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Malaysian species of *Dryopomorphus* Hinton, 1936 (Insecta: Coleoptera: Elmidae)

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Abstract

We provide a review of species of the genus *Dryopomorphus* Hinton, 1936 occurring in Malaysia. Three known species: *D. bishopi* Hinton, 1971; *D. satoi* Spangler, 1985 and *D. hendrichi* Čiampor Jr & Kodada, 2006 are diagnosed and five new species from the Malay Peninsula and Borneo are described here: *D. grandis*, *D. jaechi*, *D. memei*, *D. pekariki* and *D. sarawacensis*. Habitus photographs, drawings of genitalia and diagnostic characters of all species are included.

Key words: Coleoptera, Elmidae, *Dryopomorphus*, taxonomy, new species, Southeast Asia

Introduction

The small elmid genus *Dryopomorphus* Hinton, 1936 has an Asian distribution, occurring from Malaysia in the west to Japan in the east. Adult *Dryopomorphus* are always associated with running waters, preferring submerged accumulations of plant debris or submerged wood in shaded forest streams. *Dryopomorphus* larvae are still poorly known; the only known ones, found on the surface of waterlogged wood, belong to three Japanese species (Yoshitomi & Satô 2005).

Generally, *Dryopomorphus* species diversity was rather unknown for a long time, because most of them were collected in small series only. The four Japanese species were reviewed recently (Yoshitomi & Satô 2005), whereas the remaining four known species were described separately from Malaysia (Hinton 1971, Spangler 1985, Čiampor Jr & Kodada, 2006) and Thailand (Kodada 1993). Examining material collected in recent years, however, confirmed that the species diversity is much higher.

In this paper we continue revising the material available, focusing on the Malaysian species of *Dryopomorphus*. The examination allowed us to describe five new species from Sabah and Sarawak (Malaysian part of the island Borneo). As all known representatives of the genus, the new species are externally very similar. It is difficult to find distinct and stable external morphological characters distinguishing species, and the only reliable differences are found on the male genitalia. This problem likely also faced Spangler when he described *D. satoi* (Spangler 1985) since he repeated reasonable parts of Hinton's statements from the description of *D. bishopi* (Hinton 1971).

Material & Methods

Specimens prepared for this study were cleaned and examined under a Leica M205C stereomicroscope with a Planapo 1.0 lens, by using diffuse lighting at magnifications up to 160×. Male genitalia and pregenital segments were studied as temporary glycerine slides at magnifications up to 600× by using a Leica DM1000 compound microscope. Drawings were made with a drawing tube. Habitus photographs were made using Leica M205C with digital camera attached.

Metric characters were measured with an ocular grid to nearest the 0.05 mm. Abbreviations used in the text: CL—body length, EL—elytral length, EW—maximum elytral width, PL—pronotal length, PW—maximum pronotal width, ID—interocular distance, NMW—Natural History Museum, Vienna, CCB—collection of Fedor Čiampor, CKB—collection of Ján Kodada.

Results

Dryopomorphus bishopi Hinton, 1971

Figs. 1, 9–12, 34, 35

Dryopomorphus bishopi Hinton, 1971: 295

Type locality: Malaysia: Gombak River N.E. of Kuala Lumpur.

Material studied (CCB, CKB, NMW): 2 ex. “Malaysia, Pahang, Cameron HL, Tanah Rata env., small stream crossing path Nr.9 surrounded by primary forest: 9.VI.2001, J.F.Kočiam lgt. ”, 10ex. “Malaysia, Pahang, Kuala Lipis env., Kg. Melaka, stream in secondary forest, 6.VI.2001, J.F.Kočiam lgt. ”, 7 ex. “Malaysia, Pahang, Taman Negara, Nusa Camp env., Abai river, 12.VI.2001, J.F.Kočiam lgt. ”, 14 ex. “Prov. PAHANG, 7.2., 1060m (17a) “Gap”-Fraser Hill, MALAYSIA 1992, leg. Schillhammer”, 8ex. “Prov. PAHANG, 8.2., 1km W vom “Gap”, 750–850m (17a), MALAYSIA 1992, leg. Schillhammer”, 3 ex. “Prov. PAHANG (19), Fraser Hill, 10.2., Jeriau W f., 950m, MALAYSIA 1992, leg. Schillhammer”, 2 ex. “Prov. PAHANG (4), 4km S Tanah Rata, 23.1., 1250m, MALAYSIA 1992, leg. Schillhammer”, 5 ex. “MALAYSIA, 21.I.1992, SELANGOR: Templer Park, N K.L., leg. Jäch (1)”, 4 ex. “MALAYSIA, 3.II.1992, KELANTAN: 100km Ö Gerik, leg. Jäch (21)”

Diagnosis. Body elongate (Fig. 1), ca. 2.00–2.15 times as long as wide (CL/EW), length 3.10–3.70 mm (CL), maximum width 1.50–1.80 mm (EW); color brown to dark brown; median pronotal groove or line absent, lateral pronotal margins strongly explanate; elytral intervals densely setose, very slightly elevated; elytral striae well demarcated, striae punctures smaller on disc, larger on sides. Scutellum as long as wide, subhexagonal. Ninth segments with spiculum gastrale as in Fig. 12. Aedeagus (Figs. 9–11): in ventral/dorsal view, phallobase short and wide, with base without distinct projection; parameres almost 1.5 times as long as phallobase, wide, with subrounded apex; median lobe slightly longer than parameres, narrowed in apical 0.4, widened in basal 0.6, constricted near base, apex rounded; fibula indistinct; ventral sac robust, finely sculptured in apical portion; in lateral view parameres subparallel, narrowed apically; median lobe narrow, sinuate, abruptly widened above base. Ovipositor (Figs. 34, 35) with terminal segment short, cylindrical, bearing several types of sensilla; preterminal segment elongate 9.1 times as long as terminal segment, apically with pair of distinct sensilla; basal segment almost 1.3 times as long as preterminal and distal segments combined, fulcrum ventrale finely curved.

Distribution. Known from several localities in the Malaysian Peninsula.

Dryopomorphus hendrichi Čiampor Jr & Kodada, 2006

Fig. 2

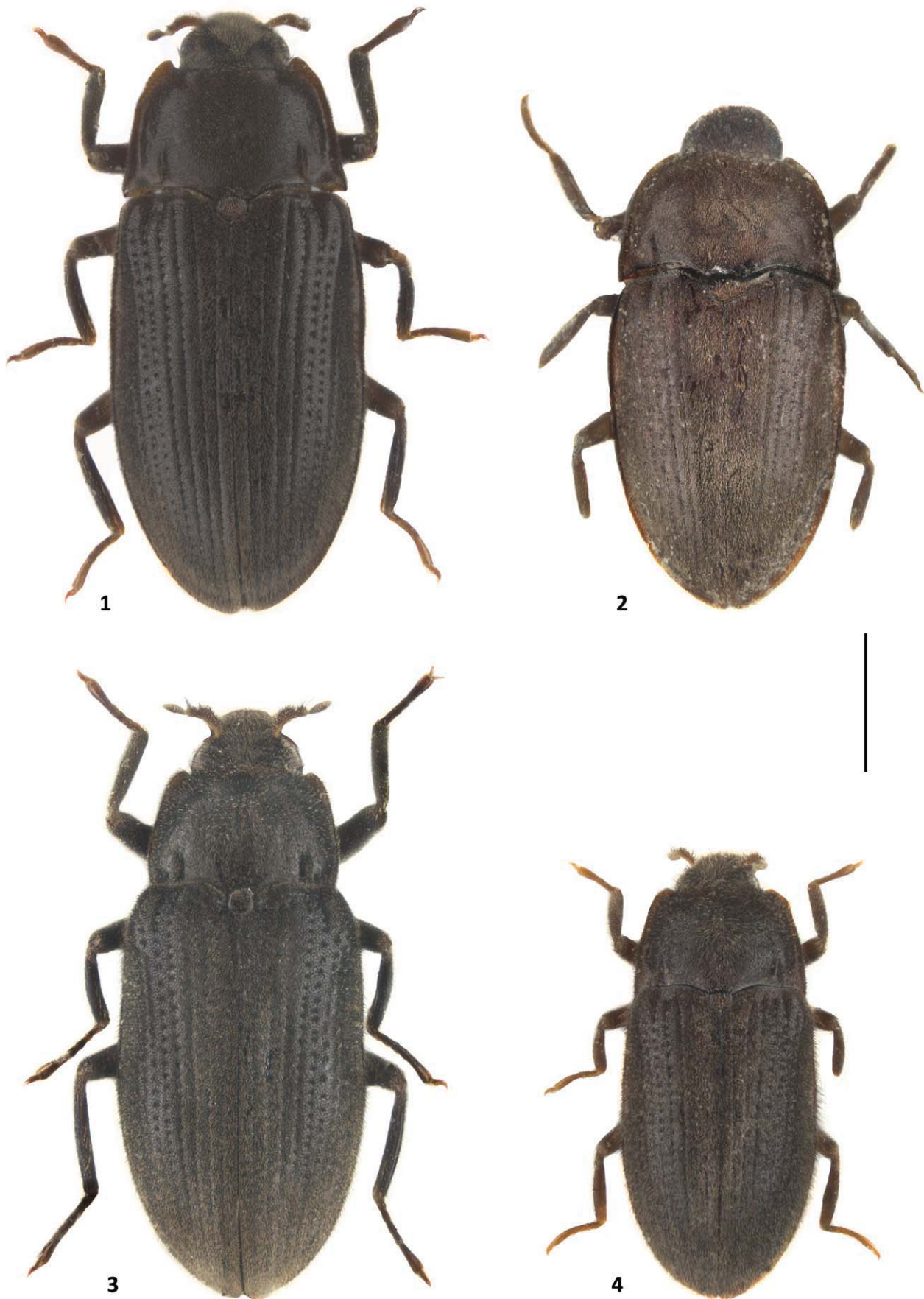
Dryopomorphus hendrichi Čiampor Jr & Kodada, 2006: 71

Type locality: West Malaysia, Johor, Bekok

Material studied: holotype (NMW): “West Malaysia/JOHOR, Bekok, path to waterfall, 10.IV.1997, 50–150m, Balke & Hendrich leg., Coll. HENDRICH”.

