

New species and new records of *Ptomaphaginus* Portevin from the Sunda region, Southeast Asia (Coleoptera: Leiodidae: Cholevinae)

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This paper aims to fill some gaps in the taxonomic knowledge of the genus *Ptomaphaginus* for the Sunda region (in insular and peninsular Southeast Asia). We have refrained from a full regional revision. However, we present new distribution records for the following previously described species: *Ptomaphaginus murphyi* Szymczakowski, 1970 (Malaysia); *P. rufus* Jeannel, 1936 (Malaysia); *P. tarsalis* Szymczakowski, 1964 (Sumatra); *P. aff. scaphaner* Szymczakowski, 1972 (Malaysia, Java); *P. sinuatus* Schilthuisen, 1984 (Java); *P. baliensis* Perreau, 1995 (Sumatra). We also name 12 new species: *P. anas* spec. nov. (Malaysia); *P. bryantioides* spec. nov. (Borneo); *P. caroli* spec. nov. (Borneo), *P. similipes* spec. nov. (Borneo); *P. kinabaluensis* spec. nov. (Borneo); *P. latimanus* spec. nov. (Borneo); *P. burckhardtii* spec. nov. (Borneo); *P. giachinoi* spec. nov. (Sumatra); *P. agostii* spec. nov. (Java); *P. kurbatovi* spec. nov. (Java); *P. loeblianus* spec. nov. (Sumatra). *P. sabahensis* spec. nov. (Borneo), and one new synonym (*P. balazuci* Perreau, 1995 syn. nov. for *P. obtusus* Szymczakowski 1959). Finally, we highlight a group of species with a characteristically shaped aedeagus, which are targeted for further phylogenetic and evolutionary study. In view of the 250th anniversary of zoological nomenclature, we name one species in honour of Carolus Linnaeus.

Introduction

The Oriental genus *Ptomaphaginus* Portevin consists mostly of very small, alate soil-dwelling beetles, which presumably, like most Cholevinae, are saprophages or scavengers at dung and carrion (Newton, 1998). Although two taxonomic revisions have appeared in the 20th century (Jeannel, 1936; Szymczakowski, 1964), their full diversity has only become apparent in the last thirty-five years with the works of Szymczakowski (e.g. Szymczakowski, 1970, 1972, 1974) and Perreau (e.g. Perreau, 1988, 1993, 1996). Even excluding the 16 species that were recently placed in a new genus, *Ptomaphaminus* Perreau, 2000, the currently known diversity in *Ptomaphaginus* s. str. stands at some 70 species, with much more material still awaiting description.

Besides its potential for further taxonomic work, the genus is suited for evolutionary studies for several reasons. Firstly, while very uniform in general body shape, the species offer a wide range of shapes in primary and secondary sexual characters (aedeagus, genital segment, abdominal tergites, and protarsi in males; spermatheca and

elytral apices in females), which begs intriguing questions about the evolution of sexual traits (see Eberhard, 1985). Secondly, certain forms have entered subterranean environments and show some degree of cave-adaptation, a subject that has always been dominated by research in the temperate zones, and which badly needs input from tropical systems (Peck & Finston, 1993). Thirdly, preliminary data (this paper and unpublished) suggest that distribution patterns of related species are often complex and small-scale, making studies of speciation an interesting possibility. And finally, ptomaphagines appear to be cultured relatively easily under laboratory conditions, which allows experimentation into, e.g., reproductive isolation, as pioneered by Peck (1983).

In conjunction with a recently started evolutionary research programme on *Ptomaphaginus* at Universiti Malaysia Sabah (e.g., Ng, 2003; Schilthuizen, 2003, 2006), this paper aims to fill some gaps in the taxonomic knowledge of the genus for as far as the Sunda region fauna (insular and peninsular Southeast Asia) is concerned. We have refrained from a full regional revision, since we feel the available data are still too scanty. However, we present new distribution records for several previously described species, we name 12 new species, give one new synonym, and we highlight a group of species with a characteristically shaped aedeagus, which is targeted for further phylogenetic and evolutionary study. In view of the 250th anniversary of zoological nomenclature, we name one species in honour of Carolus Linnaeus: *P. caroli* spec. nov.

Material and Methods

The material for this paper was collected in Malaysia by the first author, supplemented with materials from various collections. Holotypes of the new species were returned to the collection of origin, and paratypes were distributed among several collections, where possible. Abbreviations: BMNH, British Museum (Natural History), London, United Kingdom; BOR, Borneensis Collection, Institute for Tropical Biology and Conservation, Universiti Malaysia Sabah, Kota Kinabalu, Malaysia; CJRZ, Collection Jan Ružička, Prague, Czech Republic; CMNC, Canadian Museum of Nature, Aylmer, Quebec, Canada; CMPR, Collection Michel Perreau, Paris, France; CPMG, Collection Pier Mauro Giachino, Torino, Italy; FRCS, Forest Research Centre, Sabah Forestry Department, Sepilok, Malaysia; HNHM, Hungarian Natural History Museum, Budapest, Hungary; IZSEC, Institut de la Zoologie Systématique et Expérimentale, Cracow, Poland; MHNG, Muséum d'Histoire Naturelle de Genève, Switzerland; MSC, Menno Schilthuizen Collection, Schiedam, The Netherlands; RMNH, National Museum of Natural History "Naturalis", Leiden, The Netherlands (formerly Rijksmuseum van Natuurlijke Historie); SBPC, Stewart B. Peck Collection, Ottawa, Canada; SMNS, Staatliches Museum für Naturkunde, Stuttgart, Germany; ZRC, Raffles Museum, National University of Singapore; ZMA, Zoological Museum Amsterdam, University of Amsterdam, Amsterdam, The Netherlands.

Measurements were carried out using a Zeiss KS100 imaging system. Specimens to be measured were chosen to lie on both extremes of the variability range for the trait in question, so that the total range of values is expected to be captured by measuring a small number ('n') of specimens.

Systematic Part

The first nine species in the Systematic Part, of which all but *P. sinuatus* and *P. bryanti* are new, form a possibly monophyletic group of species with distributions on Borneo, Sumatra, and Java, characterised by the presence of two lateral flaps on the aedeagal apex (see above).

***Ptomaphaginus bryanti* Jeannel, 1936**
(fig. 13)

Ptomaphaginus bryanti Jeannel, 1936: 56-59, figs 63-66.— Holotype ♂ 'Type' [round white label with red rim], 'Mt. Matang, W. Sarawak, G.E. Bryant, 16.i.14' [white rectangular label], 'G. Bryant Coll. 1919-147' [white rectangular label], 'L2' [white rectangular label], 'TYPE' [white label with red print], 'See slide 5 (Jeannel 1934)' [white rectangular label], 'Ptomaphaginus bryanti n. sp. R. Jeannel det.' [white rectangular label, Jeannel's hand] in BMNH [examined]. Microscope slide, left-hand side: 'Ptomaphaginus bryanti n. sp. Jeannel, Type, Mt. Matang' [white square label, Jeannel's hand, the word 'Type' underlined in red], '1919-147 (B.M.), org. copul. ♂ (Slide 5, Jeannel 1934)' [white square label, the words 'org. copul. ♂' in Jeannel's hand], 'Type' [round white label with red rim] in BMNH [examined, and remounted (with permission) as dry mount on the pinned card].— *Ptomaphaginus bryanti* Szymczakowski 1964: 135-137, figs 14, 116-119 (redescription).

Remarks.— The aedeagus of this species was figured by Jeannel (1936: fig. 66; reproduced in fig. 13) as a highly asymmetric structure, with a long terminal and a single lateral processus. Re-examination of the type specimen, however, showed that the weakly sclerotised aedeagus was embedded in the microscope slide in a folded condition, which obscured the presence of a second lateral processus. After remounting, it became apparent that the aedeagus is in fact almost symmetrical. Its shape is very similar to that of specimens from Sabah, which we describe below as *P. bryantioides* spec. nov. *P. bryanti*, however, differs from the new species in having a much more slender habitus.

