

# The Ceratocanthinae of Ulu Gombak: high species richness at a single site, with descriptions of three new species and an annotated checklist of the Ceratocanthinae of Western Malaysia and Singapore (Coleoptera, Scarabaeoidea, Hybosoridae)

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## Abstract

The remarkable species richness of Ceratocanthinae (Coleoptera: Scarabaeoidea: Hybosoridae) found at Ulu Gombak (Selangor, West Malaysia), a secondary rainforest research station, is discussed. Eighteen species have been collected, mainly in nests of termites (Isoptera) and bess beetles (Coleoptera: Passalidae). Among them at least seven are new species, three of them here described: *Madrasostes hashimi* **sp. n.**, *Madrasostes mirificum* **sp. n.**, and *Pterorthochaetes tsurui* **sp. n.** Four other species (*Madrasostes agostii* Paulian, *Madrasostes clypeale* Paulian, *Madrasostes depressum* Paulian, and *Madrasostes simplex* Paulian) are recorded for the first time for West Malaysia and three for new states within West Malaysia (*Pterorthochaetes insularis* Gestro, *Madrasostes malayanum* Paulian and *Madrasostes sculpturatum* Paulian). A checklist of the 34 Ceratocanthinae recorded so far from West Malaysia and Singapore is provided with taxonomic, distributional and morphological remarks on some species.

## Keywords

Coleoptera, Hybosoridae, Ceratocanthinae, *Besuchetostes*, *Madrasostes*, *Pterorthochaetes Ebbrittoniella*, *Cyphopisthes*, *Eusphaeropeltis*, taxonomy, biology, termitophily, Passalidae, Isoptera, rainforest, Selangor, Malaysia

## Introduction

The feeding habits of the Ceratocanthinae (Coleoptera: Scarabaeoidea: Hybosoridae) are still unknown. Because many species are found in termite nests or in leaf litter, they have been supposed to feed on fungi (Scholtz and Grebennikov 2005) or to feed on termitaria (Iwata et al. 1992), although up to now no evidence has been obtained to support these hypotheses. The increasing information on the diversity of their mouthparts morphology and, to a lesser extent, of their life histories (e.g. Ballerio 2008, Ballerio 2009, Ballerio and Wagner 2005) however makes reasonable to expect a diversity in feeding habits too. Because of this lack of knowledge any ecological approach to the Ceratocanthinae diversity is very difficult and merely speculative. The aim of this paper is to shed some more light on Ceratocanthinae natural history by briefly discussing a massive finding of several Ceratocanthinae species at a single site in West Malaysia. We describe also three new species found at that site and take the occasion to provide an annotated checklist of the species so far recorded for West Malaysia and Singapore.

## Methods and acronyms

We refer to Ballerio (2000a, 2000b, 2008, 2009) for methods and terminological conventions. In giving label data author's comments are in square brackets, while depository collection acronyms are in parenthesis.

Micrographs were obtained with a Zeiss EVO 40 XVP Scanning Electron Microscope at the Museo Tridentino di Scienze Naturali (Trento, Italy), after gold coating.

Habitus photographs were taken with Microptic System and mounted with the automontage software CombineZM, or obtained with a Canon PowerShot S80 connected to a Leica MZ 12.5 stereomicroscope and then mounted with the automontage software Syncrosopy.

Habitus photographs of living individuals were taken in the field using Nikon D70 and Tamron 1:2.8 macro lens, with Konica Minolta Twin Flash 2400.

In the descriptions for ocellate punctures we refer to the definitions given by Howden and Gill (2003).

### Abbreviations:

<b>EL</b>	maximum elytral length
<b>EW</b>	maximum total elytral width
<b>FIT</b>	flying interecept trap

<b>HL</b>	maximum head length
<b>HW</b>	maximum head width
<b>L</b>	length
<b>PL</b>	maximum pronotal length at middle
<b>PW</b>	maximum pronotal width at middle
<b>W</b>	width
<b>ABCB</b>	Alberto Ballerio collection, Brescia, Italy.
<b>KUM</b>	The Kyushu University Museum, Fukuoka, Japan.
<b>MHNG</b>	Muséum d'histoire naturelle collection, Genève, Switzerland.

### **The Ceratocanthinae of Ulu Gombak**

From 2003 onwards, the second author conducted field work at the University of Malaya Ulu Gombak Studies Centre (West Malaysia, Selangor, 3°19'N 101°45'E, 250 m a.s.l.), for research on various groups of termitophilous and myrmecophilous insects. The area is mostly covered with advanced secondary forest of the lowland dipterocarp type. The topography is rough, mostly steep hillsides and narrow valley bottoms (Wiedemann 1969).

The total number of Ceratocanthinae collected at Ulu Gombak from 2003 to 2009, scores respectively 600 specimens and 18 species, although the majority of them (500 specimens representing 16 species) were collected in an one-month stay in 2007 (from April 5 to May 7).

The number of species recorded is particularly remarkable. Eighteen species represent about half the number of the species known from West Malaysia and appears to be a high number for a single secondary forest site. Interestingly no flightless species of Ceratocanthinae have been collected and this could be due to the circumstance that Ulu Gombak is a secondary forest, which after its re-growth has never been connected to any primary forest. The second author samplings from the area did not yield any flightless beetle species.

Currently the knowledge of the alpha diversity of Ceratocanthinae for a single site is limited to two contributions: Ballerio and Wagner (2005) listed five species occurring in the Budongo forest (Uganda) and Erwin et al. (2005) and Erwin and Geraci (2009) listed eleven morphospecies (no identifications were made) from the Yasuni National Park in Ecuador. Both lists resulted from mainly canopy fogging surveys, hence with an underestimated representation of the leaf litter fauna (often made of flightless species). The number of species collected in Ulu Gombak reveals therefore the highest species richness recorded for a single site.

## Ulu Gombak species list and collecting data

The number of specimens collected is in parenthesis.