Diagnosis. Body oval, less than 2 times as long as wide (CL/EW 1.96), length 3.20 mm (CL), maximum width 1.63 mm (EW), pronotum and elytra distinctly convex in lateral view, setae of the dense pubescence short; median pronotal groove or line absent, lateral pronotal margins strongly explanate; anterior elytral angles subacuminately produced; sublateral pronotal sulci short, less than 0.2 of PL; elytral intervals densely setose, very slightly elevated; striae punctures very small, separated by ca. 3–4 times puncture diameter; scutellum wider than long; shape of the aedeagus (see Čiampor Jr & Kodada 2006); color: head brown, pronotum, elytra, legs and antennae reddish-brown.

Distribution. So far known only from the holotype .



FIGURES 1–4. Habitus of *Dryopomorphus* species from Malaysia: 1) *D. bishopi* Hinton, 1971; 2) *D. hendrichi* Čiampor Jr & Kodada, 2006; 3) *D. satoi* Spangler, 1985; 4) *D. pekariki* n.sp. (holotype) Scale bar: 1 mm.

Dryopomorphus satoi Spangler, 1985

Figs. 3, 13–16, 36, 37

Dryopomorphus satoi Spangler, 1985: 416

Type locality: Borneo: Sabah: Poring.

Material studied (CCB, CKB, NMW): 2 ex. “Malaysia, Sabah, Crocker Range, Tenom env., Kalang Waterfall, 16–18.VI.1998, J.Kodada & F.Čiampor lgt.”, 20 ex. “Malaysia, Sabah, Crocker Range, Tenom env., Sinagang riv., ca. 1000m a.s.l., 27.5.2001, J.F.Kočiam lgt.”, 2 ex. “Malaysia, SABAH, Poring Hot Springs, 1.VI.1998, stream ca. 3m wide with stones, gravel and submerged wood flowing through primary forest”, 1 ex. “Malaysia, Sabah, Sabalangan river in primary forest, ca. 25km SE Sapulut, 26.06.1998, J.Kodada & F.Čiampor Lgt.”, 10 ex. “Malaysia, Sabah, ca. 25km SE Sapulut, Sabalangan river, 21.V.2001, J.F.Kočiam lgt.”, 2 ex. “Malaysia, Sabah, Crocker Range, Mozog env., around km 20 of Road Kota Kinabalu Tambunan, 15.VI.1996, 1a”, 1 ex. “Malaysia, SABAH, Crocker Range, Bingkor env., Taman Bandukan, 6.–7.VII.1996, 10b, shaded stream, 1.5–3.0m wide in primary forest”, 5 ex. “Malaysia, Sabah, Batu Punggul Resort, 24.6–1.7.1996, 11b, shaded stream 1.5–2.0m wide, flowing through dense primary forest”, 2 ex. “Malaysia, Sabah, Gn. Antulai, ca. 5km S Sapulut, 2.VII.1996, 13a, river about 7m wide flowing through secondary forest”, 14 ex. “Malaysia, SABAH, Kuamut river env., near Kampung Pisang Pisang (ca 106km of SAPULUT), 3.–4.VII.1996, 14a”, 6 ex. “Malaysia, SABAH, Kuamut river env., near Kampung Pisang Pisang, 3.–4.VII.1996, 14a, shaded stream in primary forest with submerged wood”, 14 ex. “SARAWAK (Borneo), ca. 40km SE Kapit, 3.1994, leg. J.Kodada”, 1 ex. “SARAWAK (Borneo), ca. 25km E KAPIT, III.1994, Kodada leg”, 39 ex. “SARAWAK (Borneo), Gunung Serapi, ca. 19km W Kuching, primary forest, III.1994, J.Kodada leg.”, 34 ex. “MAL., Sarawak 1993, 40km S Kuching, 17.2., Baan Gong Sikog Wasserf., leg. M.Jäch (3)”, 20ex. “MAL., Sarawak 1993, 80km S Kuching, 18.2., Kampung Ana Rais, leg. M.Jäch (4)”, 1 ex. “MALAYSIA: Sarawak, Mt. Penrisen, 80km S Kuching, 18.2.1993, leg. H.Zettel (4)”, 1 ex. “MAL., Sarawak 1993, E Bandar Sri Amman, Batang Ai NP, 20.2., leg. M.Jäch (9)”, 1 ex. “MALAYSIA, Sarawak, Mulu NP, 3.3.1993, leg. M.Jäch (19)”, 5 ex. “MALAYSIA, Sarawak, Mulu NP, Long Iman, 4.3.1993, leg. M.Jäch (20)”, 19 ex. “MAL., Sarawak 1993, E Bandar Sri Amman, Batang Ai NP, 19/20.2., leg. M.Jäch (7)”, 10 ex. “MAL., Sarawak 1993, 20km W Kuching, 6./7.3., Kubah NP, Gg. Serapi, leg. M.Jäch (23)”, 1 ex. “BRUNEI—Temburong, Belalong Field Res., c. Sungai Belalong, 60m, 2.–8.V.95, leg. Heiss”.

Diagnosis. Body elongate (Fig. 3), larger species; outline distinctly constricted between pronotum and elytra; pronotum without median longitudinal line; lateral margins of pronotum feebly explanate; striae punctures small, covered by pubescence; scutellum longer than wide, subpentagonal with anterior margin convex. Ninth segment with spiculum gastrale as in Fig. 16. Aedeagus (Figs. 13–15): in ventral/dorsal view phallobase parallel-sided in apical 0.6, base subacuminate; parameres ca. 1.2 times as long as phallobase, wide, parallel-sided, slightly constricted in apical 0.2 and abruptly narrowed near subacuminate apex; median lobe slightly longer than parameres, parallel-sided, apex subacuminate; fibula indistinct; ventral sac robust, finely sculptured in apical portion; in lateral view parameres curved apically, widened prebasally, median lobe very narrow, curved, widened near base. Ovipositor (Figs. 36, 37) with terminal segment relatively longer than in other species, cylindrical, bearing several types of sensilla; preterminal segment only 3.7 times as long as terminal segment, with pair of distinct sensilla; basal segment ca. 1.4 times as long as preterminal and distal segments combined, fulcrum ventrale slightly curved.

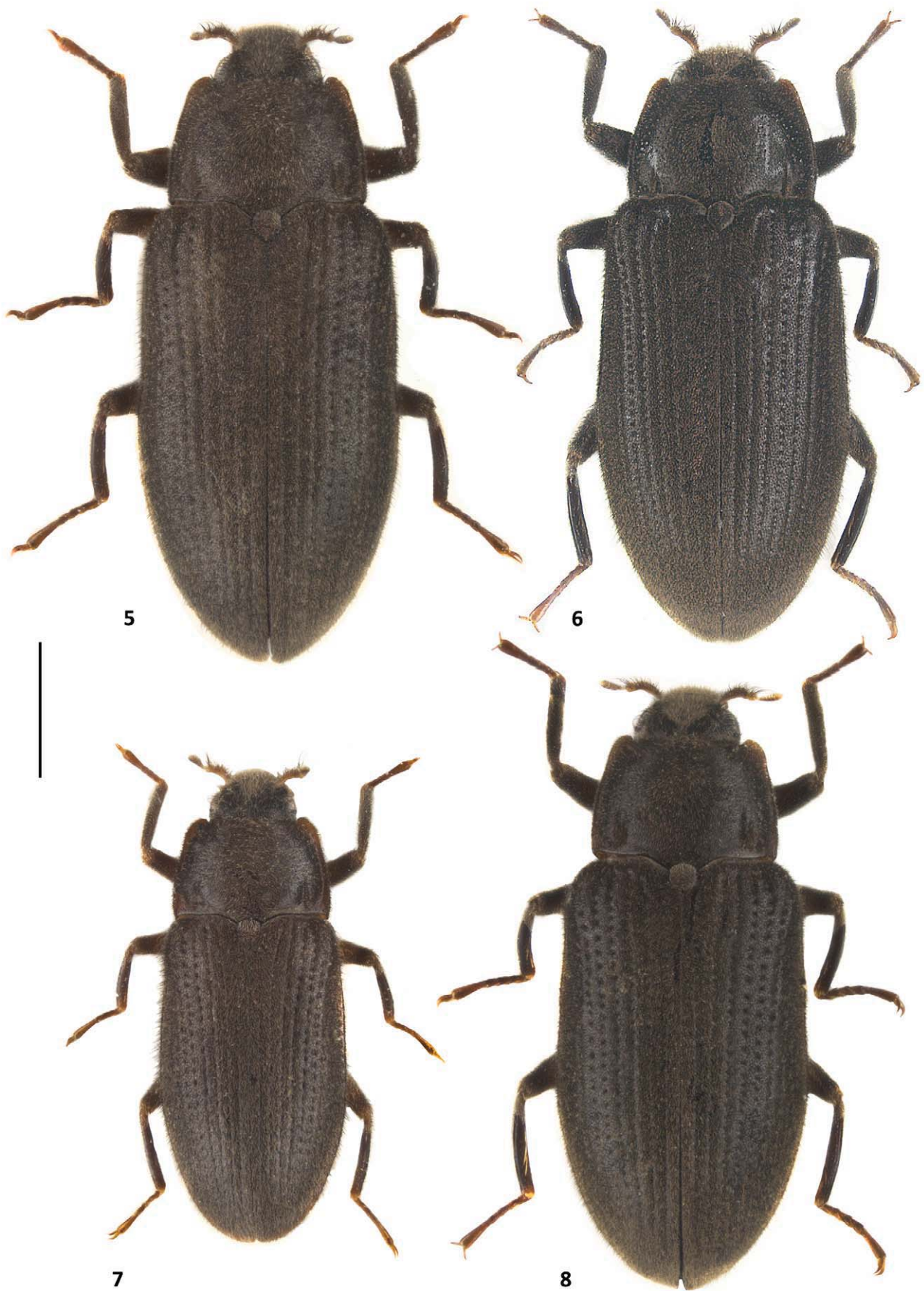
Distribution. Malaysia (Sabah, Sarawak), Brunei.

Dryopomorphus pekariki n.sp.

Figs. 4, 17–20, 38, 39

Type locality: Malaysia, Sabah, Sabalangan river (ca 25km SE from Sapulut). Lowland stream surrounded by remnants of primary forest. The stream is 5–7 m wide, with gravel, large boulders and submerged logs.