P. bryanti Jeannel, together with the new species *P. bryantioides* spec. nov., *P. kinabaluensis* spec. nov., *P. latimanus* spec. nov., *P. caroli* spec. nov., and *P. similipes* spec. nov. appear to form a group of closely related species which differ strongly in habitus and secondary sexual characteristics, but are united in the structure of the aedeagus, a generalisation of which may be given as follows. The basal part is symmetrical, 1.5 to 2 times as long as wide. The apical part is curved ventrad and has two lateral "wings", which appear to be (partly) composed of the apices of the parameres, as they carry the characteristic styli. Terminally the aedeagus has a thin-walled triangular or elongate processus, which might act as a "guide" for the extrusion of the long, but relatively thick internal styletto.

In fact, the aedeagal structure is more complex and difficult to interpret. The six species united here probably form a monophyletic group, but this needs confirmation with molecular and detailed morphological analysis. It is likely that species with a similar aedeagus, e.g., *P. coronatus* Szymczakowski from Palawan (Philippines) belong in the same group as well.

Ptomaphagus bryantioides spec. nov.
(figs 20-21).

Type material.— Holotype ♂: Malaysia: Sabah: Danum Valley Field Centre (60 km WSW of Lahad Datu), 5°00'N 117°50'E, 15.v.2000, pitfall with chicken, leg. J. de Roode (BOR). Paratypes, same collection data as holotype: 2 ♂♂, 9 ♀♀ (in BOR); same locality as holotype, 22-27.ix.2000, pitfall with human dung, leg. M. Schilthuizen: 2 ♂♂ 1 ♀ (BOR); Malaysia: Sabah: Kiansom (20 km ESE of Kota Kinabalu), 27.ii.1997, flight interception trap, leg. UMS students: 2 ♂♂, 1 ♀ (BOR); same locality, 11.iv.2000, pitfall with chicken, leg. M. Schilthuizen, 1 ♂♂, 1 ♀ (BOR); Malaysia: Sabah: Tun Fuad Stephen Municipal Park (outskirts of Kota Kinabalu), 10-12.iv.2000, pitfall with lamb, leg. M. Schilthuizen, 2 ♂♂, 5 ♀♀ (BOR), 1 ♂ (FRCS); same locality, 24-27.xi.2000, pitfall with dung or beef, leg. M. Schilthuizen, 1 ♂, 3 ♀♀ (BOR); Sugud Forest Reserve, 15 km S of Kota Kinabalu (Sabah), 200 m alt., pitfall with carrion, leg. M. Schilthuizen, 1 ♀ (BOR); Malaysia: Sabah: Batu Punggul Resort, 24.vi-1.vii.1996, flight interception trap, 13 ♂♂, 7 ♀♀ (CJRZ; CMPR).

Additional material (not included in the type series).— Tun Fuad Stephen Municipal Park, 24-27.ix.2000, 4 ♂♂, 9 ♀♀ in 70% ethanol; Kiansom, 25-29.xii.2000, 8 specimens of unidentified sex in 70% ethanol; Kiansom, 27.ii.1997, 2 specimens of unidentified sex in 100% ethanol; Danum Valley Field Centre, 15.v.2000, 2 specimens of unidentified sex in 100% ethanol. (For full collection details, see Type material above.)

Diagnosis.— Habitus broad, rectangular, flat. Thorax on average 1.8 times as wide as long. Aedeagus (figs 20-21) with two apical lateral 'wings' and a long terminal processus. Male forelegs with long hairs on the ventral side of the profemur and protibia.

Description.— Habitus broad and rectangular, relatively flat. Moderately pigmented: mostly chestnut brown; only the tarsi and the edges of thorax and elytra lighter brown. Length 2.1-2.9 mm (n = 26). Antennae slender and relatively long, 1.1-1.2 times as long as the width of the head (n = 5). Articles 6, 9, and 10 square. Male protarsi moderately dilated: the protibia at its largest width (excluding the lateral spines) is 1.5 times broader than the first article of the protarsus (n = 1). Female protarsi undilated. In the male, the ventral side of profemur and protibia carry long hairs, some of which are as long as the tarsus. Thorax 1.76-1.84 times as wide as long (n = 5), relatively flat, with the caudal corners distinctly drawn out. The mesosternal carina is strongly developed, its edge somewhat thickened. Elytra short, as long (measured from the caudal tip of the scutellum) as their combined width. Elytral apices distinctly truncate, identical in both sexes. The 3rd-5th visible abdominal sternite in the male each have a broad and very indistinct central notch and are slightly depressed in the vicinity of these notches. Aedeagus (figs 20-21) in dorsal view abruptly narrowing towards the apex, and there adorned with two lateral 'wings'. The tip is composed of a long, fragile and slightly asymmetric processus. In lateral view, the aedeagus is moderately curved, the terminal processus lies in the plane of the rest of the aedeagus, whereas the two lateral wings point ventrad. Male genital segment relatively broad, at the apex slightly triangular, 2.5 times as long as wide.

Distribution.— This species is widely distributed in the lowlands of Sabah (all localities lie below 300 m altitude), and apparently has a broad tolerance for habitat types, having been found both in primary (Danum Valley) and in secondary forests (Tun Fuad Stephen Park, Kota Kinabalu).

Remarks.— Based on aedeagal shape, *P. bryantioides* is closely related to *P. bryanti*, from which it differs in the habitus, which is very broad and stocky in *P. bryantioides*.

For example, the thoracic index for the new species is 1.76-1.84, whereas for the holotype of *P. bryanti* it is only 1.56.

Etymology.— *bryantioides*, a Latin adjective, meaning 'like *bryanti*'. The name refers to the similarity in aedeagal shape between these two species.

***Ptomaphagus caroli* spec. nov.**
(figs 14-15; 26).

Type material.— Holotype ♂: Malaysia: Sabah: Crocker Range Park: Gunung Mas (30 km ESE of Kota Kinabalu), 1350 m alt., pitfall with carrion or dung, 31.vii.2000, leg. M. Schilthuisen (BOR).

Diagnosis.— Habitus long and narrow, flat (fig. 26). Elytra 1.41 times as long as their combined width (length measured from the caudal tip of the scutellum to the apex of the elytra). Aedeagus (figs 14-15) apically with two short 'wings' and a very small, indistinct terminal processus.

Description.— Habitus narrow and elongated, relatively flat (fig. 26). Moderately pigmented: mostly chestnut brown; only the legs and the antennal bases and apices lighter yellowish brown. Length 2.7 mm. Antennae slender and relatively long, 1.1 times as long as the width of the head. Articles 6, 9, and 10 slightly wider than long. Male protarsi strongly dilated: the protibia at its largest width (excluding the lateral spines) is 1.2 times broader than the first article of the protarsus. There are no exceptionally long hairs on the ventral side of profemur and protibia. Thorax 1.62 times as wide as long, relatively flat, almost rectilinearly narrowing from caudal to rostral; the caudal corners sharp, narrowly, but distinctly drawn out. The mesosternal carina is strongly developed, its edge somewhat thickened. Elytra long, 1.41 times as long (measured from the caudal tip of the scutellum) as their combined width. Elytral apices distinctly truncate. Aedeagus (figs 14-15) in dorsal view abruptly narrowing towards the apex, and there adorned with two very short lateral 'wings'. The tip carries a short and obtuse triangular processus. In lateral view, the aedeagus is almost not curved, except for the apical quarter, which is bent ventrad under an obtuse angle. Male genital segment relatively broad, at the apex slightly triangular, 2.5 times as long as wide. Female unknown.

Distribution.— Only the holotype is known for this species. At the type locality, it was found syntopically with *P. similipes* spec. nov.