- 1) *Madrasostes variolosum* Harold  
21. V – 3. VI 2003, M. Maruyama, by FIT (6); 7. IV – 6. V. 2007, M. Maruyama et al., from termite nest(s) (195); 6 – 13. III. 2009, M. Maruyama et al., from termite nest(s) (101).
- 2) *M. simplex* Paulian  
7. IV – 6. V, M. Maruyama et al. (27); 6 – 13. III. 2009, M. Maruyama et al. (7). All from termite nest(s).
- 3) *M. hashimi* sp. n.  
19. IV. 2007, M. Maruyama et al. (1); 24. IV. 2007, M. Maruyama (1); 29. IV. 2007, M. Maruyama (1); 5. V. 2007, M. Maruyama (1). All from termite nest(s).
- 4) *M. depressum* Paulian  
15. IV. 2007, M. Maruyama et al. (2); 26. IV. 2007, M. Maruyama (2); 3. V. 2007, M. Maruyama (1); 5. V. 2007, M. Maruyama (1). All from termite nest(s).
- 5) *M. boucomonti* Paulian  
2 – 18. III 2004, M. Maruyama, by FIT (1); 11. V 2005, K. Yamada, by sifting (1); 29. IV. 2007, M. Maruyama, at light (1); 6 – 13. III. 2009, M. Maruyama et al., from termite nest(s) (6).
- 6) *M. sculpturatum* Paulian  
7. IV – 6. V. 2007, M. Maruyama et al. (114); 6 – 13. III. 2009, M. Maruyama et al. (24). All from termite nest(s).
- 7) *M. agostii*  
7. IV – 6. V. 2007, M. Maruyama et al. (14); 6 – 13. III. 2009, M. Maruyama et al. (2). All from termite nest(s).
- 8) *M. clypeale* Paulian  
7. IV – 6. V. 2007, M. Maruyama et al. (71); 6 – 13. III. 2009, M. Maruyama et al. (42). All from termite nest(s).
- 9) *M. malayanum* Paulian  
15. IV. 2007, M. Maruyama et al. (1); 16. IV. 2007, M. Maruyama et al. (1); 20. IV. 2007, M. Maruyama (1); 28. IV. 2007, M. Maruyama (1); 29. IV. 2007, M. Maruyama (1); 30. IV. 2007, M. Maruyama (1); 3. V. 2007, M. Maruyama et al. (1); 7. III. 2009, Maruyama et al. (1). All from termite nest(s).
- 10) *M. mirificum* sp. n.  
15. IV. 2007, M. Maruyama et al. (2); 16. IV. 2007, M. Maruyama et al. (1); 17. IV. 2007, M. Maruyama (1); 19. IV. 2007, M. Maruyama (3); 20. IV. 2007, M. Maruyama (3); 26. IV. 2007, M. Maruyama (5); 28. IV. 2007, M. Maruyama (3); 30. IV. 2007, M. Maruyama (1); 1. V. 2007, M. Maruyama (3); 3. V. 2007, M. Maruyama (7); 7. III. 2009, M. Maruyama et al. (2); 10. III. 2009, M. Maruyama et al. (1). All from termite nest(s).

- 11) *Pterorthochaetes insularis* Gestro  
7. V. 2005, M. Maruyama, from termite nest(s) (1); 18. VI. 2006, Y. Katayama, from bess beetle nest(s) gallery (9); 24. IV. 2007, M. Maruyama, from termite nest(s) a (1); 28. IV. 2007, M. Maruyama, from termite nest(s) (1); 30. IV. 2007, M. Maruyama, from termite nest(s) (1); 3. V. 2007, M. Maruyama, from termite nest(s) (3).
- 12) *P. tsurui* sp. n.  
15.IV.2007, M. Maruyama (1) ; 26. IV. 2007, M. Maruyama et al. (2); 28. IV. 2007, M. Maruyama (1); 29. IV. 2007, M. Maruyama (1); 30. IV. 2007, M. Maruyama (2); 3.V.2007, M. Maruyama (1) ; 4. V. 2007, M. Maruyama (1). All from termite nest(s).
- 13) *Pterorthochaetes* sp.  
20. IV. 2007, M. Maruyama (1); 24. IV. 2007, M. Maruyama (2); 26. IV. 2007, M. Maruyama (1); 28. IV. 2007, M. Maruyama (1); 29.IV.2007, M. Maruyama (1) ; 5. V. 2007, M. Maruyama (1); 7. III. 2009, S. Befu (3). All from termite nest(s).
- 14) *Eusphaeropeltis* sp. a (large, green)  
27 XI 2005, M. Maruyama, by FIT (1).
- 15) *Eusphaeropeltis* sp. b (small, rainbow)  
10 IV 2007, M. Maruyama, from termite nest(s) (1).
- 16) *Eusphaeropeltis* sp. c (small, red)  
15 IV 2007, T. Tsuru, by net sweeping (1).
- 17) *Cyphopisthes* sp.  
7. IV – 6. V. 2007, M. Maruyama et al. from termite nest(s) (121); 9. IV. 2007, T. Tsuru, by net sweeping (3).
- 18) *Ebbrittoniella ignita* (Westwood)  
9. III. 2009, Y. Matsumura, by net sweeping (1).

### Biological notes on the Ceratocanthinae of Ulu Gombak

All the *Madrasostes* species found in Ulu Gombak were associated with termites (Isoptera). Almost all the specimens and all species but *M. boucomonti* were collected from the nests of *Coptotermes* sp. The termites nested in dead standing trees, whose surface was covered by a muddy wall made by the termites. Both larvae and adults of *Madrasostes* beetles were found inside the wall (which is about 1–1.5 cm thick, allowing the digging of tunnels inside). *Madrasostes boucomonti* were only (with the sole exception of one specimen that was attracted at light) collected in the foraging galleries of *Macrotermes* sp. (not in the nest), which were wet and soft clayey, or by sifting the soil where the host termites were foraging. The *Madrasostes* species observed remained concealed under the surface of the nest material in the daytime, while they were walking and mating on the surface of the nest at night. Some specimens of *M. variolosum* (the most abundant species) were obtained also by flight interception traps.

*Pterorthochaetes* species were collected from the surface of nests of *Coptotermes* termites at night, but the condition of the nest was different from the ones where *Madrasostes* species were found: it was not wet and not muddy, and with more wood debris

(the first author in 1999 collected several *Pterorthochaetes* species inside dead logs occupied by termites in various localities of Perak, Pahang and Kelantan). *Pterorthochaetes* were also abundant in the galleries of Passalidae (e.g. *Leptaulax* sp.): both larvae and adults were found in the wood debris of the galleries. Association with Passalidae has already been reported for some New World species of Ceratocanthinae by Ohaus (1909) and Woodruff (1973). A single specimen of *Pterorthochaetes* was found in the arboreal nest of *Hospitalitermes* sp.

*Eusphaeropeltis* and *Ebbrittoniella* were usually collected by net sweeping of bushes in the daytime, or by flight interception traps (the genus *Eusphaeropeltis* elsewhere has also been collected by canopy fogging, Ballerio and Wagner 2005), but *Eusphaeropeltis* sp. b was collected inside a mound of *Dicuspidermes* sp. termites.