Type material: **holotype** male (NMW): “Malaysia, Sabah, ca. 25km SE Sapulut, Sabalangan river, 21.5.2001, J.F. Kočiam lgt.”, **paratypes** (CCB): 1 female “Malaysia, Sabah, ca. 25km SE Sapulut, Sabalangan river, 21.5.2001, J.F. Kočiam lgt.”, 1 male “Malaysia, Sabah, Sabalangan river in primary forest, ca. 25km SE Sapulut, 26.6.1998, J. Kodada & F. Čiampor Lgt.”



FIGURES 5–8. Habitus of *Dryopomorphus* species from Malaysia: 5) *D. grandis* n.sp. (holotype); 6) *D. jaechi* n.sp. (holotype); 7) *D. sarawacensis* n.sp. (holotype); 8) *D. memei* n.sp. (holotype) Scale bar: 1 mm.

Diagnosis: smaller body size, elongate; color reddish brown; outline not constricted between pronotum and elytra; striae punctures relatively coarser, less impressed; elytral intervals flat; pronotum with fine shiny median longitudinal line in anterior half; lateral pronotal margins distinctly explanate; scutellum as long as wide; median lobe thin, with simple rounded apex; phallobasis widened posteriad.

Description. Body elongate, smaller (CL: 2.95 mm), 2.18–2.19 times as long as wide (CL/EW), convex dorsally (Fig. 4); dorsal surface with very dense short adpressed yellowish setae and sparser longer semierect setae. Coloration of head black, pronotum, elytra, legs and antennae reddish brown.

Head partly retractable into thorax. Labrum short, partly concealed by clypeus, densely setose, with lateral angles rounded; clypeus longer and wider than labrum, about twice as wide as long, densely setose; frontoclypeal suture visible, straight; surface of clypeus and labrum densely punctured, coarse. Eyes large, slightly protruding from head outline, subtriangular in lateral view, ID: 0.40–0.45 mm; surface not raised near dorsal margin of eyes; frons and vertex irregularly densely punctured, interstices shiny, punctures setose.

Thorax. Pronotum widest at base, nearly as wide as elytral base, PW: 1.15–1.25 mm, PL: 0.73–0.76 mm; disc convex, punctures well impressed, separated by puncture diameter, interstices shiny; lateral margins explanate, converging anteriorly in nearly straight line up to strongly arcuate anterior corners; sublateral basal sulci moderately converging anteriorly, shallow, present ca. along posterior 0.2 of pronotum; hypomeron subparallel, slightly narrowed posteriad, anteriorly more than three times as wide as protibia, anterior depression well developed, surface rough, with moderately dense longer setae. Prosternal process ca. 1.6 times as long as prosternum in front of coxae, lateral margins raised, posterior margin distinctly produced medially, surface of prosternum subglabrous with denser small and sparser larger setae. Mesoventrite short, widest in middle, markedly constricted between pro- and mesocoxae; mesoventral cavity deep. Metaventrite impressed anteriorly between coxae; disc thin, present from anterior depression to posterior margin; disc flat, with larger punctures, row of deep punctures anteriorly to each metacoxa, surface structure as on prosternum. Elytra 2.15–2.30 mm long (EL), 1.32–1.42 mm wide (EW); disc convex, densely pubescent; sides gradually arcuately converging posteriad, narrowly explanate; anterolateral corners rounded; humerus feebly prominent; epipleuron widest anteriorly, slightly inflected at level of metacoxa, narrowed posteriad, with distinct anterior transverse carina. Each elytron with ten striae; punctures in anterior part and in admesal striae smaller, in lateral striae larger and more distinct, striae not impressed; intervals flat, with dense micropunctuation. Scutellum as long as wide, sides arcuate. Legs relatively short, not modified, hind tibiae longest, mid tibiae shortest.

Abdomen. Intercoxal process of first ventrite triangular, longer than wide, lateral margins raised continuously into carinae reaching posterior margin of ventrite, apex subacute; admesal cavities short, oblique; lateral portion of ventrites I–III with larger punctures; punctures of ventrite IV–V smaller; posterolateral angles of ventrite I–IV protruding posteriad; apex of ventrite V rounded. Ninth segment with spiculum gastrale as in Fig. 20. Aedeagus (Figs. 17–19): in ventral/dorsal view phallobase wide, without basal process; parameres subequal in length with phallobase, wide, widest in basal 0.25, moderately narrowed toward subrounded apex; median lobe slightly longer than parameres, narrow, slightly widened in apical 0.3, apex round; fibula indistinct; ventral sac robust, finely sculptured in apical portion; in lateral view parameres abruptly curved apically, median lobe very narrow, sinuate. Ovipositor (Figs. 38, 39) with terminal segment short, cylindrical, bearing several types of sensilla; preterminal segment elongate, 8.1 times as long as terminal segment, with pair of distinct sensilla; basal segment ca. 1.1 times as long as preterminal and distal segments combined, fulcrum ventrale feebly sinuate.

Distribution. So far known only from the type locality.

Etymology. This species is dedicated to Ladislav Pekárik, our friend and colleague.

***Dryopomorphus grandis* n.sp.**

Figs. 5, 21–23, 40–42

Type locality: Malaysia, Sabah, Crocker range Mountains—submontane rainforest stream surrounded by primary forest. The type material was collected below Sunsuron waterfall in ca. 4–5 m wide stream with gravel, large boulders and submerged logs.

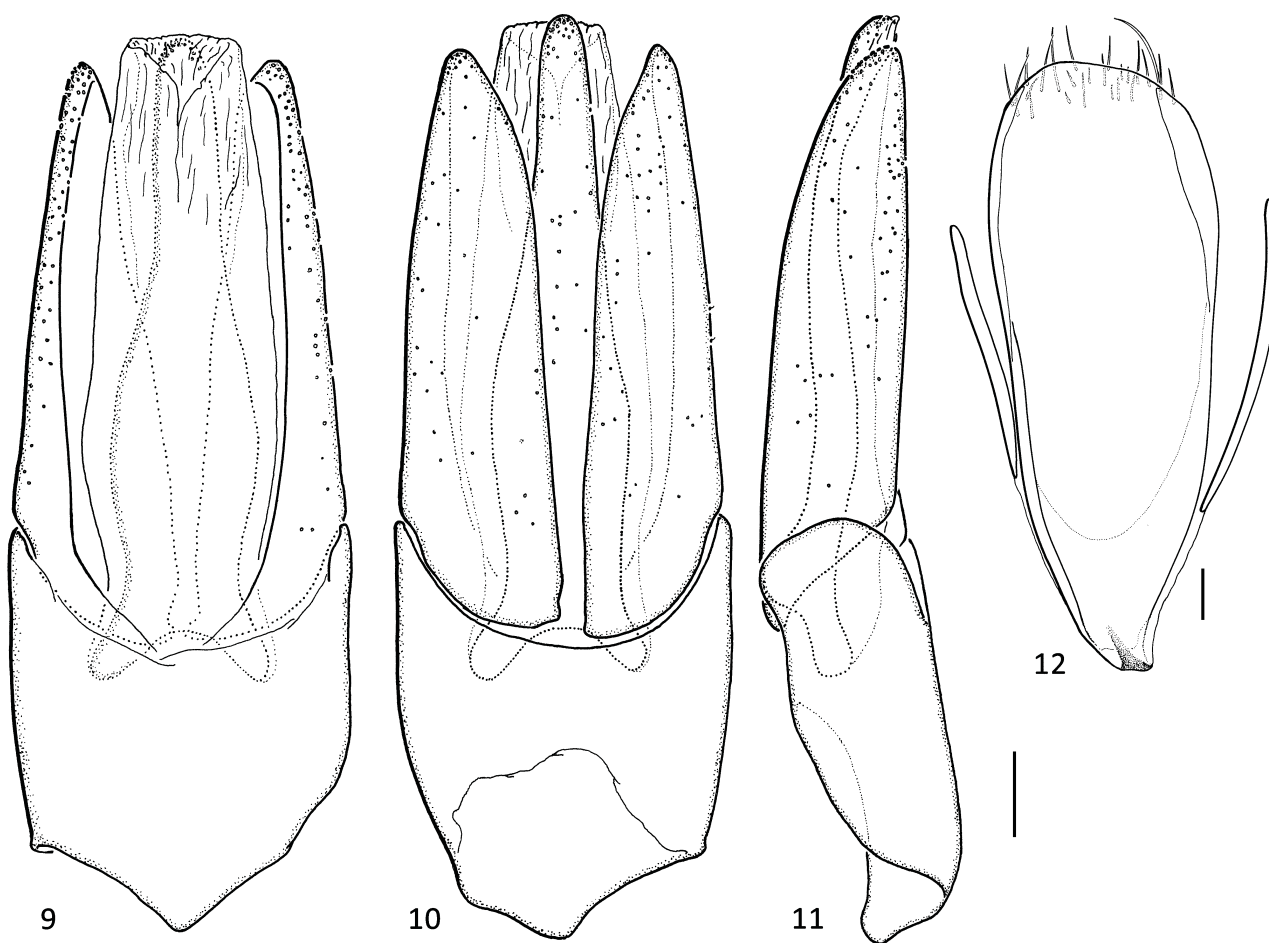
Type material: holotype male (NMW): "Malaysia, Sabah, Crocker Range, around km 56 of road Kota Kinabalu Temburon, Sunsuron Waterfall env., 1100–1200m a.s.l., 8.VI.1996, 5a", paratypes (CCB, CKB, NMW):

3 males, 4 females: "Malaysia, Sabah, Crocker Range, around km 56 of road Kota Kinabalu Temburon, Sunsuron Waterfall env., 1100–1200m a.s.l., 8.VI.1996, 5a", 12 males, 8 females: "Malaysia, Sabah, Crocker Range, Mawar Waterfall env., 17.VI.1996, 9a, river about 4–6m wide, flowing through primary forest, shaded".

Diagnosis: The largest known species, outline constricted between pronotum and elytra, pronotum without median longitudinal line, parameres short, phallobasis long with distinct basal projection, median lobe with knife-shaped apex in lateral view.

Description. Body elongate, largest species (CL: 3.98–4.39 mm), 2.15–2.28 times longer than wide (CL/EW), convex dorsally (Fig. 5); dorsal surface with very dense short adpressed yellowish setae and sparser longer semierect setae. Coloration of head, pronotum, elytra dark brown, femora, tibiae paler, tarsi, antennae and anterior pronotal angles reddish brown.

