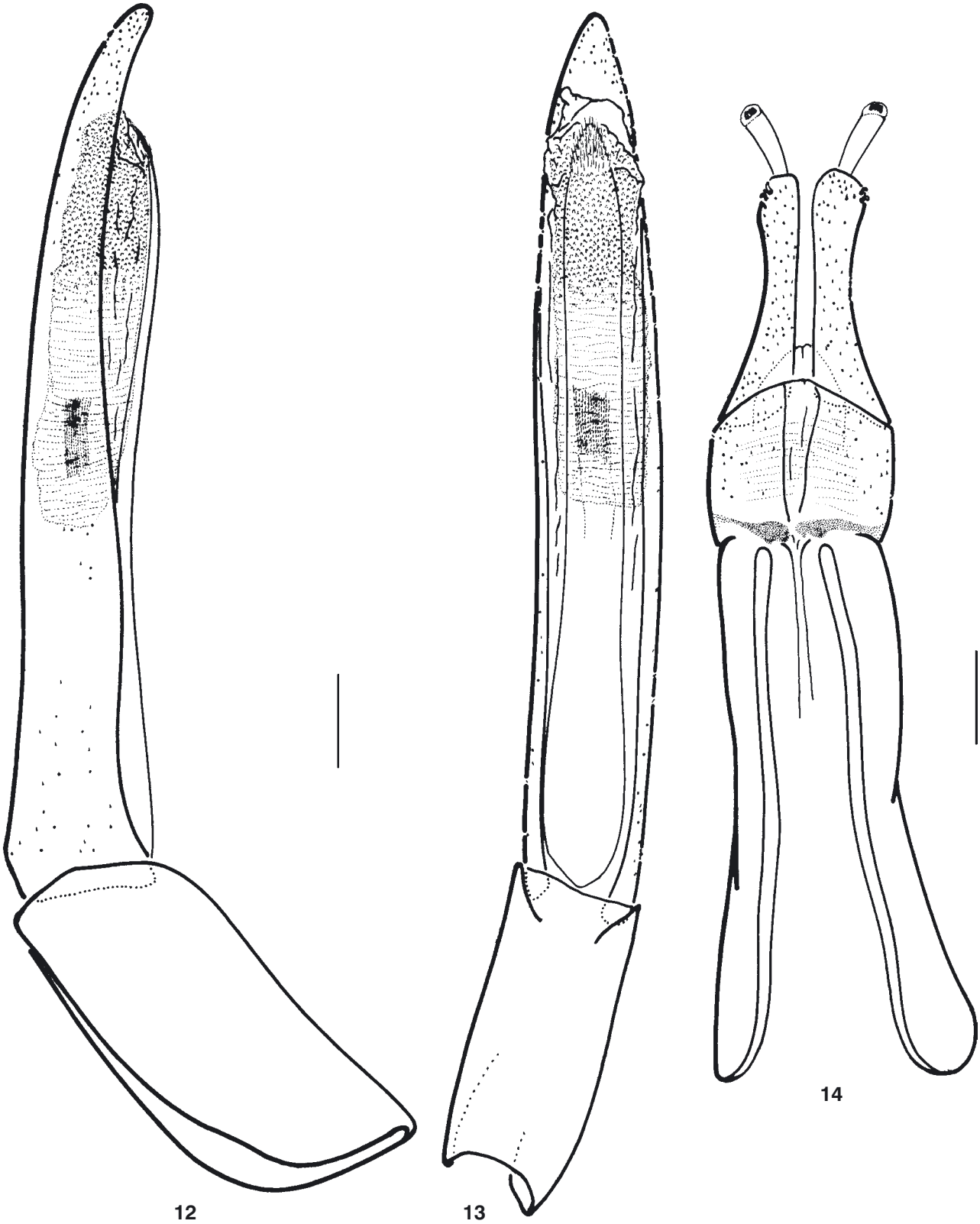
Description. Body form obovate (Fig. 3); CL in ♂ 4.13 mm, in ♀♀ (4.06–4.31 mm, Ø = 4.21 ± 0.13); EW in ♂ 1.74 mm, in ♀♀ (1.67–1.74 mm, Ø = 1.71 ± 0.04), CL/EW in ♂ 2.37, in ♀♀ (2.36–2.55, Ø = 2.44 ± 0.09).



Figs 9–11 *Graphelmis merkli* sp.nov.: 9) aedeagus lateral view; 10) aedeagus ventral view; 11) ovipositor. Scale bars: 0.1mm.

Colour pattern: pronotum with indistinct yellow anterior margin and border along posterior half of median pronotal groove; elytra with distinct yellow subtriangular marking in anterior third and yellow posterior third, both yellow parts connected by yellow stripe along elytral suture in median third.