*Cyphopisthes* sp. were collected in similar condition as *Madrasostes* species, but preferred more clayey nest material. Once the termite nest was excavated, specimens of *Cyphopisthes* sp. flew attracted to the nest material at night (interestingly this behaviour was not observed in *Madrasostes*), a similar behaviour is reported by Howden and Gill (2000) for the Neotropical genus *Astaenomoechus* Martínez and Pereira, 1959, *Cyphopisthes* sp. were also collected by net sweeping of bush in the daytime.

### **Annotated checklist of the Ceratocanthinae of West Malaysia and Singapore with description of three new species from Ulu Gombak**

An alphabetic list of the Ceratocanthinae currently recorded for West Malaysia and Singapore is provided below, based on published records plus the new species hereinafter described and the new records from Ulu Gombak. For each species the known distribution is recorded (“Known distribution”), limited to the country (or to the state if within West Malaysia) and the original bibliographical source is added in brackets. West Malaysia is simply indicated for old records from “Malacca”, since this name in ancient literature had a broader meaning than in present days (being now the name of a small coastal state south of Negeri Sembilan). “New material examined” refers only to unpublished data extending the known distribution to West Malaysia or to new state records within West Malaysia (the Ulu Gombak material, being already listed above, is not reported). Some taxonomic and morphological remarks on various species are added. The record of *Madrasostes feae* (Gestro, 1899) (sub *Pterorthochaetes feae*) for “Malacca” found in Paulian (1978) is erroneous as demonstrated by Ballerio (1999).

With the three new species hereinafter described, the number of species known to occur in West Malaysia increases to 34 (about the 10% of all known Ceratocanthinae species worldwide and the 60% of the species recorded from South East Asia). This figure is however far from being complete: the first author has examined at least 10 further undescribed species occurring in West Malaysia and it is reasonable to think that other species, especially flightless members of the *Perignamptus* genus group, could occur in the primary rainforests still present in the area, so that the final figure could be well over 50 species, making the Malay Peninsula a hot spot of Ceratocanthine diversity.

***Besuchetostes howdeni* Paulian, 1979**

Known distribution: West Malaysia (Pahang) (Paulian 1979).

Remarks. This is a flightless species known up to now by the type series only. Examination of the type series revealed that this species does not belong to *Besuchetostes* Paulian, 1972 (see below, under *B. jaccoudi*, for more details).

***Besuchetostes jaccoudi* Paulian, 1977**

Known distribution: West Malaysia (Pahang) (Paulian 1977).

Remarks. This is another flightless species known up to now by the holotype (in the collection of the Museum National d'Histoire naturelle, Paris) and a few further specimens from the type locality (MHNG, ABCB). Examination of all available material revealed that this species does not belong to *Besuchetostes*. Paulian placed this species in the genus *Besuchetostes* mainly because of the lack of genal canthus/dorsal ocular area, a character to which he gave much importance. However, according to a preliminary analysis carried out by the first author, the presence/absence of a genal canthus seems often the result of the fusion of the genal canthus with the occipital area of the head surface, a character that could be related to an adaptation to live in dark environments (leaf litter, dead logs), so it is highly homoplastic in the group and not particularly reliable for defining genera. Based on the aforesaid analysis the genus *Besuchetostes* is now characterized by a combination of characters involving mouthparts morphology, pronotum posteriorly swollen and protruding backwards, male genitalia and, above all, the shape of antennal scape and pedicellus. In *Besuchetostes* the antennal scape is regularly gradually swollen proximad and the pedicellus is very large (about as wide as the apical portion of scape), whereas in *B. jaccoudi* the scape is securiform, with pedicellus smaller than the apical portion of the scape. The overall morphology of *B. jaccoudi* would suggest its placement in the *Perignamptus* genus group, as defined by Ballerio (2009), although currently it is not possible to assign it to any given genus, due to the messy systematics of the genera belonging to the group.

***Cyphopisthes crux* (Sharp, 1875)**

Known distribution: Indonesia (Kalimantan), West Malaysia (Perak, Selangor) (Paulian 1942)

***Cyphopisthes minutus* Paulian, 1978**

Known distribution: Malaysia (Perak) (Paulian 1978).

***Cyphopisthes wallacei* (Pascoe, 1860)**

Known distribution: Indonesia, West Malaysia (Perak) (Paulian 1978).

Remarks. The West Malaysian record is doubtful, as stated by Paulian himself (1978). The occurrence of *C. wallacei* outside Borneo has to be confirmed. The synonymy between *Cyphopisthes wallacei* and *Cyphopisthes humeralis* Gestro, 1899 (described from Borneo) established by Paulian (1978) doesn't seem acceptable. The majority of

published records for *C. wallacei* outside Borneo seems to be wrong. The genus *Cyphopisthes* Gestro, 1899 is in need of a revision.

***Ebbrittoniella gestroi* (Paulian, 1942)**

Known distribution: Indonesia (Sumatra, Kalimantan), East Malaysia (Sabah, Sarawak), West Malaysia (Pahang, Perak) (Ballerio 2000b).

***Ebbrittoniella ignita* (Westwood, 1883) (Fig. 4D)**

Known distribution: Indonesia (Sumatra, Kalimantan), East Malaysia (Sabah), West Malaysia (Selangor, Pahang, Johor) (Ballerio 2000b).

***Eusphaeropeltis aureola* Gestro, 1899**

Known distribution: West Malaysia (Perak) (Gestro 1899)

***Eusphaeropeltis aurora* (Lansberge, 1887)**

Known distribution: West Malaysia (Perak) (Gestro 1899)

***Eusphaeropeltis iris* Gestro, 1899**

Known distribution: West Malaysia (Perak) (Paulian 1978)

***Eusphaeropeltis kedahensis* Paulian, 1942**

Known distribution: West Malaysia (Kedah) (Paulian 1978)

***Eusphaeropeltis punctatissimus* (Lansberge, 1887)**

Known distribution: Brunei, West Malaysia (Paulian 1978)

***Madrasostes agostii* Paulian, 1993 (Fig. 2C, Fig. 6B)**

Known distribution: Indonesia (Sumatra) (Paulian 1993).

Remarks. First record for West Malaysia.

***Madrasostes boucomonti* Paulian, 1978 (Fig. 2B)**

Known distribution: West Malaysia (Selangor) (Paulian 1978), Indonesia (Sumatra) (Paulian 1992).