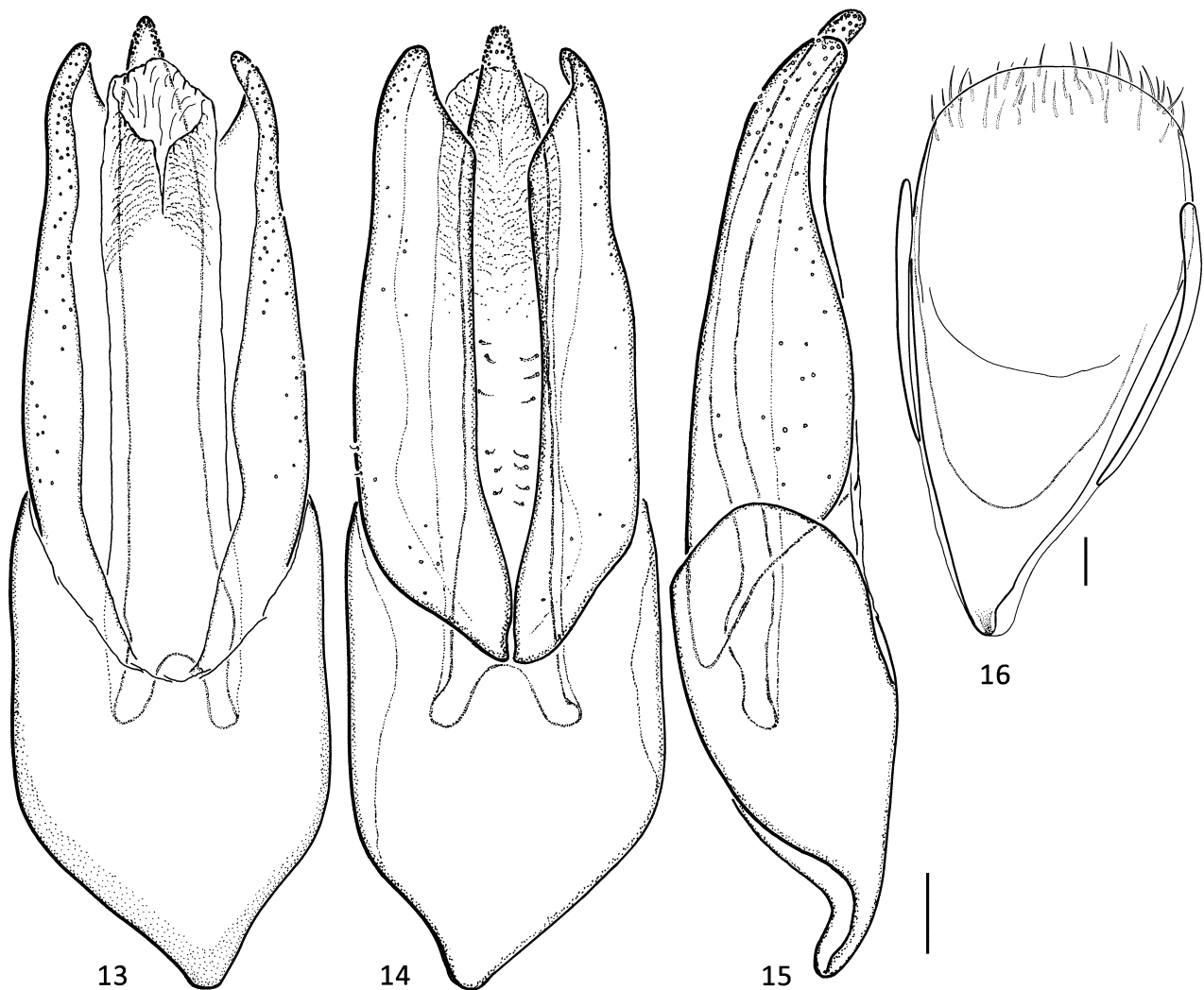
Head partly retractable into thorax. Labrum shorter than wide, ca. as long as clypeus, partly concealed by clypeus, densely setose, lateral angles rounded with brush of long curved yellowish setae, anterior margin mesally slightly emarginate; clypeus longer and wider than labrum, about twice as wide as long, densely setose; frontoclypeal suture visible, straight; surface of clypeus and labrum densely punctured. Eyes large, slightly protruding from head outline, subtriangular in lateral view, ID: 0.48–0.58 mm; surface not raised near dorsal margin of eyes; frons and vertex irregularly densely punctured, interstices shiny, punctures setose.



FIGURES 9–12. *Dryopomorphus bishopi* Hinton, 1971: 9) aedeagus ventral view; 10) aedeagus dorsal view; 11) aedeagus lateral view; 12) segment 9 and spiculum gastrale. Scale bar: 0.1 mm.

Thorax. Pronotum widest in basal third, PW: 1.40–1.53 mm, PL: 0.90–1.00 mm; disc convex, punctures well impressed very dense on entire surface; lateral margins slightly explanate, subparallel, only slightly converging anteriorly; anterior angles more explanate than sides, produced, rounded; hypomeron narrowed posteriorly, anteriorly ca. three times as wide as protibia, anterior depression well impressed, with carina along posterior margin, surface rough, densely setose. Sublateral basal sulci shallow, almost straight, present ca. along posterior third of pronotum. Prosternal process twice as long as prosternum in front of coxae, lateral margins raised, posterior margin distinctly

produced medially, surface of prosternum rugose with dense small and sparse longer setae. Mesoventrite short, widest in middle, markedly constricted between coxae; mesoventral cavity deep. Metaventrte impressed anteriorly between coxae; discrimen thin, present along whole length; disc flat, sides with larger punctures, row of deep and partly fused punctures anteriorly of each metacoxa, surface with denser pubescence than prosternum. Elytra 3.09–3.39 mm long (EL), 1.75–2.00 mm wide (EW); disc convex, densely pubescent; sides parallel in anterior half, then gradually arcuately converging posteriad, narrowly explanate; anterolateral corners rounded; humerus feebly prominent; epipleuron widest anteriorly, slightly inflected at level of metacoxa, narrowed posteriad, with distinct anterior transverse carina. Each elytron with ten striae; stria punctures equally small, hardly visible beneath pubescence, striae not impressed; intervals not convex, with dense micropunctuation. Scutellum longer than wide, sides arcuate. Legs pubescent, tibiae relatively long.



FIGURES 13–16. *Dryopomorphus satoi* Spangler, 1985: 13) aedeagus ventral view; 14) aedeagus dorsal view; 15) aedeagus lateral view; 16) segment 9 and spiculum gastrale. Scale bar: 0.1 mm.

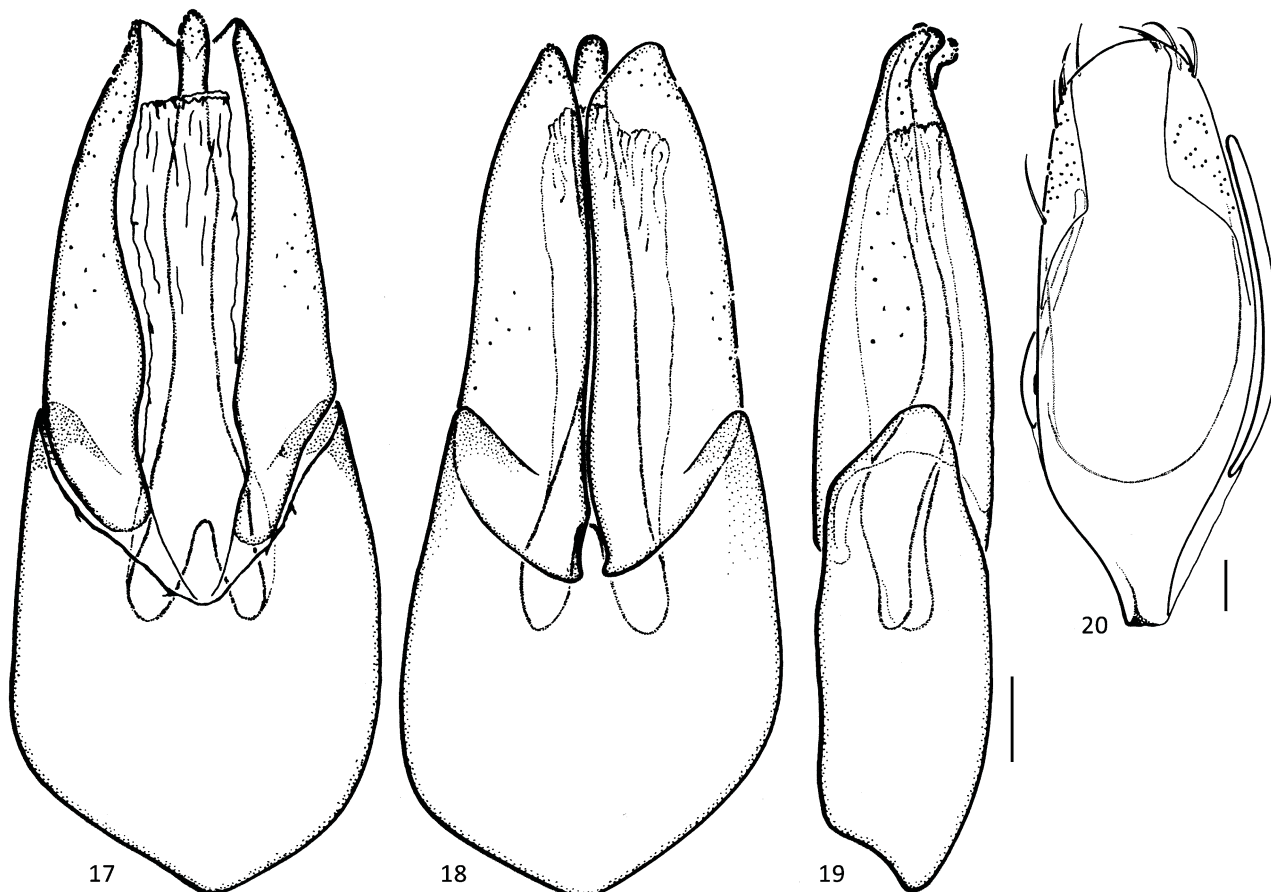
Abdomen. Intercoxal process of first ventrite triangular, longer than wide, lateral margins raised continuously into carinae reaching posterior margin of ventrite, apex subacute; admesal cavities short, oblique; lateral portion of ventrite I with larger setigerous punctures; posterolateral angles of ventrite II–IV feebly protruding posteriad; apex of ventrite V rounded. Ninth segment with spiculum gastrale as in Fig. 40.