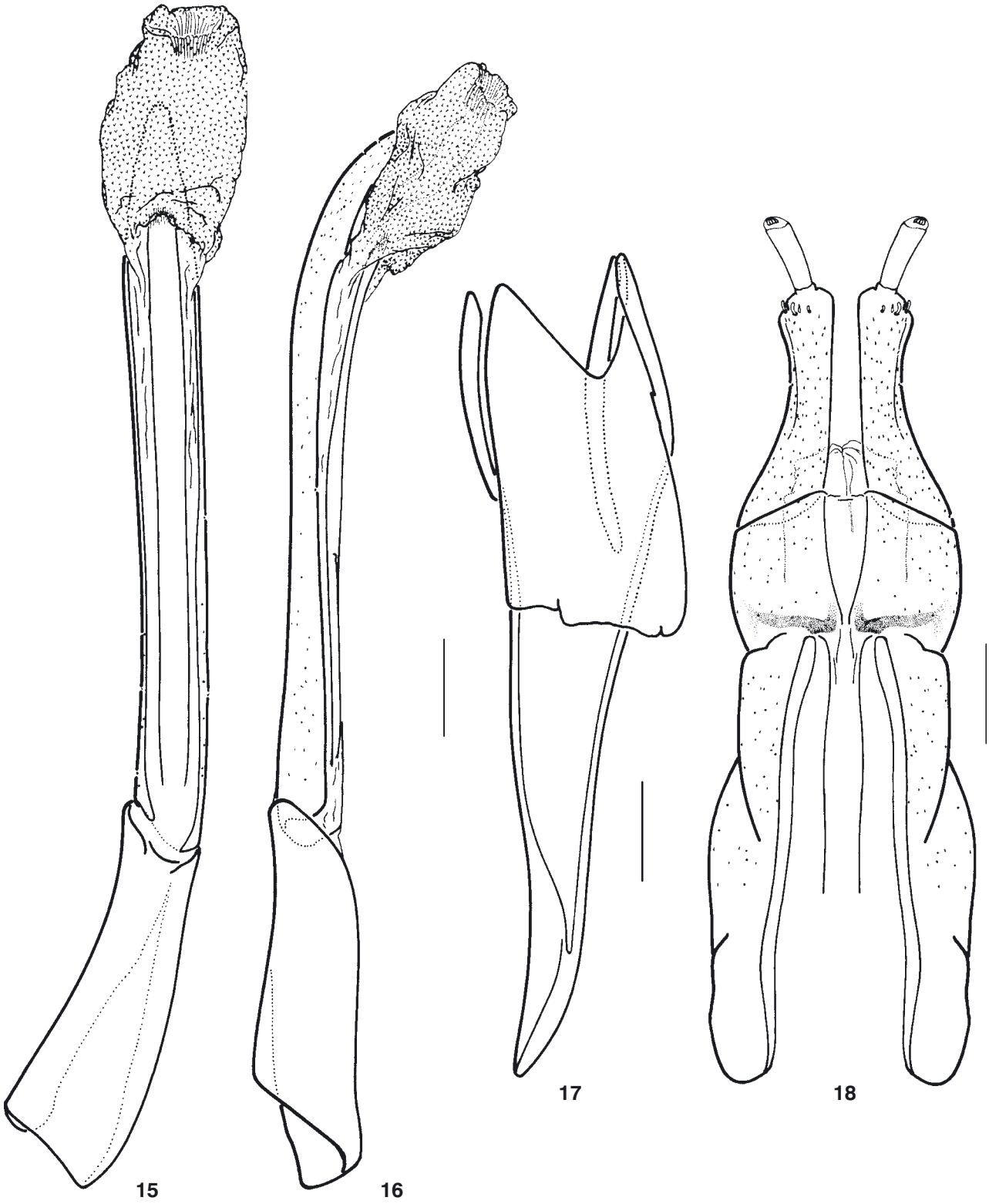
Head. HW in ♂ 0.82 mm, in ♀♀ (0.82–0.87 mm, Ø = 0.85 ± 0.02); ID in ♂ 0.38 mm, in ♀♀ (0.41–0.46 mm, Ø = 0.43 ± 0.02); ED in ♂ 0.41 mm, in ♀♀ (0.38–0.41 mm, Ø = 0.39 ± 0.01); HW/ID in ♂ 2.15, in ♀♀ (1.90–2.00, Ø = 1.97 ± 0.06). Labrum glabrous, sparsely setose; anterior third slightly paler; clypeus with sparse yellow



Figs 12–14 *Graphelmis hintoni* sp.nov.: 12) aedeagus lateral view; 13) aedeagus ventral view; 14) ovipositor. Scale bars: 0.1mm.

setae, about as long as labrum, except posterolateral parts glabrous; frons and vertex densely irregularly punctured; eyes moderately large, oval in lateral view and convex in dorsal view, without distinctly raised margin.