***Madrasostes clypeale* Paulian, 1993 (Fig. 2D, Fig. 6C, D)**

Known distribution: Indonesia (Sumatra) (Paulian 1993).

New material examined: West Malaysia, Perak, 25 km NE of Ipoh, Banjaran Titi Wangsa Mounts, Gunung Korbu, 1400–1800 mt., 11–31.I.1999, leg. P. Cechovsky (ABCB); West Malaysia, Perak, Penang Island, above botanical garden, 250 mt., 12.XI.1999, #4a, leg. Cuccodoro & Loebl, sifting forest leaf litter (MHNG, ABCB). Remarks. First record for West Malaysia (Perak and Selangor). The amazing sexual dimorphism of this species has already been described (Ballerio 2006). An examination of the microsculpturing of pronotum through scanning electron microscopy re-

vealed that the pronotal punctures bottom surface is areolate (Fig. 5A, B). The larger punctures of females have the areolate surface limited to a portion of the bottom and slightly raised (Fig. 5C, D, E). Each puncture is often preceded by a short fine seta. It was not possible to detect any pore inside the punctures, so that the dirt which usually fills the punctures comes probably from outside. The species closest to *M. clypeale* is *Madrasostes thai* Paulian, 1987, known only by the male holotype from Thailand (Chanthaburi province, well north of the isthmus of Kra, which is the boundary between the Sundaland and Indochinese subregions, see Corlett 2009). Both *M. clypeale* and *M. thai* represent a distinctive group within *Madrasostes* and their current generic placement in the genus *Madrasostes* must be regarded as provisional in the framework of a revision of the *Perignamptus* generic group.

***Madrasostes depressum* Paulian, 1992** (Fig. 2A)

Known distribution: Indonesia (Sumatra) (Paulian, 1992).

Remarks. First record for West Malaysia (Selangor). This species has two distinctive paired thick sclerites in the internal sac of aedeagus. The shape of these sclerites in the Ulu Gombak material is slightly different from the shape of the sclerites of the holotype, however, due also to the circumstance that the Sumatran population is known by the type only, we were unable to find further differences that could allow a taxonomic separation of the Sumatran populations from Peninsular Malaysian specimens.

***Madrasostes malayanum* Paulian, 1979** (Fig. 2E)

Known distribution: West Malaysia (Pahang).

Remarks. First record for Selangor. This species was known only by its type series, which consists only on females. The overall morphology suggests a close similarity to *Madrasostes parcepunctatum* Paulian, 1989 from Borneo (Sabah).

***Madrasostes mirificum* sp. n.**

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(Fig. 2F, G, H, I, J)

**Type locality.** West Malaysia: Ulu Gombak (Selangor), 3°19' N 101°45' E.

**Material examined.** *Holotype*, male: West Malaysia, Selangor, Ulu Gombak, 250 mt., 17.IV.2007, Leg. M. Maruyama / *Madrasostes mirificum* sp. n. det. Ballerio & Maruyama 2009 Holotypus (KUM) [distended specimen, glued on a card, dissected, genitalia mounted in DMHF resin on a separate card, same pin]. *Paratypes* [three males dissected]: same locality as holotype but: 15 IV 2007, M. Maruyama et al. (1 male and 1 female); 16 IV 2007, M. Maruyama et al. (1 male); 19 IV 2007, M. Maruyama (3 males); 20 IV 2007, M. Maruyama (2 males and 1 female); 26 IV 2007, M. Maruyama (3 males and 2 females); 28 IV 2007, M. Maruyama (1 male and 2 females); 30 IV 2007, M. Maruyama (1 male); 1 V 2007, M. Maruyama (3 females); 3 V 2007, M. Maruyama (5 males and 2 females), 7.III.2009, M. Maruyama (2 males) ; 10.III.2009,

M. Maruyama (1 male).(20 KUM, 2 MHNG, 6 ABCB) ; 5 males and 9 females [two males and one female dissected]: West Malaysia, Perak, 25 km NE of Ipoh, Banjaran Titi Wangsa Mounts, Gunung Korbu, 1400–1800 mt., 11–31.I.1999, leg. P. Cechovsky (ABCB).

**Description.** HL = 0.58 mm; HW = 1.16 mm; PL = 1.53 mm; PW = 1.93 mm; EL = 2.32 mm; EW = 1.88 mm.

Small Ceratocanthinae, body shiny, setose; “rolling up” coaptations perfect; volant.

Dorsum black, setation yellow/whitish, sternum reddish, antennae reddish.

*Head:* wide (W/L ratio = 2), subpentagonal, sexually dimorphic, fore portion triangular, apex forming an obtuse angle (about 120°), both sides of the angle rectilinear, irregularly serrated, not reflexed upward, tip of triangle blunt; genae aligned with fore margin, acutely protruding outwards, genal canthus present, reaching the occipital area of head, dorsal ocular area small, dorsal interocular area about 18 times the maximum width of the dorsal ocular area, ventral ocular area small; head dorsal surface with dense impressed fine comma-shaped punctures, fore margin with a few very fine shallow transverse striae. Near each comma-shaped puncture a very short erect simple seta.

*Pronotum:* subrectangular, wider than long (W/L ratio = 1.25), wider than elytra; fore margin feebly bisinuate; fore angles gently subtruncate at apex; fore edge continuously finely margined, edges of sides without any visible margin (dorsal view), base continuously strongly margined; base at middle not protruding backwards; pronotal surface regularly convex without paradiscal depressions. Shiny, smooth, with dense impressed horseshoe-shaped punctures, with opening centrifugally oriented, their distance from each other being inferior than their diameter, two smooth areas with sparser puncturation near base at each side of disc. Each puncture bearing in the middle a short erect simple seta, about as long as the puncture diameter.

*Scutellum:* about as wide as long, sides proximally subparallel and distinctly notched by elytral articular process, then convergent to form a triangle with elongate acute apex and sides slightly curved inward. Surface slightly depressed in the middle, covered by dense impressed horseshoe-shaped punctures, with opening directed backwards. Apical portion of mesepisterna visible from above.