Aedeagus (Figs. 21–23): in ventral/dorsal view phallobase wide, slightly longer than median lobe, subparallel, widest in middle, with distinct basal process; parameres ca. 0.75 times as long as phallobase, widest around middle, slightly constricted subapically, apices widely rounded in lateral view, obliquely truncated in ventral/dorsal view; median lobe slightly longer than parameres, widest near middle, strongly narrowed apically, sinuate in lateral view, dorsal side with distinct apical keel; fibula indistinct; ventral sac robust, finely sculptured in apical portion.

Ovipositor (Figs. 41, 42) robust, long, with terminal segment short, cylindrical, bearing several types of sensilla; preterminal segment distinctly elongate 4.9 times as long as terminal segment, with pair of distinct sensilla; basal segment ca. 1.3 times as long as preterminal and distal segments combined, fulcrum ventrale feebly curved.

Distribution. So far known only from a few localities in the Malaysian state of Sabah.

Etymology. The species name is from latin *grandis*—big, as this is the biggest known species of the genus.



FIGURES 17–20. *Dryopomorphus pekariki* n.sp. (holotype): 17) aedeagus ventral view; 18) aedeagus dorsal view; 19) aedeagus lateral view; 20) segment 9 and spiculum gastrale. Scale bar: 0.1 mm.

***Dryopomorphus jaechi* n.sp.**

Figs. 6, 24–26, 43, 44

Type locality: Malaysia, Sarawak, Baan Gong Sikog waterfall

Type material: **holotype** male (NMW): "MAL., Sarawak, 1993, 40km S Kuching, 17.2., Baan Gong Sikog Wasserf., leg. M. Jäch (3)", **paratypes** (CCB, CKB, NMW): 2 males, 1 female: "MAL., Sarawak, 1993, 40km S Kuching, 17.2., Baan Gong Sikog Wasserf., leg. M. Jäch (3)", 1 female: "MAL., Sarawak, 1993, 80km S Kuching, 18.2., Kampung Ana Rais., leg. M. Jäch (4)".

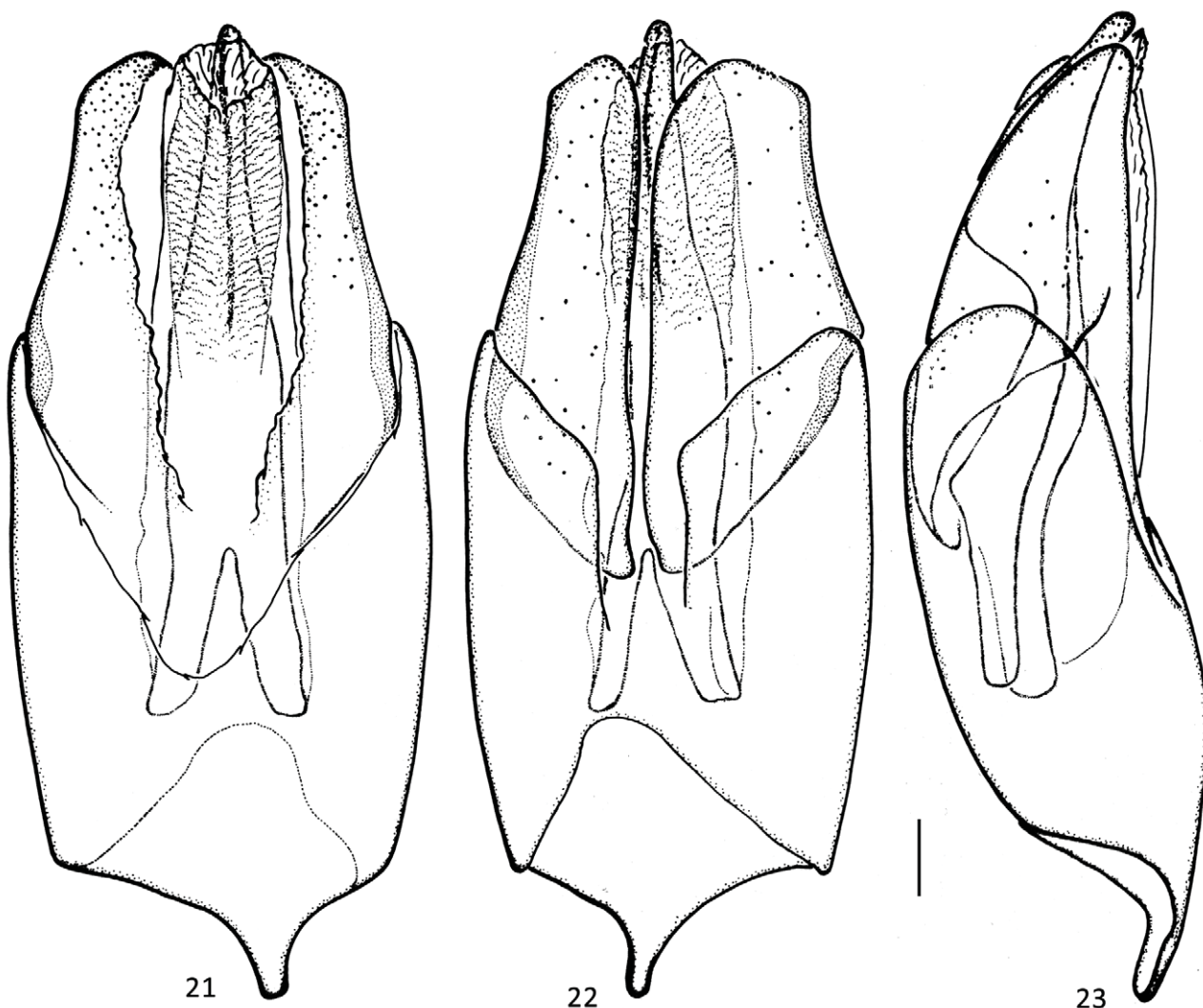
Diagnosis: body elongate; coloration dark, almost black; pronotum without median longitudinal line; pronotum with larger punctures; parameres elongate, very thin in apical half; phallobasis distinctly short.

Description. Body elongate, larger species (CL: 4.00–4.30 mm), 2.17–2.25 times as long as wide (CL/EW), convex dorsally (Fig. 6); dorsal surface with dense short pale setae and sparser longer semierect setae. Coloration of head, pronotum, elytra, femora and tibiae dark almost black; tarsi, antennae and anterior angles of pronotum brown.

Head partly retractable into thorax. Labrum shorter than wide, about as long as clypeus, partly concealed by clypeus, densely setose, lateral angles rounded with brush of long curved yellowish setae, anterior margin straight; clypeus longer and wider than labrum, about twice as wide as long, densely setose; frontoclypeal suture visible,

straight; surface of clypeus and labrum punctured, interstices shiny. Eyes large, slightly protruding from head outline, suboval in lateral view, ID: 0.49–0.51 mm; surface not raised near dorsal margin of eyes; frons and vertex irregularly densely punctured, interstices shiny, punctures setose.

Thorax. Pronotum widest before basal third, PW: 1.37–1.49 mm, PL: 0.93–0.98 mm; disc convex, with larger setigerous punctures separated by 1–2 times puncture diameter; sides convex, slightly explanate, anterior angles more explanate than sides, produced, rounded; hypomeron subparallel, anteriorly about three times as wide as protibia, anterior depression well impressed, surface rough, densely setose. Sublateral basal sulci less developed, short, almost straight, present about along posterior 0.2 of pronotum. Prosternal process widened in basal half, parallelsided in apical half, about 1.8 times as long as prosternum in front of coxae, lateral margins raised, posterior margin distinctly produced medially; surface of disc glabrous, those of sides rugose. Mesoventrite short, widest in middle, markedly constricted between coxae, mesoventral cavity deep. Metaventrite very finely impressed anteriorly between coxae; discrimen narrow, present along whole length; disc flat, sides with larger punctures, with row of deep partly fused punctures before each metacoxa, surface equally pubescent as prosternum. Elytra 3.07–3.37 mm long (EL), 1.84–1.98 mm wide (EW); disc convex, densely pubescent; sides slightly widened in anterior half, then gradually arcuately converging posteriad, narrowly explanate; anterolateral corners rounded; humerus feebly prominent; epipleuron widest anteriorly, slightly inflected at level of metacoxa, narrowed posteriad, with distinct anterior transverse carina. Each elytron with ten striae, punctures small and deep; striae not impressed; intervals not convex, with dense micropunctuation. Scutellum longer than wide, subpentagonal. Legs pubescent, not modified; tibiae relatively long, mid- and hind tibiae without pubescence on upper side, with rows of cleaning fringes.