Remarks.— Based on aedeagal shape, *P. caroli* is closely related to *P. bryanti*, *P. similipes* and *P. bryantoides*. However, it differs from all these by the distinctly elongated habitus (elytral index of 1.41) and the apical 'wings' of the aedeagus, which are very short.

Etymology.— Named in honour of Carolus Linnaeus. The present paper appears in conjunction with the 250th anniversary of the publication of Linnaeus' *Systema Naturae* on 1 January 1758, which marks the start of zoological nomenclature.

***Ptomaphagus similipes* spec. nov.**
(figs 18-19; 27-28).

Type material.— Holotype ♂: Malaysia: Sabah: Crocker Range Park, 5°47.079'N 116°20.492'E, 31.x.2000, pitfall with carrion or dung, leg. M. Schilthuisen (BOR). Paratypes same collection data as holotype: 3 ♂♂, 7 specimens of undetermined sex (BOR); Malaysia: Sabah: Crocker Range Park: Gunung Mas (30 km ESE of Kota Kinabalu), 1350 m alt., 31.vii.2000, pitfall with carrion or dung, leg. M. Schilthuisen: 2

specimens of unidentified sex (BOR); Malaysia: Sabah: Sugud Forest Reserve, 15 km S of Kota Kinabalu (Sabah), 200 m alt., 16-20.ix.2001, pitfall with carrion, leg. M. Schilthuizen, 1 ♂, 4 individuals of unidentified sex (BOR); Malaysia: Sabah: Mahua Waterfall (5°47'52.3"N 116°24'19.0"E), 1017 m alt., 2-5.vii.2001, pitfall with carrion or dung, leg. M. Schilthuizen, 1 ♂ (BOR); Malaysia: Sabah: Mount Trus Madi (5°34.152'N 116°29.638'E), 1400 m alt., pitfall with lamb, 23-28.x.2001, leg. M. Schilthuizen, 3 ♂♂, 2 ♀♀, 7 specimens of unidentified sex in 70% ethanol (BOR).

Additional material (not included in the type series).— Type locality, 4 specimens of unidentified sex in 70% ethanol, 2 specimens of unidentified sex in 100% ethanol; Sugud, 7♂♂ in 100% ethanol; Kinabalu Park Headquarters, 5-8.vii.2003, in pitfall with pork, 1 ♂ (DNA isolate). (For full collection details, see Type material above.)

Diagnosis.— Habitus relatively slender, ovoid. Elytra on average 1.2 times as long as their combined width (length measured from the caudal tip of the scutellum to the elytral apices). Aedeagus (figs 18-19) with two short apical lateral 'wings' and a short terminal processus. Male forelegs usually with long hairs on the ventral side of the profemur and protibia. Male protarsi completely undilated, of the same width as in the female (figs 27-28).

Description.— Habitus relatively slender, ovoid. Moderately pigmented: mostly chestnut brown; only the legs, the elytral apices, the tips and the bases of the antennae lighter brown. Length 2.4-3.0 mm (n = 18). Antennae slender and relatively long, 1.1-1.2 times as long as the width of the head (n = 2). Articles 6, 9, and 10 slightly longer than wide. Male and female protarsi completely undilated (figs 27-28): the protibia at its largest width (excluding the lateral spines) is 2.5 times broader than the first article of the protarsus (n = 1). In the male, the ventral side of profemur and protibia carry long hairs, some of which are as long as the tarsus. (In one paratype specimen from Mount Trus Madi, these hairs were absent.) Thorax 1.69-1.80 times as wide as long (n = 3), the caudal corners distinctly drawn out. The mesosternal carina is strongly developed, its edge somewhat thickened. Elytra of medium length, 1.19-1.23 times as long (measured from the caudal tip of the scutellum) as their combined width. Elytral apices distinctly truncate, identical in both sexes. The 3rd-5th visible abdominal sternite in the male each have a broad and relatively distinct central notch and are depressed in the vicinity of these notches. Aedeagus (figs 18-19) in dorsal view abruptly narrowing towards the apex, and there adorned with two short lateral 'wings'. The tip is composed of a short, obtuse, triangular processus. In lateral view, the aedeagus is almost not curved, except for the apical quarter, which is bent ventrad under an obtuse angle. Male genital segment relatively broad, at the apex slightly triangular, 2.5 times as long as wide.

Distribution.— This species is distributed in the Crocker and Trus Madi mountain ranges of western Sabah, where it was found in lower montane forest, but also (Sugud) in lowland forest in the foot hills.

Remarks.— Based on aedeagal shape, *P. similipes* is closely related to *P. caroli*, from which it differs strongly in the habitus, which is very slender in *P. caroli*. It may also be related to *P. coronatus* from Palawan, which has a similar habitus. The undilated protarsi make females and males difficult to distinguish externally.

Etymology.— *similipes*, a Latin composite noun in apposition, meaning 'identical feet'. The name refers to the fact that in this species males and females both have undilated tarsi. The name is based on a suggestion by Jan-Willem van Velzen, a visitor to an exhibition on Linnaean taxonomy in the National Museum of Natural History 'Naturalis', in which the naming of this new species was an exhibit feature.

***Ptomaphagus kinabaluensis* spec. nov.**
(figs 24-25; 29-30).

Type material.— Holotype ♂: Malaysia: Sabah: Mount Kinabalu: Kinabalu Park Headquarters, 1500 m alt., 13-18.i.2001, pitfall with lamb, leg. M. Schilthuizen (BOR). Paratypes same collection data as holotype: 4 ♂♂ 3 ♀♀ (BOR); same locality, 16.v.1987, leg. A. Smetana: 1 ♀ (MHNG); same locality, 21.v.1987, leg. A. Smetana: 2 ♂♂ (MHNG, CMPR), 1 ♀ (CMPR); same locality, 12.viii.1988, leg. A. Smetana: 1 ♂ (MHNG); same locality, 5.viii.1988, leg. A. Smetana: 2 ♂♂ (MHNG, CMPR); Malaysia: Sabah: Mount Kinabalu: Mempening trail, 1600 m, 17.v.1987, leg. A. Smetana: 3 ♂♂ (MHNG, CMPR); Malaysia: Sabah: Crocker Range, 1600 m, km 51 rte Kota Kinabalu, Tambunan, 18.v.87, leg. Burckhardt & Löbl, 1 ♂ (MHNG); Malaysia: Sabah: Mt. Kinabalu, 1550 m., 29.iv.1987, leg. Burckhardt & Löbl (MHNG).

Additional material (not included in the type series).— Mount Kinabalu, 13-18.i.2001, 1 specimen of unidentified sex in 70% ethanol, 1 specimen of unidentified sex in 100% ethanol (BOR). (For full collection details, see Type material above.)

Diagnosis.— Habitus slender, ovoid. Elytra 1.2-1.3 times as long as their combined width (length measured from the caudal tip of the scutellum to the elytral apices). Aedeagus (figs 24-25) short and wide, with two elongated apical lateral ‘wings’ and a short terminal processus. Antennae short, as long as the width of the head. Female elytral apices drawn out. Male with a central extension on the 4th visible abdominal sternite.

Description.— Habitus slender, ovoid. Moderately pigmented: mostly chestnut brown; only the legs, the elytral apices, the tips and the bases of the antennae lighter brown. Length 2.3-3.0 mm (n = 8). Antennae short and condensed, as long as the width of the head (n = 4). Articles 6 distinctly, 9 and 10 slightly wider than long. Male protarsi only slightly dilated: the protibia at its largest width (excluding the lateral spines) is 2.5 times broader than the first article of the protarsus (n = 1). In the male, the ventral sides of profemur and protibia do not carry any long hairs. Thorax 1.68-1.86 times as wide as long (n = 4), the caudal corners slightly drawn out. The mesosternal carina is strongly developed, its edge somewhat thickened. Elytra relatively slender, 1.23-1.30 times as long (measured from the caudal tip of the scutellum) as their combined width (n = 4). Elytral apices rounded (not truncated) in the male (fig. 30), and drawn out in the female (fig. 29). The 4th visible abdominal sternite in the male with a central point at its caudal edge; the 6th with a broad and relatively distinct central notch. Aedeagus (figs 24-25) in dorsal view short and wide, approximately 1.5 times as long as wide. Apically abruptly narrowing, and there adorned with two long lateral ‘wings’. The tip is composed of a short, obtuse, triangular processus. In lateral view, the aedeagus is almost not curved, except for the apical quarter, which is bent ventrad under a distinct angle. Male genital segment relatively broad, at the apex slightly triangular, 2.5 times as long as wide.