*Elytra:* longer than wide (W/L ratio = 0.81), apical fourth regularly rounded (dorsal view), apex slightly re-entering inward (lateral view); elytra regularly convex, although slightly flattened at disc; elytral suture not or very finely raised; inferior sutural stria present, ending just before humeral area; marginal area with sparse irregular puncturation, articular area with striation, not visible in lateral view; humeral callus small; elytral articular process large, smooth and shiny. Elytra smooth, shiny, with four longitudinal, weakly raised, blunt carinae, the first carina corresponding to the sutural stria, starting at medial third, the second one more raised apically, starting near elytral base, the third and fourth ones starting at apical third. Elytral puncturation made of irregular longitudinal rows of medium sized impressed elongate horseshoe-shaped punctures (each one bearing in the middle a simple erect seta), with opening backwards, their distance from each other being inferior to their diameter, mixed with simple impressed

punctures. Between sutural carina and the second carina in the distal third of elytra punctures often merging into three longitudinal impressed lines.

Clypeopleuron short and transversely slightly grooved at each side. Apex of head forming a thick protrudent process, more developed in males. Labrum wide and short, semicircular, bearing six long semierect setae and distally fringed by long fine setae directed forward. Distal epipharynx (Fig. 5G) semicircular, longitudinally divided by a strong anterior median process; pariae distinctly raised with respect to the haptolachus; median brush and corypha absent; apical fringe made of long fine setae, absent in the middle. Mentum (Fig. 5F) ventrally flat, widely emarginated in the middle, emargination regularly wide-U-shaped; labial palpi (including palpiger) two jointed, first joint short and transverse, joint two longer and plumper than preceding one, joint four flattened, apically bearing some short sensilla, all joints, apart from the last one, fringed with long setae. Maxillae (Fig. 5J) with an elongate single membranous lacinia, covered with fine long setae, monolobed galea proximally sclerotized and distally clothed with very coarse long fine setae with distinctive comb-like tip (galeal brush) (Fig. 5I), maxillary palpi (including palpiger) four jointed, palpiger very small, joint two wide and relatively short, joint three relatively short, joint four long and subconical, about as long as preceding two together, apically bearing some short sensilla. Mandibles (Fig. 5H) short, regularly curved, apicalis with very short and blunt apical tooth, not protruding over mesal brush, lateral sclerite of apicalis bearing a distinct large pore, conjunctive present, mesal brush wide and well developed, basalis with molar lobe relatively strong. Antennae 10-segmented, scape long (about half the total length of antenna), distally securiform, pedicellus plump and rounded, flagellum short and thin, distinctly wider than long short articles, antennal club with three articles, articles uniformly setose.

Ventral areas of prothorax slightly alutaceous, setigerously punctured, with setae fine and long. Procoxae transversely oriented, apices nearly touching each other; fore trochanters relatively wide, with fore tips bearing a tuft of long setae; profemora slender, fore margin slightly curved inwards, surface almost smooth with few recumbent setae; protibiae straight, sexually dimorphic, apical spur relatively long, sharp, distally curved downward, protarsi with first article longer than the following three articles together, articles two to four relatively plump, article five slightly longer than four, bearing two short curved claws, each tarsomere, except tarsomere five, ventrally bearing a tuft of fine setae. Mesosternum narrow, short and plump. Mesocoxae large, almost adjacent to each other, transversely oriented. Trochanters narrow, with hind tip acute. Mesofemora slender, surface smooth, with hind edge emarginated at distal third. Mesotibiae slender, thick, inner angle of apex with one straight apical spur, mesotarsi inserted near the inner angle of apical edge, slightly longer than apical edge of tibia, with first four articles plump and subequal, fifth slightly longer than the preceding one, bearing two small curved claws; each tarsomere, except the last one, ventrally bearing a tuft of coarse setae; trochanters of metafemora narrow, with hind tip acute, metafemora plumper than mesofemora, surface hairy, hind edge distally with a small emargination, metatibiae triangular, elongate, flat, inner side not sinuated, ending with two straight and sharp fine spurs paired at the inner angle of the tibia, metatarsi almost as long as the apical edge of tibia,

first article almost as long as the following two together, articles two to four short and plump, fifth longer than the fourth, with ends with two claws small and feebly curved; each tarsomere, with the exception of the last one, ventrally bearing a tuft of coarse setae. Outer face of meso- and metatibiae with longitudinal striae along inner margin.

*Wings:* normally developed.

*Sexual dimorphism:* males with strongly modified head and pro- and mesotibiae. Male head with distal portion, before fore margin, lowered compared to median and proximal portions of head, tip truncated swollen (nose-like) and directed upwards, overall head shape more subrectangular than subpentagonal. Male protibiae thicker than female protibiae, twisted, median and distal third disaligned compared to basal third, median and distal third arched in lateral view, outer margin ending with two strong teeth, other three outer teeth present medially and basally, protibia ending with an apical spur plumper than in females and with distal third more dramatically bent downwards, ventral side fringed by rows of thick setae. Male mesotibiae ending with a straight apical spur and with the inner apical angle with an acute expansion (false spur) replacing the hooked apical spur usually present in other genera of Ceratocanthinae. Females with head normally shaped (Fig. 2H) protibiae normally developed, with two apical teeth and a row of four denticles, apical spur of protibiae slender and more gently bent downwards, mesotibiae ending with a straight apical spur, lacking any false transverse spur.

*Male genitalia:* genital segment fairly sclerotized, Y-shaped (Fig. 8A), with manubrium about as long as basal triangle. Aedeagus with basal piece distally curled (Fig. 8B), about six times longer than parameres; parameres slightly asymmetrical, dorsally flattened (Fig. 8C).

**Variability.** The type series shows a strong variability in the development of the smooth areas near the base of pronotum as well as in the microsculpturing of elytra, especially in the shape and density of punctures between carinae and in the development of the longitudinal striae.

**Identification.** Easily identifiable among all other *Madrasostes* because of the very thick pro- and mesotibiae and the sexually dimorphic characters (male shape of protibia and nose-like process on head), which are unique among all other known Ceratocanthidae.

**Etymology.** *Mirificum*, Latin adjective meaning wonderful, due to the striking morphological features that characterize this species.

**Distribution and habitat.** This species occurs in Perak and Selangor in both lowland and submontane rainforest. The paratypes from Gunung Korbu were collected in a termite nest (Petr Checovsky, pers. comm.). For more details on the Ulu Gombak series see the introductory paragraphs.

**Remarks.** *Madrasostes mirificum* sp. n. displays a series of unique characters (most of which likely to be autoapomorphic), which place this species in a very isolated position within the genus *Madrasostes* and which would represent good points for the erection of a distinct genus in the framework of a complete revision of the *Perignamptus* genus group: a) male's apex of head modified, b) male protibiae shaped as in Fig. 2I, J, d) mesotibiae thick, e) male mesotibiae ending with only one apical spur.