Thorax. Pronotum wider than long, widest at base; PL in ♂ 1.13 mm, in ♀♀ (1.13–1.19 mm, Ø = 1.17 ± 0.04); PW in ♂ 1.23 mm, in ♀♀ (1.21–1.28 mm, Ø = 1.24 ± 0.04); AP in ♂ 0.87 mm, in ♀♀ (0.90 – 0.95 mm, Ø = 0.92 ± 0.03); lateral margins narrowly explanate; anterior angles produced, acuminate; sublateral tubercles vestigial; median groove narrow, moderately deeply impressed, with acuminate apices; prebasal admedian pits vestigial; sur-



Figs 15–18 *Graphelmis grouvellei* (West Malaysia): 15) aedeagus lateral view; 16) aedeagus ventral view; 17) spiculum gastrale and sternite 9; 18) ovipositor. Scale bars: 0.1mm.

face densely micropunctured, except for almost glabrous yellow anterior portion. Proventrite subglabrous; prosternal process with feebly raised plicate margins; posterior margin with distinct median protuberance. Scutellum slightly elongate, anterior margin straight; lateral margins with small median tubercles; surface shiny. Mesoventrite glabrous. Metaventrite with disc almost flat, sparsely setose in males; longitudinal suture narrow; admedian prebasal punctures shallow, transverse. Elytra with sides parallel-sided in about anterior 0.6, then converging toward rounded or feebly produced apices; EL in ♂ 3.00 mm, in ♀♀ (2.88–3.13 mm, Ø = 3.04 ± 0.14); lateral margins slightly explanate and sparsely serrate; strial punctures: shallow in anterior and posterior third, deeper impressed in middle third. Legs glabrous; FT in ♂ 1.47 mm, in ♀♀ (1.38–1.47 mm, Ø = 1.43 ± 0.04); MT in ♂ 1.44 mm, in ♀♀ (1.34–1.41 mm, Ø = 1.38 ± 0.04); HT in ♂ 1.53 mm, in ♀♀ (1.41–1.50 mm, Ø = 1.45 ± 0.04); tarsomere 5 slightly longer than combined length of tarsomeres 1–4.

Abdomen. Admedian keels of ventrite 1 extending middle, almost reaching posterior margin of ventrite; abdominal intercoxal process and mesal portion of remaining ventrites glabrous, shiny; lateral portions of ventrites covered by plastron structures; apex of ventrite 5 with sides slightly produced.

Aedeagus (Figs 12, 13). Penis elongate, with sparse small spines; in lateral view penis subparallel, slightly continuously narrowed toward apex; in ventral view parallel-sided; fibula narrow with subacuminate apex; membranous endophallus with numerous small spines and more sclerotized ring; phallobasis ca. 0.5 times as long as penis.

Ovipositor (Fig. 14). Styli almost straight, ca. 0.21 times as long as coxite. Coxite divided ventrally, distal part ca. 1.6 times as long as basal part. Paraproct ca. 1.2 times as long as combined length of coxite and styli; baculi feebly sinuate.

Sexual dimorphism. Males are usually recognized by smaller body size and fine setation on disc of metaventrite.

Distribution. Sabah (Malaysia).

Etymology. Named in honour of the great entomologist Howard E. Hinton.

***Graphelmis grouvellei* Delève, 1970**
Figs 4, 15–18

Material examined. (NMW, CCB) 6♂♂, 3♀♀: "Malaysia, Pahang, Taman Negara, Nusa Camp env. Tabong river, 13. VI. 2001, J.F. Kočiam lgt."; 15♂♂, 17♀♀ "Malaysia, Pahang, Kuala Lipis env., Kenong Rimba Park, Kenong river, 5. VI. 2001, J.F. Kočiam lgt."; 6♂♂, 5♀♀: "W Malaysia/Pahang, Taman Negara NP, Nusa Camp, Sungai Abai, 150m, 16.6.1994, stream in prim. forest, MA 6, Hendrich leg.".

Remarks. The specimens studied within this work differ slightly from those from Sumatra and Kalimantan in less distinct colour pattern and darker colouration. The differences however are not too distinct and do not allow unambigous separation of these specimens from the ones from Indonesia. That is why I refrain from describing them as a new species. *G. grouvellei* belongs to the species with well developed hind wings, and this species is often collected to light traps. This suggests that specimens of *G. grouvellei* are capable of dispersal flights, and thus can have wide area of distribution. However, slight differences can suggest that population from West Malaysia was isolated for a relatively long time, and it is probable that they already form or will form in the future a separate species. This however cannot be supported by morphological study.

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