Distribution.— This species has been found only in lower montane forest on Mount Kinabalu and in the Crocker Range.

Remarks.— Based on aedeagal shape, *P. kinabaluensis* is closely related to *P. bryantoides*, from which it differs strongly in the habitus, which is much more slender in *P. kinabaluensis*. Also, *P. kinabaluensis* has distinctive secondary sexual characteristics: the only slightly dilated male protarsi, the drawn-out elytral apices in the female (fig. 29), and the absence of long hairs on the male forelegs.

Etymology.— *kinabaluensis*, a Latin adjective, meaning ‘from Kinabalu’. The name refers to the type locality.

Ptomaphaginus latimanus spec. nov.
(figs 22-23).

Type material.— Holotype ♂: Malaysia: Sabah: Mount Trus Madi (5°34.152'N 116°29.638'E), 1400 m alt., 23-28.x.2001, pitfall with lamb, leg. M. Schilthuisen (BOR). Paratypes same collection data as holotype: 5 ♂♂ (one of which preserved in 100% ethanol) 2 ♀♀ (BOR).

Diagnosis.— Habitus slender, ovoid. Elytra 1.15-1.25 times as long as their combined width (length measured from the caudal tip of the scutellum to the elytral apices; $n = 5$). Aedeagus (figs 22-23) short and wide, with two elongated apical lateral 'wings' and a short terminal processus. Antennae short, as long as the width of the head. Male with broad and indistinct central notches on the 5th and 6th visible abdominal sternite.

Description.— Habitus slender, ovoid. Moderately pigmented: mostly chocolate to chestnut brown, the thoracal disk darker; the legs, the elytral apices, the thoracal edges and the tips and the bases of the antennae yellowish. Length 2.3-2.9 mm ($n = 5$). Antennae short and condensed, as long as the width of the head ($n = 4$). Antennal articles 6, 9, and 10 square in the female, wider than long in the male. Male protarsi strongly dilated: the protibia at its largest width (excluding the lateral spines) is as wide as the first article of the protarsus ($n = 1$). In the male, the ventral sides of profemur and protibia do not carry any long hairs. Thorax 1.60-1.75 times as wide as long ($n = 4$), the caudal corners slightly drawn out. The mesosternal carina is strongly developed, its edge somewhat thickened. Elytra not very slender, 1.15-1.25 times as long (measured from the caudal tip of the scutellum) as their combined width ($n = 5$). Elytral apices truncated in both sexes. The 4th visible abdominal sternite in the male with no central point at its caudal edge; the 5th and 6th with a broad and relatively indistinct central notch. Aedeagus (figs 22-23) in dorsal view short and wide, approximately 1.5 times as long as wide. Apically abruptly narrowing, and there adorned with two long lateral 'wings'. The tip is composed of a short, obtuse, triangular processus. In lateral view, the aedeagus is almost not curved, except for the apical quarter, which is bent ventrad under a distinct angle. Male genital segment broad, at the apex slightly triangular, two times as long as wide.

Distribution.— This species has been found only in lower montane forest on Mount Trus Madi.

Remarks.— Based on the aedeagal shape, *P. latimanus* is closely related to *P. kinabaluensis*, from which it differs strongly in the habitus, which is much more slender in *P. kinabaluensis*. Also, the two differ markedly in secondary sexual characteristics: *P. kinabaluensis* has drawn-out elytral apices in the female, only slightly dilated male protarsi and a central point on the 4th abdominal sternite in the male, whereas *P. latimanus* has normal abdominal sternites and elytral apices, but strongly dilated male protarsi.

Etymology.— *latimanus*, a combination of *latus*, a Latin adjective, meaning 'broad', and *manus*, a Latin noun, meaning 'hand'. The name refers to the strongly dilated protarsi of the male.

Ptomaphagus giachinoi spec. nov.
(figs 5-6).

Type material.— Holotype ♂: Indonesia: Sumatra: Brastagi G. Sibayan, 1200 m. alt., 5.iii.1989 (CPMG).

Diagnosis.— Habitus shortly ovoid. Male with a small central depression on the 5th, and a large semicircular and slightly depressed plate on the central part of the 6th visible abdominal sternite, not bordered by long hairs as in *burckhardti*. This species is characterized by the special morphology of the aedeagus, which has a characteristic narrow apex with two lateral acuminate flaps (figs 5-6).

Description.— Habitus shortly ovoid. General colour dark brown, the apex of elytra and legs somewhat lighter, the antennae light brown, with the 6th, 7th, and 8th articles slightly darker. Length: 2.8 mm. Antennae slender, 1.15 times longer than the width of the head. Male protarsi as wide as the protibia. Pronotum short, 1.8 times as wide as long. Elytra 1.15 times as long (measured from the caudal tip of the scutellum) as their combined width, the sides parallel on the rostral half, and regularly curved on the caudal half. Male with a small central depression on the 5th, and a large semicircular and slightly depressed plate on the central part of the 6th visible abdominal sternites. Aedeagus (figs 5-6) wide from the base to the apex of the parameres, the apex parallel, narrow, with two lateral acuminate flaps, each of which carry two dorsal setae. The parameres widened and protruding at their apex. In lateral view, the apex of the aedeagus is bent downward sharply, and carries several thick ventrally-oriented setae, as in *P. loeblianus*.

Distribution.— The only specimen known is from the type locality, Gunung Sibayan (Sumatra).

Etymology.— Dedicated to Pier Mauro Giachino, famous specialist of the Choleviinae.

Ptomaphagus loeblianus spec. nov.
(figs 3-4)

Type material.— Holotype ♂: Indonesia: Sumatra: W Sumatra, Padangpanjan, 600 m alt., 17.xi.1989, leg. Agosti, Löbl, Burckhardt (MHNG).

Diagnosis.— Habitus ovoid. Species well characterized by the complex apical structure of the aedeagus (figs 3-4).

Description.— Habitus ovoid. Light brown, the legs and antennae lighter, nearly yellowish. Length: 2.6 mm. Antennae 1.1 times as long as the width of the head. Male protarsi dilated, 0.7 times as wide as the apex of protibia. Pronotum 1.8 times wider than long, nearly as wide as elytra, the apical corners drawn out. Elytra 1.25 times longer than their combined width. Aedeagus (figs 3-4) elongated with a central apical expansion, surrounded by two lateral ones both with a perpendicular external tooth and folded towards the down side at the apex, where it carries several ventrally-oriented setae, as in *P. giachinoi*, with which it appears closely related (as the latter, it and *P. agostii* also carry two setae on the dorsal side of each aedeagal flap). Internal stylus long and thin.

Distribution.— Presently known only from the type locality: Padangpanjan in Western Sumatra.

Etymology.— dedicated to one of the first collectors of this species: Ivan Löbl.

Ptomaphaginus agostii spec. nov.
(figs 1-2).

Type material.— Holotype ♂: Indonesia: Java: W Java: Cibodas, 50 km E of Bogor, 1400 m alt., 3-6.xi.1989 (MHNG). Paratypes: 1 ♂, 5 ♀ with the same collection data (MHNG; CMPR).

Diagnosis.— Habitus ovoid. Male with a large, flat, central sternal plate extended from the anterior margin of the 3rd visible sternite to the apical edge of the 6th and regularly widened from the front to the apex.