***Madrasostes rafflesi* Paulian, 1979**

Known distribution: Malaysia (Pahang) (Paulian 1979).

Remarks. An enigmatic species. The holotype only is known, most probably a female. This species shows an unusual morphology and its placement in *Madrasostes* must be regarded as doubtful.

***Madrasostes hashimi* sp. n.**

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(Fig. 1C, D)

**Type locality:** West Malaysia: Ulu Gombak (Selangor), 3°19' N 101°45' E.

**Material examined.** *Holotype*, male: West Malaysia, Selangor, Ulu Gombak, 250 mt., 24.IV.2007, Leg. M. Maruyama / *Madrasostes hashimi* sp. n. det. Ballerio & Maruyama 2009 Holotypus (KUM) [distended specimen glued on a card, dissected, genitalia mounted in DMHF resin on a separate card, same pin]. *Paratypes* [all dissected]: 19. IV. 2007, M. Maruyama et al. (1 male); 29. IV. 2007, M. Maruyama (1 female); 5. V. 2007, M. Maruyama (1 male). All from termite nest(s). (2 KUM, 1 ABCB)

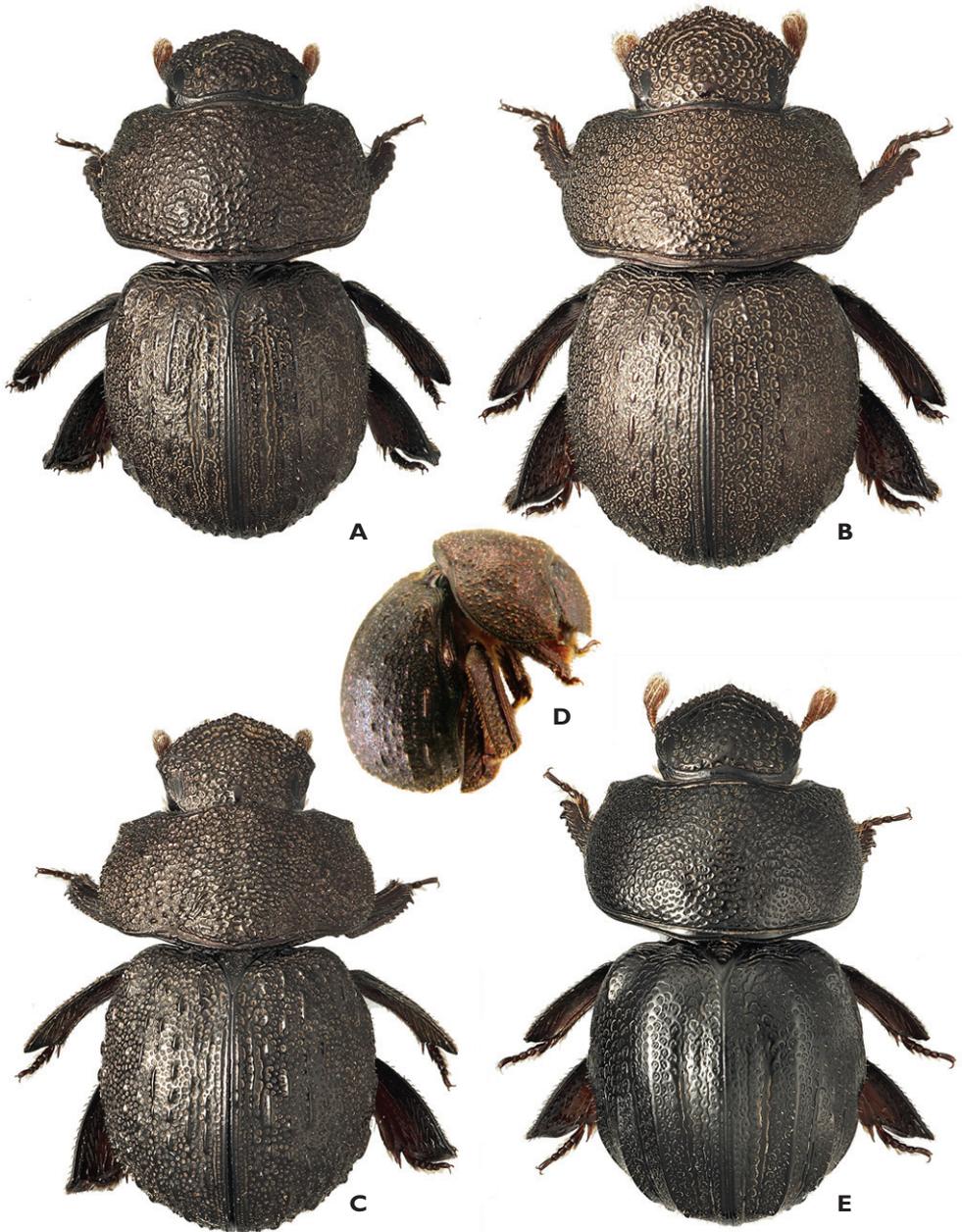
**Description.** HL = 1.21 mm; HW = 2 mm; PL = 1.28 mm; PW = 3.42 mm; EL = 3.57 mm; EW = 3.5 mm.

Medium sized Ceratocanthinae, surface shiny, finely setose (45x); "rolling up" adaptations perfect; wings present and fairly developed.

Dorsum dark brown with bronze sheen, sternum reddish, antennae reddish.

*Head:* wide (W/L ratio = 1.64) pentagonal, fore portion triangular, apex forming an obtuse angle (about 120°), both sides of the angle slightly convex, irregularly finely serrated, not reflexed upward, tip of triangle blunt; genae almost aligned with fore margin, slightly protruding outwards, while forming a rounded acute angle, genal canthus normally developed, reaching the occipital area of head, dorsal ocular area small, dorsal interocular area about 18 times the maximum width of the dorsal ocular area, ventral ocular area relatively large; head dorsal surface slightly convex, with dense puncturation, punctures deeply impressed, their distance being inferior than their diameter, intervals between punctures irregularly raised, giving a granulose appearance to head sculpturing, punctures ocellate, bearing a short fine seta, fore margin with two deep, fine, transverse striae.