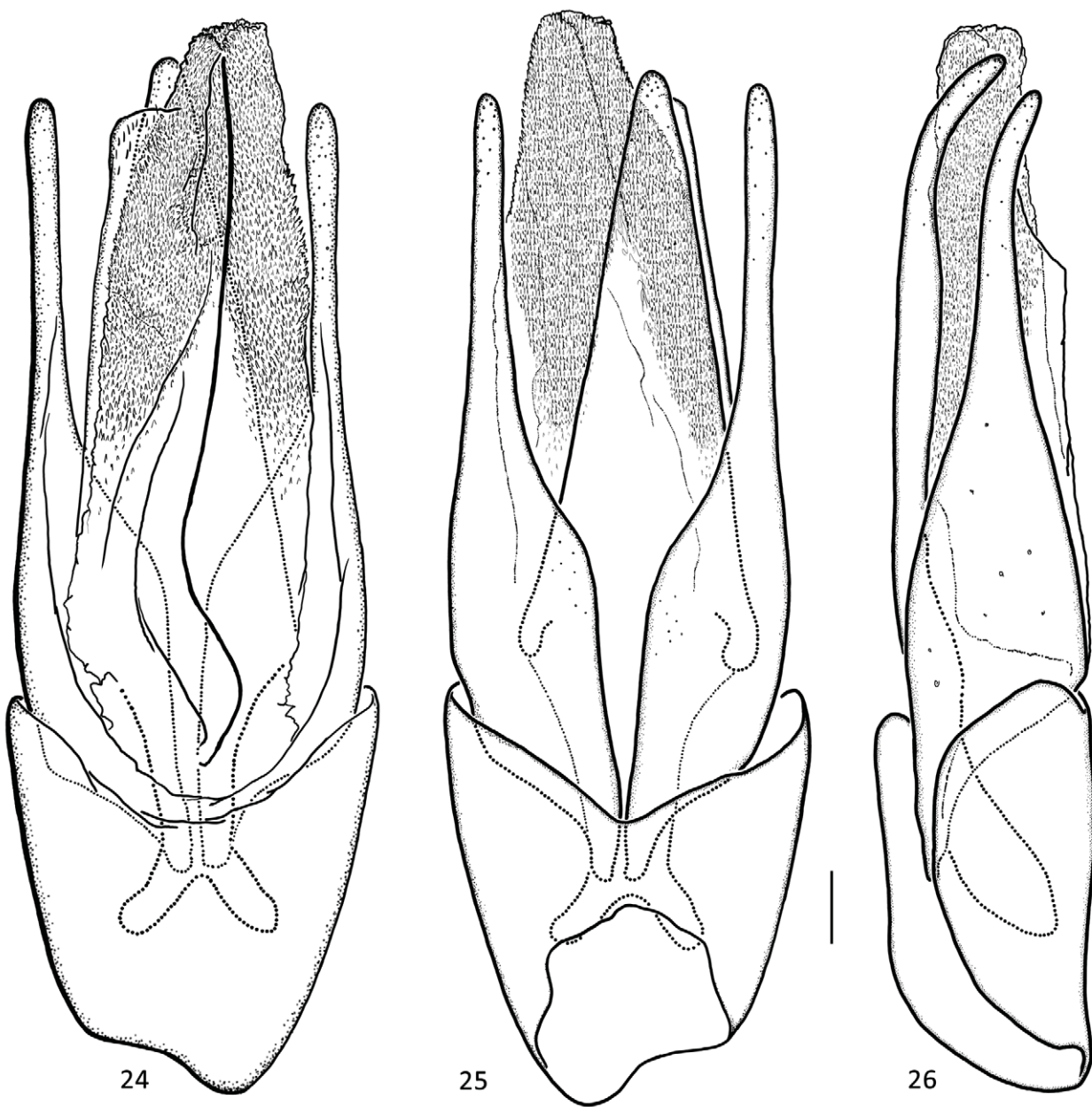
FIGURES 21–23. *Dryopomorphus grandis* n.sp. (holotype): 21) aedeagus ventral view; 22) aedeagus dorsal view; 23) aedeagus lateral view. Scale bar: 0.1 mm.

Abdomen. Intercoxal process of first ventrite triangular, longer than wide, lateral margins raised continuously into carinae reaching posterior margin of ventrite, apex subacute; admesal cavities short, oblique; lateral portion of ventrite I without distinct larger setigerous punctures; posterolateral angles of ventrite III–IV very feebly protruding posteriorly; apex of ventrite V rounded.

Aedeagus (Figs. 24–26): in ventral/dorsal view phallobase wide, widest apically, distinctly narrowed toward base, with moderate rounded basal projection; parameres almost twice as long as phallobase, wide in basal half, very narrow in apical half, apices rounded; median lobe subequal in length with parameres, arrow-shaped, distinctly widened in basal third; fibula very long and narrow; ventral sac robust, finely sculptured in apical half; in lateral view parameres wide in basal half, very narrow in apical half, with finely curved apices, median lobe narrow, straight, apex curved. Ovipositor (Figs. 43, 44) with terminal segment short, cylindrical, bearing several types of sensilla; preterminal segment 4.5 times as long as terminal segment, with pair of distinct sensilla in reticulated cuticle; basal segment almost 1.3 times as long as preterminal and distal segments combined, fulcrum ventrale curved in apical and distal parts.

Distribution. So far known only from a few localities in the Malaysian state of Sabah.

Etymology. This species is dedicated to Manfred A. Jäch, who kindly provided the material for this study.



FIGURES 24–26. *Dryopomorphus jaechi* n.sp. (holotype): 24) aedeagus ventral view; 25) aedeagus dorsal view; 26) aedeagus lateral view. Scale bar: 0.1mm.

***Dryopomorphus sarawacensis* n.sp.**

Figs. 7, 27–30, 45, 46

Type locality: Malaysia, Borneo, Sarawak, Rumah Ugap stream—lowland stream surrounded by dense primary dipterocarp forest. The stream is 2–3 m broad and up to 60 cm deep, with gloomy water (probably due to erosion in upstream areas).

Type material: **holotype** male (NMW): "SARAWAK (Borneo), ca. 40km SE KAPIT, 03.1994, J. Kodada leg. / Rumah Ugap, stream in dense primary dipterocarp forest", **paratypes** (CCB, CKB, NMW): 13 exs. "SARAWAK (Borneo), ca. 40km SE KAPIT, 03.1994, J. Kodada leg. / Rumah Ugap, stream in dense primary dipterocarp forest", 38 exs. "SARAWAK (Borneo), ca. 40km SE KAPIT, 03.1994, J. Kodada leg.", 31 exs. "SARAWAK (Borneo), ca. 40km SE KAPIT, 3.1994, J. Kodada leg.", 50 exs. "SARAWAK (Borneo), ca. 25km E KAPIT, III.1994, Kodada leg.", 3exs. "MAL., Sarawak 1993, 40km S Kuching, 17.2., Baan Gong Sikog Wasserf [waterfall] leg. M. Jäch (3)", 1ex. "MAL., Sarawak 1993, 80km S Kuching, 18.2., Kampung Aná Rais leg. M. Jäch (4)".

Diagnosis: body form elongate; smaller species; pronotum with indistinct median longitudinal line; femora reddish-brown; parameres irregularly shaped in apical half; median lobe with knife-shaped apex.

Description. Body elongate, size smaller, CL: 2.82–3.09 mm, 2.17–2.36 times as long as wide (CL/EW), convex dorsally (Fig. 7); body outline subparallel; dorsal surface with very dense short adpressed yellowish setae and sparser longer semierect setae. Coloration of head black, pronotum, elytra, tibiae dark brown, femora, tarsi, antennae and lateral margins of elytra reddish brown.

Head partly retractable into thorax. Labrum shorter than wide, ca. as long as clypeus, partly concealed by clypeus, densely setose, lateral angles rounded with brush of long curved yellowish setae; clypeus longer and wider than labrum, about twice as wide as long, densely setose; frontoclypeal suture visible, straight; surface of clypeus and labrum densely punctured. Eyes large, slightly protruding from head outline, subtriangular in lateral view, ID: 0.38–0.48 mm; surface not raised near dorsal margin of eyes; frons and vertex irregularly densely punctured, interstices shiny, punctures setose.

Thorax. Pronotum widest in basal third, PW: 1.05–1.18 mm, PL: 0.65–0.80 mm; disc convex, punctures well impressed, on sides separated by their diameter with interstices shiny, on disc denser; lateral margins distinctly explanate, in anterior 0.6 converging in nearly straight line toward subacute produced anterior angles; hypomeron subparallel, narrowed posteriad, anteriorly about three times as wide as protibia, anterior depression shallow, surface rough, with moderately dense long hairs, anterior depression microreticulate. Sublateral basal sulci shallow, straight, present ca. along posterior 0.35 of pronotum. Prosternal process ca. 1.6 times as long as prosternum in front of coxae, lateral margins raised, posterior margin distinctly produced medially, surface of prosternum rugose with denser small and sparser longer setae. Mesoventrite short, widest in middle, markedly constricted between coxae, mesoventral cavity deep. Metaventricle impressed anteriorly between coxae; discrimin thin, present from anterior depression to posterior margin; disc flat, lateral sides with larger punctures, with row of deep partly fused punctures before each metacoxa, surface as on prosternum. Elytra 2.17–2.45 mm long (EL), 1.27–1.41 mm wide (EW); disc convex, densely pubescent; sides parallel in anterior half, then gradually arcuately converging posteriad, narrowly explanate; anterolateral corners rounded; humeri feebly prominent; epipleuron widest anteriorly, slightly inflected at level of metacoxa, narrowed posteriad, with distinct anterior transverse carina. Each elytron with ten striae; strial punctures in anterior part and in admesal rows smaller, in lateral rows larger and more distinct, striae not impressed; intervals not convex, with dense micropunctuation. Scutellum as long as wide, sides arcuate. Legs relatively short, not modified, hind tibiae longest, mid tibiae shortest.