Description.— Habitus ovoid. Colouration dark brown on the head, pronotum, and elytra, red brown on the legs, and yellow on the antennae, with articles 5 to 8 darker. Length: 2.3-2.9 mm (n = 7). Antennae 1.1 times longer than the width of the head. Male protarsi 0.75 times as wide as the protibia. Pronotum 1.7 times as wide as long, the caudal corners slightly drawn out. Elytra 1.3 times as long (measured from the caudal tip of the scutellum) as their combined width, truncated in both sexes. Male with a large central sternal flat plate extended from the anterior margin of the third visible sternite to the apical edge of the 6th and regularly widened from the front to the apex. Aedeagus (figs 1-2) more slender than *P. giachinoi*, slightly narrowed in the basal half, parallel in the third quarter, then triangularly narrowed at the apex, with two lateral acuminate flaps, just before the apex.

Distribution.— Known only from the type locality, Cibodas in West Java.

Remarks.— Probably related to *P. giachinoi* and *P. loeblianus* because of the presence of two setae on each of the lateral flaps of the aedeagal apex. .

Etymology.— Dedicated to D. Agosti, one of the collectors of this species.

Ptomaphaginus sinuatus Schilthuizen, 1984

Material.— Indonesia: Java: W Java, Mt. Gede, 50 km SE Bogor, 2000-2200 m, 5.xi.1989, leg. Agosti, Löbl, Burckhardt: 2 ♂♂, 3 ♀♀ (MHNG, CMPR).

Remarks.— This species was only known from the holotype from Cigembong, SW Java, at 600 m altitude (Schilthuizen, 1984). These new specimens (which morphologically correspond closely with the holotype, with the exception that the habitus and aedeagus are somewhat less slender) derive from a locality in the vicinity, but at much greater altitude.

Ptomaphaginus murphyi Szymczakowski, 1970

Ptomaphaginus murphyi Szymczakowski, 1970: 289-292, figs 21-30.— Holotype ♂ (in IZSEC) and paratype ♀ (in ZRC) from Ulu Gombak, Selangor, Malaysia ([not examined]).

Material.— Malaysia: The Gap (Selangor), 26-28.x.1977, leg. B. Bendell, 1 ♂ (SBPC); Gombak (Selangor), 8.iv.1963, killed in pan of alcohol under light, #113, leg. G.C. Sanderson, 1 ♂ (SBPC).

This species was described by Szymczakowski (1970) on the basis of a ♂ and a ♀ from Ulu Gombak (Peninsular Malaysia, state of Selangor). We report new material from the type locality (Ulu Gombak) and from a nearby locality (The Gap). The habitus and aedeagus closely match the original description.

Ptomaphagus anas spec. nov.
(figs 16-17).

Type material.— Holotype ♂: Malaysia: Selangor: 15 miles N of Kuala Lumpur, Universiti Malaya Field Station, Ulu Gombak, x-xi.1977 leg. B. Bendell (in SBPC, due to be deposited at CMNC). Paratypes same locality as holotype: 2 ♂♂ 1 ♀ (in BOR), 3 ♂♂ 1 ♀ (in SBPC), 1 ♀ (in FRCS); Malaysia: Pahang: Berinchang, Cameron Highlands, 26.iii.1977, leg. T. Jaccoud: 1 ♂ (in MHNG); Malaysia: Sarawak: Semongak, 9-16.i.1978 leg. B. Bendell: 1 ♂ (in SBPC); Malaysia: Sabah: Batu Punggul Resort env., 24.vi-1.vii.1996, vegetation debris and forest floor litter accumulated around large trees near river: 2 ♂♂ (in CJRZ); Malaysia: Sabah: Mt. Kinabalu Park Headquarters, 1500 m alt., 8-16.v.1987, interception trap, leg. A. Smetana: 1 ♂ (in MHNG); Malaysia: Sabah: Kibongol, (7 km N of Tambunan), 700 m alt., 20.v.1987, leg. Burckhardt & Löbl: 4 ♂♂ and 2 ♀♀ (in MHNG and CMPR).

Additional material (not included in the type series).— 36 fragmented individuals in preservative from the type locality (MSC, to be deposited in SBPC).

Diagnosis.— This new species is relatively large and convex. The aedeagus is characteristically shaped (figs 16-17): strongly curved, distally tapering into a narrow, flattened, and slightly upturned apex. In general shape reminiscent of the aedeagus of *P. murphyi*, which, however, is characterized by a squarish, subapical expansion.

Description.— Habitus ovoid, relatively convex. Reddish brown to black (though the dark colouration in some specimens may be due to preservation); the tarsi and the edges of thorax and elytra lighter brown. Length 2.3-2.9 mm ($n = 9$). Antennae slender but not very long, 1.1 times as long as the width of the head ($n = 3$). Articles 9 and 10 slightly broader than long; article 6 square. Male protarsi moderately dilated: the protibia at its largest width (excluding the lateral spines) is 1.4 times broader than the first article of the protarsus ($n = 1$). Female protarsi undilated. Thorax 1.65 times as wide as long ($n = 3$), convex, with the caudal corners distinctly drawn out. The mesosternal carina is strongly developed, its edge somewhat thickened. Elytra short, 1.1 times as long (measured from the caudal tip of the scutellum) as their combined width ($n = 3$). Elytral apices moderately truncate, identical in both sexes. Aedeagus (figs 16-17) in dorsal view gradually narrowing towards the apex. The tip is triangular and slightly asymmetric. A broad medial furrow runs over the dorsal side of the aedeagus, and dissolves just short of the apex. In lateral view, the aedeagus is strongly curved, almost semicircular, and distinctly thickened at the point of strongest curvature. In some specimens, the tip of the internal stylet is seen to emerge just ventral of the aedeagal apex. Male genital segment relatively narrow, spoon-shaped, four times as long as wide.

Distribution.— Apparently widely distributed in the Malay Peninsula and Borneo.

Remarks.— Based on aedeagal shape, *P. anas* may be related to several other species from Sumatra and the Malay Peninsula, viz., *P. tarsalis* Szymczakowski, *P. rufus* Jeannel, *P. lacertosus* Szymczakowski, and *P. murphyi* Szymczakowski. The Sumatran *P. jacobsoni* Szymczakowski, known from females only, appears similar to *P. anas*, but has its caudal thoracal corners not as strongly drawn out.

Etymology.— *anas*, a Latin noun in apposition, meaning 'duck'. The name refers to the tip of the aedeagus, which has the shape of a duck-bill.

Ptomaphaginus rufus Jeannel, 1936

Ptomaphaginus rufus Jeannel, 1936: 56-58, figs 67-68.— Holotype male 'Type' [round white label with red rim], 'Bûkit Timah, Singapore, G.E. Bryant, 7.v.09' [white rectangular label], 'G. Bryant Coll., 1919—147' [white rectangular label], 'TYPE' [white rectangular label with red print], 'See slide 7 (Jeannel 1934)' [white rectangular label], 'Ptomaphaginus rufus n. sp. R. Jeannel det.' [white rectangular label, Jeannel's hand] in BMNH [examined]. Microscope slide, left-hand side: 'Ptomaphaginus rufus n. sp. Jeannel, Type, Singapore' [white square label, Jeannel's hand, the word 'Type' underlined in red], 'B.M. 1919-147, org. copul. ♂ (Slide 7, Jeannel 1934)' [white square label, the words 'org. copul. ♂' in Jeannel's hand], 'Type' [round white label with red rim] in BMNH [examined].— Szymczakowski 1964: 99-101, fig. 11 (redescription); Szymczakowski 1970: 287-289, figs 10-20 (redescription).