*Pronotum:* subtrapezoidal, wider than long (W/L ratio = 2.66), almost as wide as elytra; fore margin feebly bisinuate; fore angles slightly, but distinctly protrudent forward, broadly subtruncate at apex, outer apex of truncation acute and distinctly protruding, a distinct sinuature at the outer side of the apex; fore edge continuously finely margined, edges of sides without any visible margin (dorsal view), base strongly margined; base at middle very slightly protruding backwards, basal edge neither swollen nor raised; pronotal surface regularly convex with one shallow depression at each side of disc (paradiscal depressions). Surface shiny, smooth, with dense strong irregular puncturation; punctures deep, ocellate, their distance being less than their diameter,



**Figure 1.** Ceratocanthinae of Ulu Gombak. **A** *Madrasostes variolosum* habitus dorsal **B** *Madrasostes simplex* habitus dorsal **C** *Madrasostes hashimi* sp. n. habitus dorsal **D** idem habitus lateral **E** *Madrasostes sculpturatum* habitus dorsal.

intervals between punctures irregularly raised, giving a granulose appearance to pronotal sculpturing, punctures bearing often a fine short seta.

*Scutellum*: wider than long, sides proximally subparallel and distinctly notched by elytral articular process, then convergent to form a triangle with elongate acute apex and sides slightly curved inward. Surface slightly depressed in the middle. Apical portion of mesepisterna visible from above. Scutellum uniformly densely punctured; punctures about as large and shaped as on head.

*Elytra*: slightly longer than wide (W/L ratio = 0.98), apical fourth regularly rounded (dorsal view), apex slightly re-entering inward (lateral view); elytra regularly convex, although slightly flattened at disc; elytral suture very finely raised; inferior sutural stria present, ending just before humeral area, delimiting a small marginal elytral area; marginal area poorly developed, smooth, articular area with striation, visible in lateral view; humeral callus small; elytral articular process small, smooth and shiny. Elytra strongly densely punctured, basal and median third covered by a mix of horseshoe-shaped impressed punctures, their distance from each other being shorter than their diameter, each one bearing a very short fine seta and simple impressed punctures, distal third covered by dense ocellate punctures, discal surface with sparse longitudinal short carinae, distal third and sides with sparse, short tubercles. Wings present.

Clypeopleuron very short and transversely slightly grooved at each side. Labrum wide and short, semicircular, distally fringed by long fine setae directed forward. Distal epipharynx semicircular, longitudinally divided by a strong anterior median process; pariae distinctly raised with respect to the haptolachus; median brush and corypha absent; apical fringe made of long fine setae, absent in the middle. Mentum ventrally flat, widely emarginated in the middle, emargination regularly wide-U-shaped; labial palpi (including palpiger) four jointed, first joint very short and transverse, joint two short, joint three longer and plumper than joint two, joint four subconical, apically bearing some short sensilla, all joints, except four, fringed with long setae. Maxillae with an elongate single membranous lacinia, covered with fine long setae, monolobed galea proximally sclerotized and distally clothed with very coarse, long, fine setae, with distinctive comb-like tip (galeal brush), maxillary palpi (including palpiger) four jointed, palpiger very small, joint two wide and relatively short, joint three relatively short, joint four long and subconical, about as long as two and three together, apically bearing some short sensilla. Mandibles short, regularly curved, apicalis with pointed apical tooth short and blunt, not protruding over mesal brush, lateral sclerite of apicalis bearing a distinct large pore, conjunctive present, mesal brush wide and well developed, basalis with molar lobe relatively strong. Antennae 10-segmented, scape long (about half the total length of antenna), securiform, pedicellus plump and rounded, flagellum short, with articles distinctly wider than long, antennal club with three uniformly setose articles.

*Sexual dimorphism*: males with protibiae ending with an apical spur plumper than in females and with distal third more dramatically bent downwards, mesotibiae ending with a straight apical spur and an inner apical spur bent inwards at a right angle, almost fused with the apex of mesotibia. Females with apical spur of protibiae slender and more gently bent downwards, mesotibiae ending with two straight apical spurs.



**Figure 2.** Ceratocanthinae of Ulu Gombak. **A** *Madrasostes depressum* habitus dorsal **B** *Madrasostes boucomonti* habitus dorsal **C** *Madrasostes agostii* sp. n. habitus dorsal **D** *Madrasostes clypeale* male habitus dorsal **E** *Madrasostes malyanum* habitus dorsal **F** *Madrasostes mirificum* sp. n. habitus dorsal **G** habitus lateral of male **H** fore body of female **I** male protibia dorsal view **J** male protibia lateral view.

*Male genitalia*: genital segment fairly sclerotized, V-shaped (Fig. 8D). Aedeagus with basal piece twisted, about three times longer than parameres; internal sac relatively small, containing a large very thick asymmetrical spiraliform sclerite (Fig. 8F); parameres asymmetrical (Fig. 8E), laterally flattened.

**Variability.** The type series shows variability mainly in the development of longitudinal carinae of elytra.

**Identification.** *Madrasostes hashimi* sp. n. can be mistaken only with *M. thoracicum* Paulian, 1989 known from Borneo (Sabah). The new species however differs from the former because of a) the puncturation of elytra which in *M. thoracicum* is slightly larger and denser, b) the shape of elytral carinae that in *M. hashimi* sp. n. are usually longer than in *M. thoracicum*, c) the sculpturing of pronotum which is much stronger in *M. thoracicum*, with puncturation deeper and more transverse, and finally d) the shape of the sclerite of the internal sac of aedeagus, which in the new species is larger and distinctly spiraliform (Fig. 8F), whereas in *M. thoracicum* is short and shaped in a different way (Fig. 8G)

**Etymology.** Dedicated to Dr. Rosli Hashim, who always helps Munetoshi Maruyama's research in Malaysia.

**Distribution and habitat.** This new species is known only from the type locality. For details on collecting circumstances see the introductory paragraphs.

***Madrasostes sculpturatum* Paulian, 1989** (Fig. 1E)

Known distribution: Indonesia (Sumatra) (Paulian, 1989), West Malaysia (Perak) (Paulian, 1989, Grebennikov et al. 2005), East Malaysia (Paulian, 1989).

Remarks. First record for Selangor.

***Madrasostes simplex* Paulian, 1989**

Known distribution: East Malaysia (Sabah) (Paulian 1979) (Fig. 1B)

Remarks. First record for West Malaysia (Selangor). *Madrasostes simplex* is extremely similar to *M. variolosum* and to *M. reticulatum* (Lansberge, 1887). *Madrasostes variolosum* is a very common species and has a wide distribution, ranging from Thailand to Borneo (based on first author's unpublished data) and showing a clinal morphological variation in the sculpturing of elytra, while *Madrasostes reticulatum* is restricted to Sulawesi and the Philippines (although the Philippine population shows intermediate characters between *M. variolosum* and *M. reticulatum*). *Madrasostes simplex* can be easily distinguished from *M. variolosum* because of the sculpturing of elytra and pronotum and the shape of parameres.