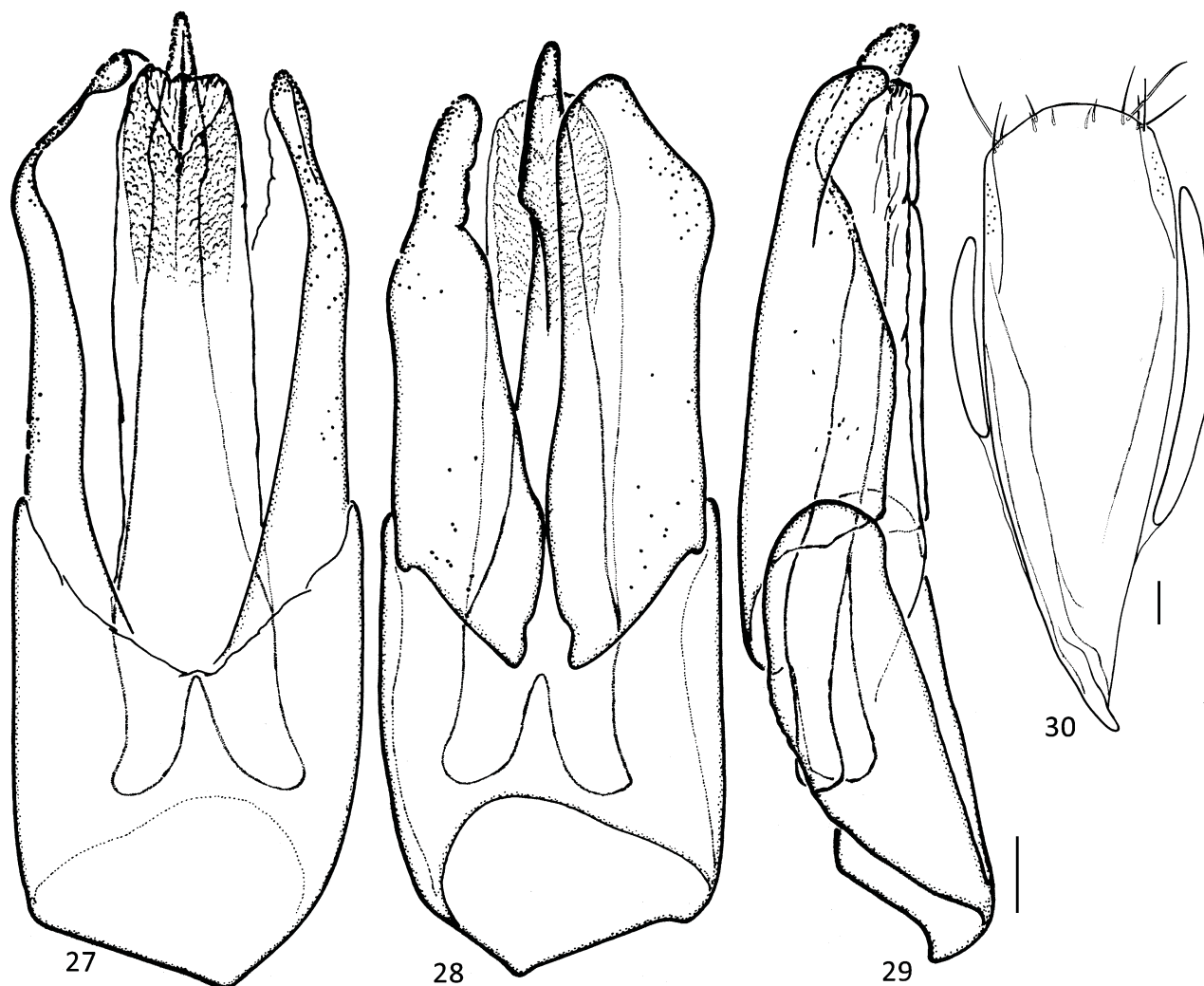
Abdomen. Intercostal process of first ventrite triangular, longer than wide, lateral margins raised continuously into carinae reaching posterior margin of ventrite, apex subacute; admesal cavities short, oblique; lateral portion of ventrites I–III without larger punctures; posterolateral angles of ventrite III–IV protruding posteriad; apex of ventrite V rounded.

Ninth segment with spiculum gastrale as in Fig. 30. Aedeagus (Figs. 27–29): in ventral/dorsal view phallobase wide, subparallel, widest in middle, without basal process, only with moderate basal projection; parameres ca. 1.25 times longer than phallobase, unevenly shaped; median lobe slightly longer than parameres, widened toward base; fibula indistinct; ventral sac robust, finely sculptured in apical portion; in lateral view parameres finely curved apically, median lobe very narrow, sinuate, apex with distinct keel on dorsal side (knife-shaped). Ovipositor (Figs. 45, 46) slender, with terminal segment short, cylindrical, bearing several types of sensilla; preterminal segment

distinctly elongate 10.6 times as long as terminal segment, with pair of distinct sensilla; basal segment subequal in length with preterminal and distal segments combined, fulcrum ventrale feebly curved.

Distribution. So far known only from the type locality.

Etymology. This species is named after the Malaysian state of Sarawak, where it was collected.



FIGURES 27–30. *Dryopomorphus sarawacensis* n.sp. (holotype): 27) aedeagus ventral view; 28) aedeagus dorsal view; 29) aedeagus lateral view; 30) segment 9 and spiculum gastrale. Scale bar: 0.1 mm.

***Dryopomorphus memei* n.sp.**

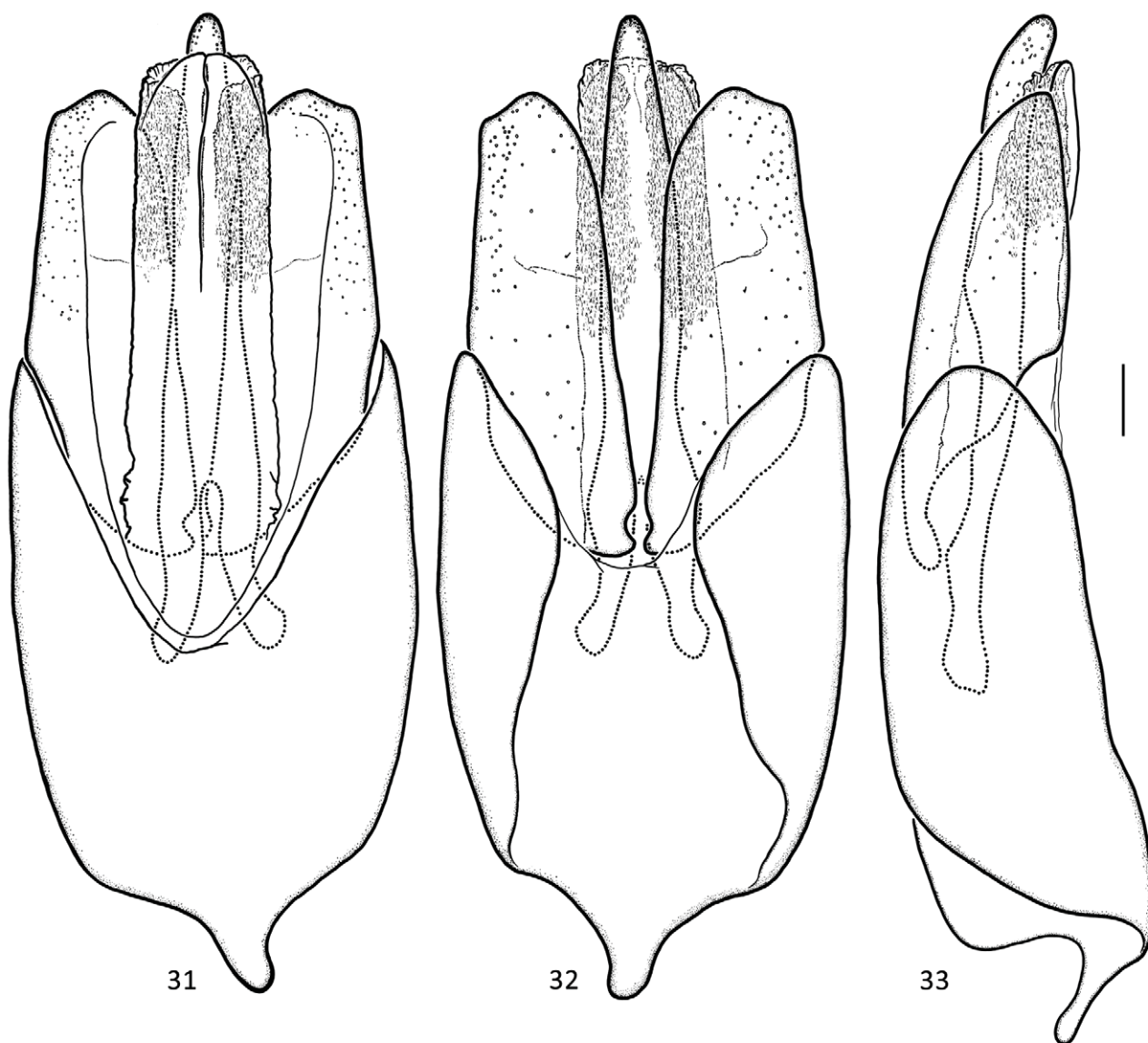
Figs. 8, 31–33, 47, 48

Type locality: Malaysia, Sarawak, Kelabit highlands, Umg. Bario.

Type material: **holotype** male (NMW): "MAL., Sarawak, 1993, Kelabit HL, Umg. Bario, 28.2., 1000–1200m, leg. M. Jäch (16)", **paratypes** (CCB, CKB, NMW): 5 males, 5 females, 9 unsexed exs.: "MAL., Sarawak, 1993, Kelabit HL, Umg. Bario, 28.2., 1000–1200m, leg. M. Jäch (16)", 23 exs.: "MAL., Sarawak, 1993, Kelabit HL, Umg. Bario, 26.2., ca. 1000m, leg. M. Jäch (14)", 3 unsexed exs.: "MAL., Sarawak, 1993, Kelabit HL, 5km E Bario, Pa Ukat, 1.3., ca. 1000m, leg. M. Jäch (17)".

Diagnosis: larger species; body form elongate; resembles *D. grandis* sp.nov., from which it differs in darker femora and median lobe with simple rounded apex.

Description. Body elongate, CL: 3.88–4.07 mm, 2.11–2.26 times as long as wide (CL/EW), convex dorsally (Fig. 8); dorsal surface with dense short pale setae and sparser longer semierect setae. Coloration of head, pronotum, elytra, femora and tibiae dark almost black, tarsi, antennae and anterior pronotal angles brown.