Material.— Malaysia: Air Hitam forest reserve, 5 km west of Serdang (Selangor), in pitfall with beef, viii.1989, leg. M. Schilthuizen, 1 ♂, 1 ♀ (BOR). Serdang Lama (Selangor), rubber estate, 10.vii.1989, leg. M. Schilthuizen, 1 ♂ (BOR). Taman Negara (Pahang), primary forest, 22-27.vi.1989, leg. M. Schilthuizen, 1 ♂ (BOR).

Remarks.— This species has been recorded from several sites in Singapore (Jeannel, 1936; Szymczakowski, 1970), which is also the provenance of the holotype. A female paratype derives from the west coast of Sumatra, but Szymczakowski (1964) suspects this specimen may actually belong to the related *P. tarsalis* Szymczakowski. Our material provides the first localities outside of Singapore: in the Malaysian states of Pahang and Selangor, which suggests the species is more widely distributed across the Malay Peninsula. The new specimens closely match Szymczakowski's (1970) redescription.

Ptomaphaginus tarsalis Szymczakowski, 1964

Ptomaphaginus tarsalis Szymczakowski, 1964: 94-99, figs 43-51.— Holotype ♂ (in ZMA) and paratypes ♂ and ♀ (in ZMA) from Fort de Kock, Sumatra, Indonesia [examined].

Material.— Indonesia: West-Sumatra, Palopo Nature Reserve N Bukittinggi, 900 m, 18-20.xi.1989, leg. Löbl, Agosti & Burkhardt, 5 ♂ ♂, 4 ♀ ♀ (MHNG, CMPR).

Remarks.— This species, which is characterized by short and robust appendices, was described by Szymczakowski (1964) from Fort de Kock, Sumatra (the colonial name of Bukittinggi). The new specimens, collected at the type locality, match all characters of Szymczakowski's description.

Ptomaphaginus aff. scaphaner Szymczakowski, 1972

Ptomaphaginus scaphaner Szymczakowski, 1972: 297-300, figs 28-33.— Holotype ♂ 'VIETNAM Cue phuong Ninh binh, 5-18.v.1966 Exp. Gy. TOPÁL' [white rectangular label], 'Nr. 385 from trap in soil' [white rectangular label], Holotypus 1971 *Ptomaphaginus scaphaner* Szymczakowski' [white rectangular label with red rim, Szymczakowski's hand] in HNHM [examined].

Material.— Malaysia: The Gap (Selangor), 26-28.x.1977, leg. B. Bendell, 1 ♂ (SBPC); Crocker Range Park (Sabah), 5°47.079'N 116°20.492'E, 1500 m alt., pitfall with carrion, 31.x.2000, leg. M. Schilthuizen, 2 ♂ ♂

(BOR); Sugud Forest Reserve, 15 km S of Kota Kinabalu (Sabah), 200 m alt., pitfall with carrion, leg. M. Schilthuisen, 1 ♀ (BOR); Mount Trus Madi (Sabah), 5°34.152'N 116°29.638'E, 1400 m alt., pitfall with lamb, 23-28.x.2001, leg. M. Schilthuisen, 1 ♂ (BOR). Malaysia: Sabah: Crocker Range, Gunung Emas, 1500-1700 m, around km 52 of road Kota Kinabalu-Tambunan, 6-18.vi.1992, 1 ♂ (CJRZ); Malaysia: Pahang: Cameron Highlands, Tanah Rata, 1600 m alt., Horák leg., 11-27.ii.2000, 1 ♂ (CJRZ); Indonesia: Java: W Java, Mt. Gede, 50 km SE Bogor, 2000-2200 m alt., 5.xi.1989, leg. Agosti, Löbl, Burckardt, 2 ♂♂ (MHNG); Indonesia: West Java, 3 km W of Cibodas, Mt Gede National Park, Jäkl leg., in rainforest, 1500 m alt., pitfall traps baited with fish meat, 5-25.vi.1996, 1 ♂ (CJRZ); Indonesia: West Java, Mt Gede National Park 3 km from Cibodas, 1200 m alt., 5-25.vi.1996, Jäkl leg., baited pitfall traps with fish meat, secondary forest, 1 ♀ (CJRZ)

Remarks.— Originally described from Vietnam (Szymczakowski, 1972), new Malaysian and Indonesian material, if indeed conspecific, would extend its known range to Java, Peninsular Malaysia, and Borneo. This suggests the species may be unusually widely distributed in the Sunda region. Although it derives from distant localities, the new material closely matches the holotype, although small differences in the aedeagus are apparent, and the specimen from Peninsular Malaysia has almost undilated protarsi (about as wide as the third antennal segment). The female, which has not been described before, is identical to the male in external appearance.

Ptomaphagus kurbatovi spec. nov.
(figs 9-10).

Type material.— Holotype ♂: Indonesia: Java, W Java, Mt. Gede, 1400-1500 m, 24-28. V. 97, leg. S. Kurbatov. Paratypes: same collection data: 1 ♂, 3 ♀♀ (MHNG, CMPR); Indonesia: Java: W Java, Cibodas, 50 km E of Bogor, 1400 m. 3-6.xi.1989: 8 ♂♂, 5 ♀♀ (MHNG, CMPR).

Diagnosis.— Habitus ovoid, size quite small. Male with a large flat plate extended on the central part of all the visible abdominal sternites, regularly widened from the front part towards the apex of the 6th sternite, and not bordered with hairs. The place where the apical edge of the 6th visible sternite meets this plate (the central third of its width) resembles a straight line, the apical edge is curved only on the two lateral third. This flat plate is similar to that of *Ptomaphagus agostii*, but extends on all visible abdominal sternites, and is not limited to the third to 6th visible sternite as in *agostii*.

Description.— Habitus ovoid. Dark brown, the head and the pronotum darker than the elytra, the legs reddish brown. The first six articles of the antennae and the tip of the 11th yellow, the other dark brown. Length: 1.90-2.25 mm (n = 6). Antennae 1.1 times as long as the width of the head. Male protarsus 0.7 times as wide as the protibia. Pronotum 1.9 times wider than long, the apical corners not drawn out. Elytra slender, 1.4 times longer than their combined width. Male with a large flat plate extended on the central part of all the visible abdominal sternites (see above). Aedeagus (figs 9-10) broad, the apex as wide as the base, not thinner at the apex as in the other species described in this work, the sides nearly parallel.

Distribution.— Presently known only from two places on Java: Mt. Gede and Cibodas.

Etymology.— dedicated to one of the first collectors of this species: Serguei Kurbatov.

Ptomaphagus baliensis Perreau, 1995

Material.— Indonesia: Sumatra: Jambi, Mt. Kerinci, 1750-1850 m, 11-12.xi.1989, leg. Agosti, Löbl & Burckhardt: 29 specimens (CMPR, MHNG).

Remarks.— The specimens from Sumatra are slightly larger than the specimens from the type locality, Bali, but otherwise fit the original description.

Ptomaphagus sabahensis spec. nov.

(figs 11-12)

Type material.— Holotype ♂: Malaysia: Sabah: Mt. Kinabalu, 1580 m, 27.iv.1987, leg. Burckhardt & Löbl (MHNG).

Diagnosis.— Habitus long oval. Species elongated, the body shape parallel, light brown. Pronotum short.

Description.— Habitus ovoid. Light brown, the tarsi and antennae lighter, uniformly yellowish. Length: 2.4 mm. Antennae 1.15 times as long as the width of the head. Male protarsi dilated, 0.7 times as wide as the apex of protibia. Pronotum 2.3 times wider than long, nearly as wide as elytra, the apical corner drawn out. Elytra 1.35 times longer than their combined width. Aedeagus (figs 11-12) quadrangular with a long and sinuous apical expansion. Internal stylus moderately thick, expanded outside the aedeagus at the apex.

Distribution.— Presently known only from the type locality: Mt. Kinabalu.

Etmymology.— Named from the region where it has been found first.

Ptomaphagus burckhardti spec. nov.

(figs 7-8).

Type material.— Holotype ♂: Malaysia: Sabah: Mount Kinabalu, 2600 m alt., 1.v.1987 leg. Burckhardt and Löbl (MHNG). Paratype: 1 ♂: same data as holotype (CMPR).

Diagnosis.— Habitus slender, ovoid. Uniformly light brown. Eyes reduced. Elytra laterally not curved, narrowed caudad in an approximately straight line. Male with a large and deep semicircular depression extended on the 5th and 6th visible abdominal sternites, bordered on the front half with long and dense hairs, and a central notch on the apical edge of the 6th.

Description.— Habitus slender, ovoid, uniformly light brown. Length: 2.5 mm. Eyes reduced, each only 0.1 times as wide as the width of the head. Antennae slender, 1.25 times longer than the width of the head. Profemur as wide as the protibia. Pronotum 1.7 times as wide as long, with caudal corners slightly drawn out. Elytra slender, 1.25 times as long (measured from the caudal tip of the scutellum) as their combined width, the widest part at the base, the sides very slightly curved, rectilinearly narrowed from base to apex. Apterous. Male with a large and deep semicircular depression extended on the 5th and 6th visible abdominal sternites, bordered on the front half with long and dense hairs, and a central notch on the apical edge of the 6th. Aedeagus (figs 7-8) slender. The apex is tapered terminally and ends in a flattened, duck-bill-shaped processus. It carries several long, curved, lateral setae.

Distribution.— The single known specimen was found at high altitude on Mount Kinabalu.

Remarks.— At first glance, the species is similar to a *Ptomaphaminus*, because of the small size, the lack of pigmentation and reduced eyes, which suggest an adaptation to a deep montane litter biotope (as does the absence of wings). However, since it lacks the diagnostic thoracal characters of this genus, it is placed in *Ptomaphaginus*.

Etymology.— Dedicated to Daniel Burckhardt, who first collected this species.

***Ptomaphaginus obtusus* Szymczakowski 1959**

Ptomaphaginus obtusus Szymczakowski, 1959: 135. (holotype in HNHM)

Loc. typ.: Sumatra central, Fort de Kock, caverne Pauh

Ptomaphaginus balazuci Perreau, 1995: 970. **syn. nov.**

Loc. typ.: Indonésie, Ngalam Kamang près de Tinngo

Closer inspection of the type material of *P. balazuci* and the description of *P. obtusus* reveal that the external and genital traits of the two are identical. Hence, we consider *P. balazuci* a junior synonym of *P. obtusus*. The collection localities of the two are from the same locality.

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Figs 1-6.

Fig. 1, *Ptomaphagus agostii* spec. nov., holotype; aedeagus, dorsal view.

Fig. 2, *P. agostii* spec. nov., holotype; aedeagus, lateral view.

Fig. 3, *P. loeblianus* spec. nov., holotype; aedeagus, dorsal view.

Fig. 4, *P. loeblianus* spec. nov., holotype; aedeagus, lateral view.

Fig. 5, *P. giachinoi* spec. nov., holotype; aedeagus, dorsal view.

Fig. 6, *P. giachinoi* spec. nov., holotype; aedeagus, lateral view.

1



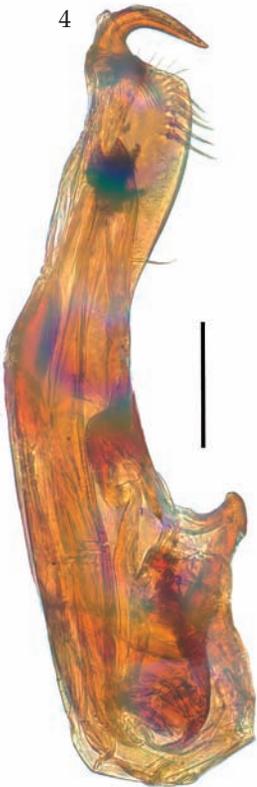
2



3



4



5



6



Figs 7-12.

Fig. 7, *Ptomaphagus burckhardti* spec. nov., holotype; aedeagus, dorsal view.

Fig. 8, *P. burckhardti* spec. nov., holotype; aedeagus, lateral view.

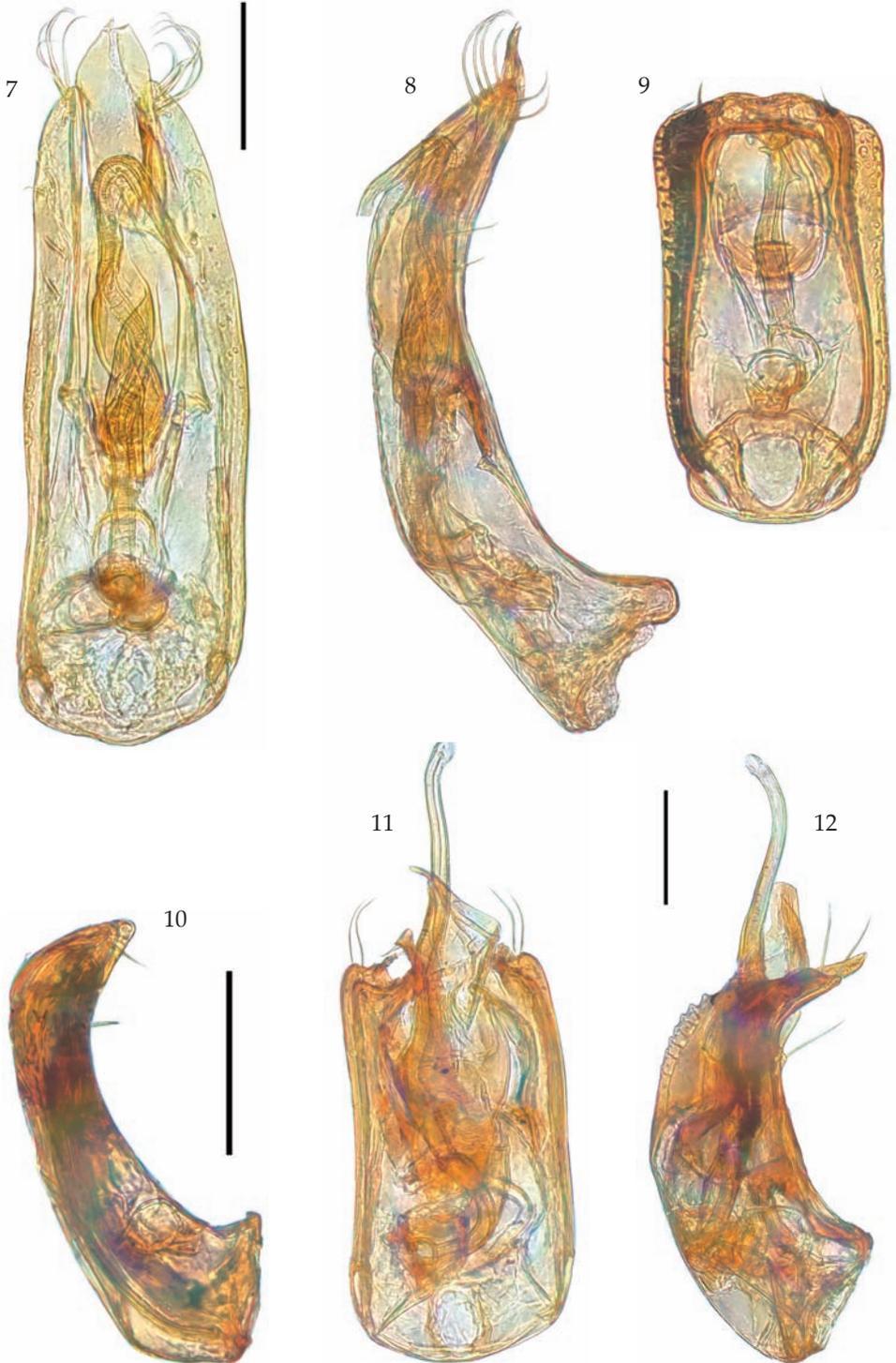
Fig. 9, *P. kurbatovi* spec. nov., paratype (Cibodas); aedeagus, dorsal view.