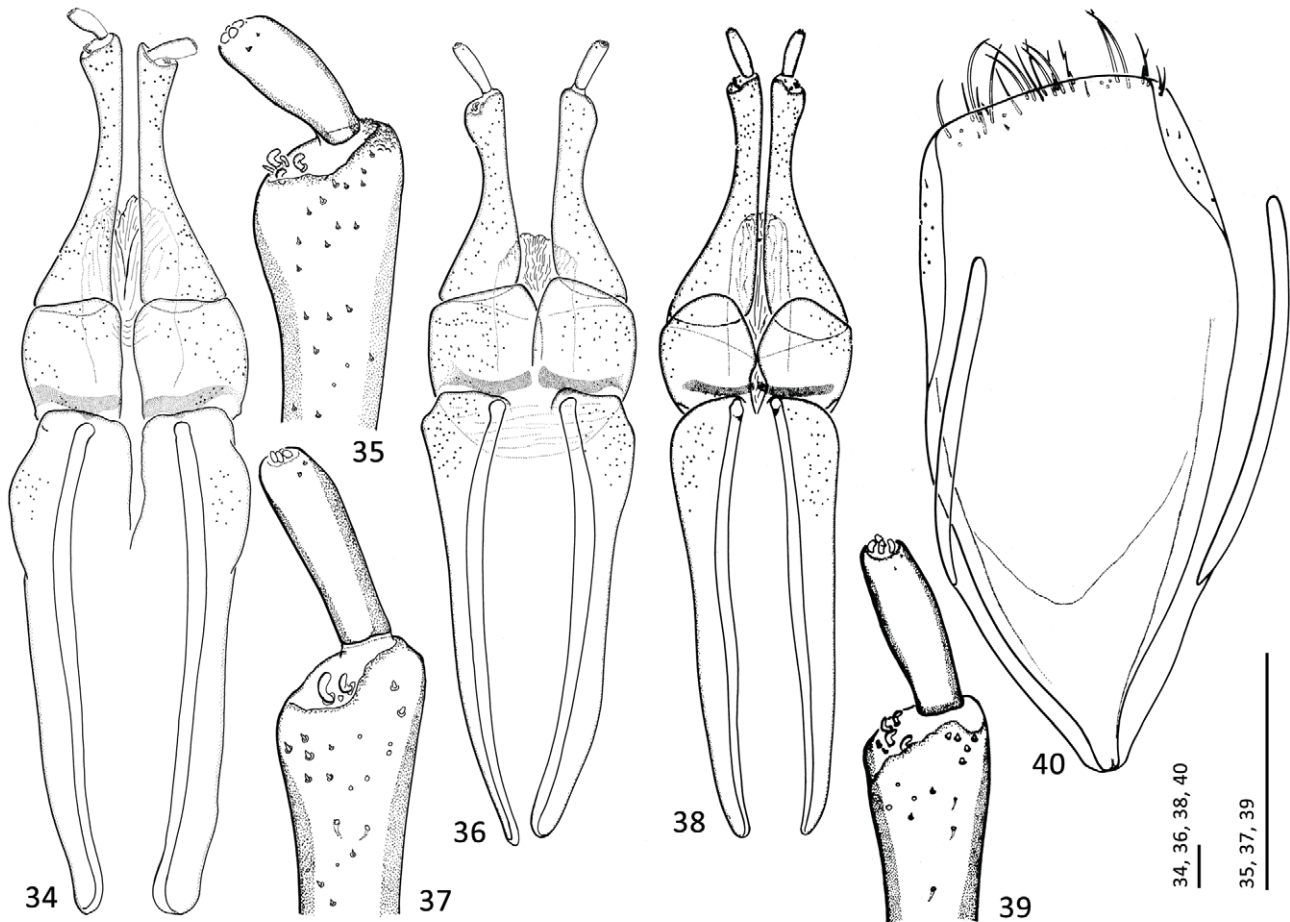


FIGURES 31–33. *Dryopomorphus mamei* n.sp. (holotype): 31) aedeagus ventral view; 32) aedeagus dorsal view; 33) aedeagus lateral view. Scale bar: 0.1 mm.

Head partly retractable into prothorax. Labrum shorter than wide, ca. as long as clypeus, partly concealed by clypeus, densely setose, lateral angles rounded with brush of long curved yellowish setae, anterior margin straight; clypeus longer and wider than labrum, about twice as wide as long, densely setose; frontoclypeal suture visible, straight; surface of clypeus and labrum densely punctured. Eyes well developed, slightly protruding from head outline, suboval in lateral view, ID: 0.49–0.56 mm; surface not raised near dorsal margin of eyes; frons and vertex irregularly densely punctured, interstices shiny, punctures setigerous.

Thorax. Pronotum widest before base, PW: 1.33–1.42 mm, PL: 0.84–0.92 mm; disc convex, surface with larger setigerous punctures separated by 1–2 times puncture diameter; sides convex, slightly explanate, anterior angles more explanate than sides, produced, rounded; hypomeron subparallel, anteriorly ca. three times as wide as protibia, anterior depression well impressed, surface glabrous, densely setose. Sublateral basal sulci almost straight, present ca. along posterior 0.4 of pronotum. Prosternal process parallelsided, ca. 1.8 times as long as prosternum in front of coxae, lateral margins markedly raised, posterior margin distinctly produced medially; surface glabrous. Mesoventrite short, widest in middle, markedly constricted between coxae, mesoventral cavity deep. Metaventrite impressed anteriorly between coxae; discrimen suture thin, present along whole length or interrupted behind anterior depression; disc flat, sides with larger punctures, with row of deep partly fused punctures before each metacoxa, surface equally pubescent as prosternum. Elytra 3.04–3.22 mm long (EL),

1.77–1.88 mm wide (EW); disc convex, densely pubescent; anterior margin sinuate, sides parallel in anterior half, then gradually arcuately converging posteriad, narrowly explanate; anterolateral corners rounded; humeri feebly prominent; epipleuron widest anteriorly, slightly inflected at level of metacoxa, narrowed posteriad, with distinct anterior transverse carina. Each elytron with ten striae, these not impressed, punctures small and deep; intervals flat, with dense micropunctuation. Scutellum longer than wide, drop-shaped. Legs pubescent, not modified, tibiae relatively long, mid and hind tibiae without pubescence on upper side, with rows of cleaning fringes.



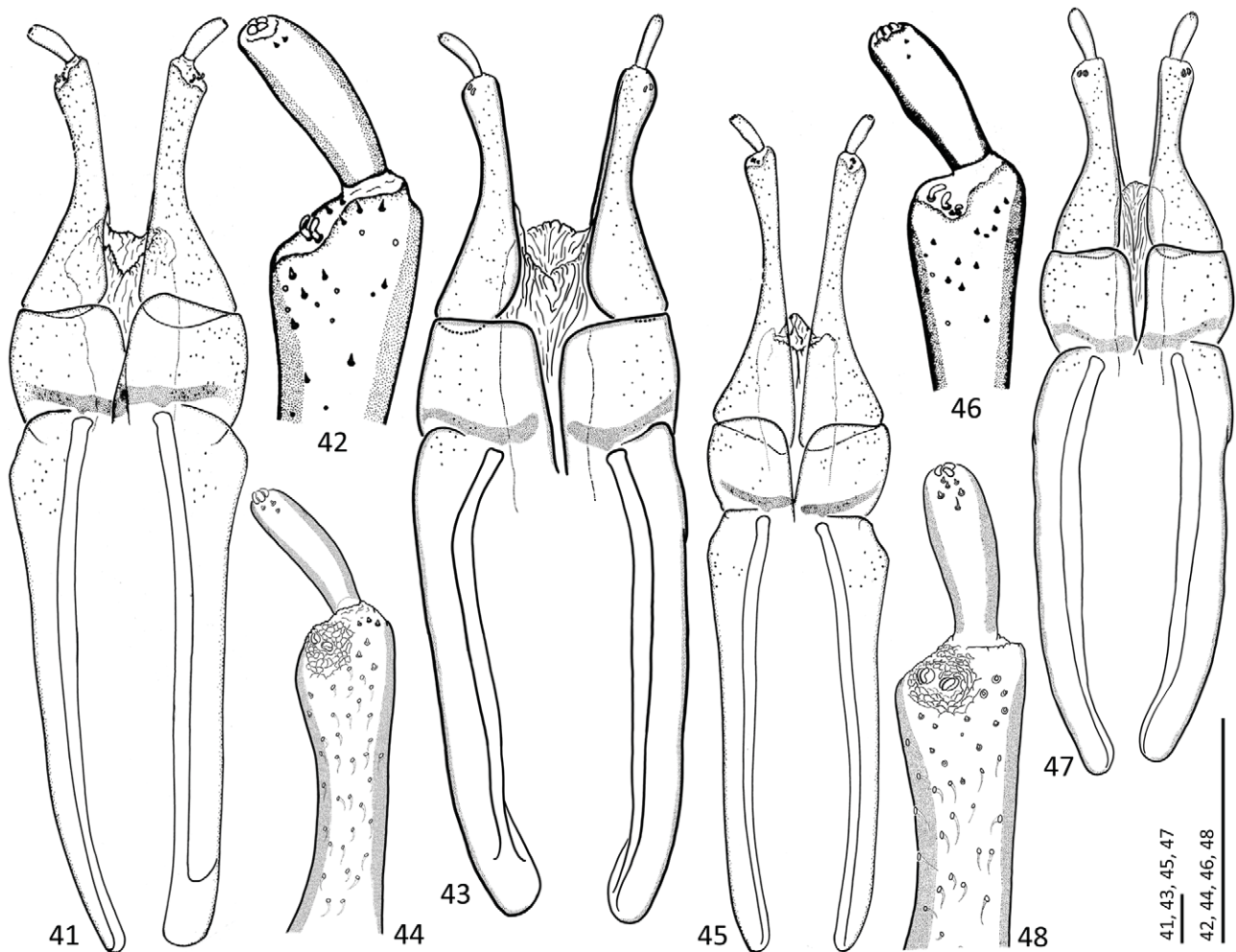
FIGURES 34–40. 34–39, Ovipositors: 34) *D. bishopi* Hinton, 1971; 35) same, detail of terminal segment; 36) *D. satoi* Spangler, 1985; 37) same, detail of terminal segment; 38) *D. pekariki* sp.nov.; 39) same, detail of terminal segment; 40) segment 9 and spiculum gastrale of *D. grandis* n.sp. Scale bar: 0.1 mm.

Abdomen. Intercostal process of first ventrite triangular, longer than wide, lateral margins raised continuously into carinae reaching posterior margin of ventrite, apex subacute; admesal cavities short, oblique; lateral portion of ventrite I with distinct larger setigerous punctures; posterolateral angles of ventrite III–IV very feebly protruding posteriad; apex of ventrite V rounded.

Aedeagus (Figs. 31–33) wide, phallobase as long as penis, basal process distinct; parameres ca. 0.7 times as long as phallobase, wide in dorsal or ventral view, in lateral view distinctly narrowed toward apex; median lobe feebly developed, slightly longer than parameres, apex round; fibula feebly developed; ventral sac robust, finely sculptured in apical portion; penis in dorsal view narrow, slightly widened basally, in lateral view slightly sinuate, basolateral apophyses moderately long. Ovipositor (Figs. 47, 48) with terminal segment short, cylindrical, bearing several types of sensilla; preterminal segment 3.6 times as long as terminal segment, with pair of distinct sensilla; basal segment ca. 1.4 times as long as preterminal and distal segments combined, fulcrum ventrale curved.

Distribution. Known from several localities in the Crocker Range Mountains, Sabah, Malaysia.

Etymology. This species is dedicated to the very good friend of the daughter of the junior author, called Meme.



FIGURES 41–48. Ovipositors: 41) *D. grandis* n.sp.; 42) same, detail of terminal segment; 43) *D. jaechi* n.sp.; 44) same, detail of terminal segment; 45) *D. sarawacensis* n.sp.; 46) same, detail of terminal segment; 47) *D. memei* n.sp.; 48) same, detail of terminal segment. Scale bar: 0.1 mm.

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