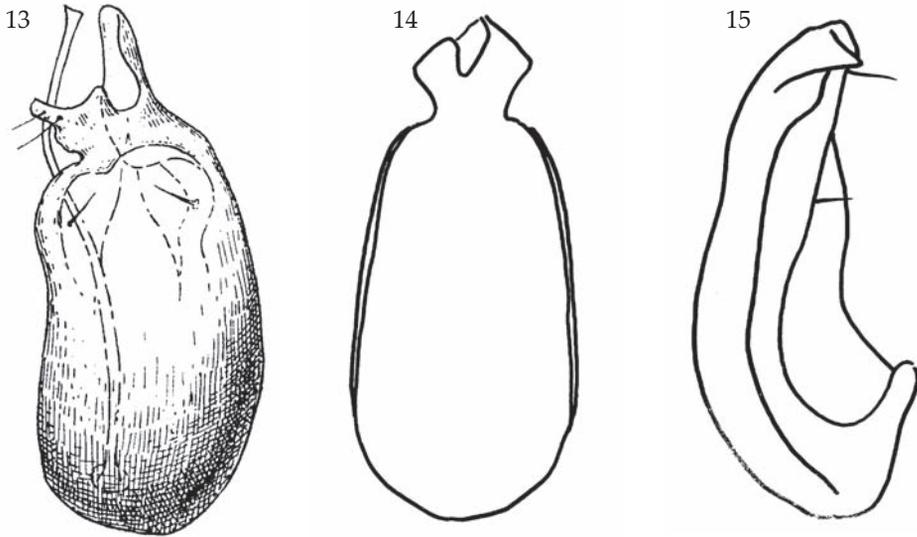
Fig. 10, *P. kurbatovi* spec. nov., paratype (Cibodas); aedeagus, lateral view.

Fig. 11, *P. sabahensis* spec. nov., holotype; aedeagus, dorsal view.

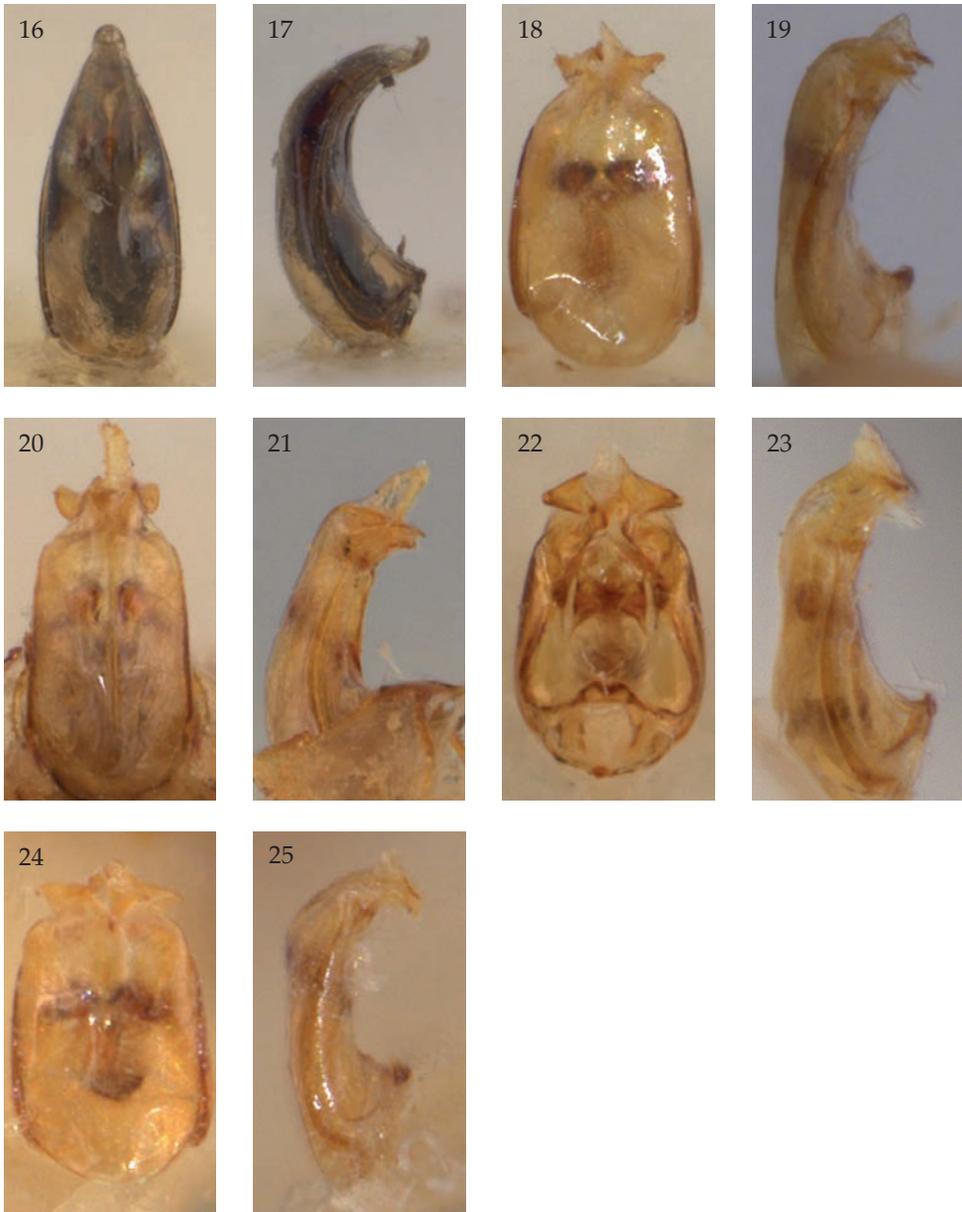
Fig. 12, *P. sabahensis* spec. nov., holotype; aedeagus, lateral view.

All scale lines 100 μm .





Figs 13-15. 13, *Ptomaphagus bryanti* Jeannel, aedeagus; reproduced from Jeannel (1936). 14, *Ptomaphagus caroli* spec. nov., holotype; aedeagus dorsal view. 15, *Ptomaphagus caroli* spec. nov., holotype; aedeagus lateral view.



Figs 16-25. 16, *Ptomaphaginus anas* spec. nov. holotype; aedeagus, dorsal view. 17, *Ptomaphaginus anas* spec. nov. holotype; aedeagus, lateral view. 18, *Ptomaphaginus similipes* spec. nov. holotype; aedeagus, dorsal view. 19, *Ptomaphaginus similipes* spec. nov. holotype; aedeagus, lateral view. 20, *Ptomaphaginus bryantioides* spec. nov., paratype (from Kiansom); aedeagus, dorsal view. 21, *Ptomaphaginus bryantioides* spec. nov., paratype (from Kiansom); aedeagus, lateral view (basal part partly obscured by the genital segment). 22, *Ptomaphaginus latimanus* spec. nov., holotype; aedeagus, ventral view. 23, *Ptomaphaginus latimanus* spec. nov., holotype; aedeagus, lateral view. 24, *Ptomaphaginus kinabaluensis* spec. nov., holotype; aedeagus, dorsal view. 25, *Ptomaphaginus kinabaluensis* spec. nov., holotype; aedeagus, lateral view.



Figs 26-30. 26, *Ptomaphagus caroli* spec. nov., holotype; habitus, dorsal view. 27, *Ptomaphagus similipes* spec. nov., female paratype (from Crocker Range); protarsus. 28, *Ptomaphagus similipes* spec. nov., male paratype (from Trus Madi); protarsus. 29, *Ptomaphagus kinabaluensis* spec. nov., female paratype (from Gunung Kinabalu); elytral apices. 30, *Ptomaphagus kinabaluensis* spec. nov., holotype; elytral apices.