***Madrasostes variolosum* (Harold, 1874)** (Fig. 1A, Fig. 6A)

Known distribution: Indonesia, West Malaysia (Paulian 1978).

Remarks. See under *Madrasostes simplex*.

***Paulianostes acromialis* (Pascoe, 1860)**

Known distribution: Singapore, West Malaysia (Pahang, Perak) (Ballerio 2000a)

***Paulianostes georyssoides* (Gestro, 1899)**

Known distribution: Indonesia, West Malaysia (Pahang) (Ballerio 2000a).

***Pterorthochaetes brevisetosus* Gestro, 1899**

Known distribution: Singapore (Gestro 1899).

Remarks. The record from Sumatra published by Paulian (1992) seems incorrect.

***Pterorthochaetes gestroi gestroi* (Harold, 1874)**

Known distribution: Indonesia, Malaysia (Paulian 1978).

***Pterorthochaetes gestroi longisetosus* Gestro, 1899**

Known distribution : Singapore (Gestro 1899).

Remarks. *Pterorthochaetes gestroi gestroi* and *P. gestroi longisetosus* shows differences strong enough to warrant their separation at specific level.

***Pterorthochaetes haroldi* (Sharp, 1875)**

Known distribution: Indonesia, East Malaysia, West Malaysia (Pahang), Singapore (Paulian 1978).

Remarks. The first author began a revision of the genus *Pterorthochaetes* in the late 90's, the revision is still in progress. Based on the preliminary results of this revision the majority of records of *P. haroldi* (and *P. incertus*, which will probably become a junior synonym of *P. haroldi*) reported by Paulian (1978) (e.g. Java, Thailand, Vietnam, Sri Lanka, etc.) are wrong.

***Pterorthochaetes incertus* Gestro, 1899**

Known distribution: Indonesia, West Malaysia (Paulian 1978).

Remarks. See under *P. haroldi*.

***Pterorthochaetes insularis* Gestro, 1899 (Fig. 3A)**

Known distribution: Indonesia, Philippines (Paulian 1978), Nepal (Ballerio 1999), West Malaysia (Kelantan) (Grebennikov et al. 2005).

New material examined: West Malaysia, Perak, 25 km NE of Ipoh, Banjaran Titi Wangsa Mounts, Gunung Korbu, 1400–1800 mt., 11–31.I.1999, leg. P. Cechovsky (ABCB).

Remarks. First record for Perak and Selangor. Based on unpublished data of the senior author, *P. insularis* is a quite common species with a wide distribution, spanning from Nepal to Borneo, with a strong geographical morphological variation, whose taxonomic meaning still needs to be evaluated.

***Pterorthochaetes latus* (Sharp, 1875)**

Known distribution: Singapore (Paulian 1978).

***Pterorthochaetes montanus* Ballerio, 1999**

Known distribution: West Malaysia (Pahang, Perak). (Ballerio 1999).

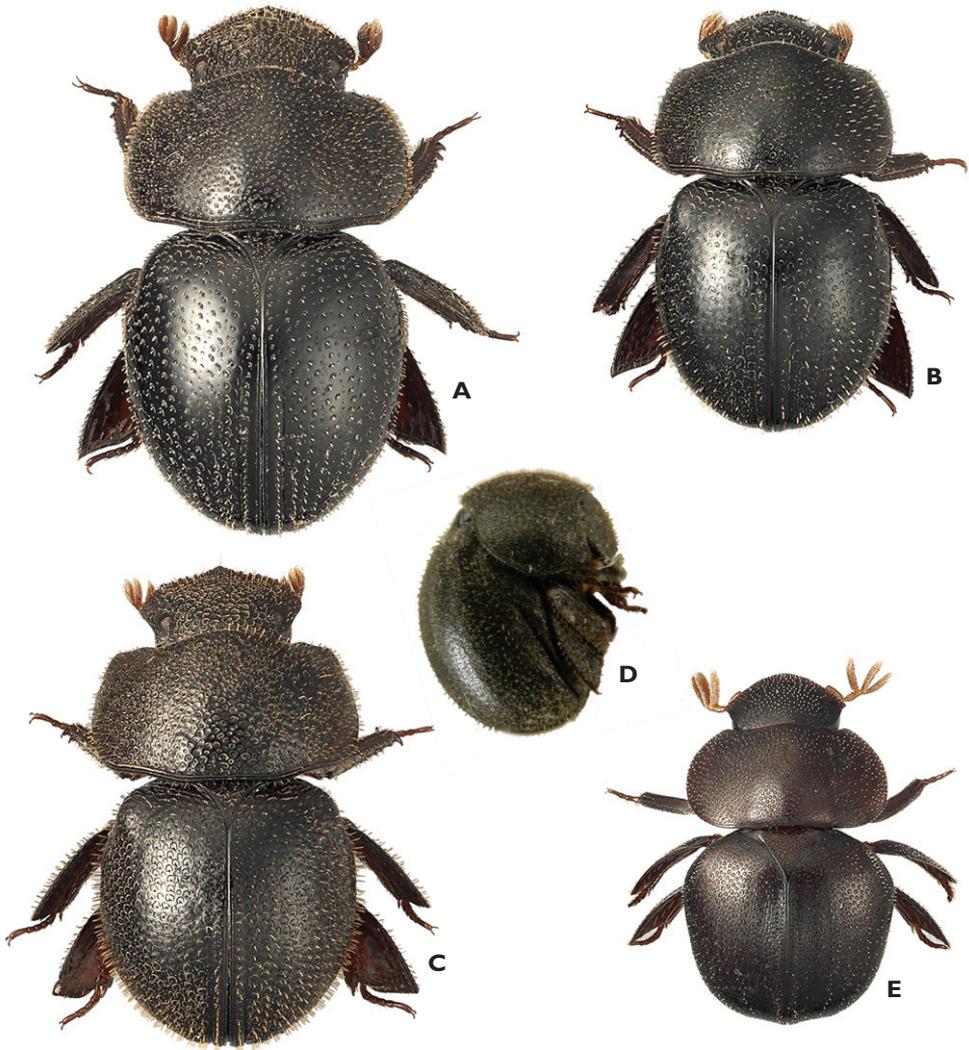
***Pterorthochaetes tsurui* sp. n.**

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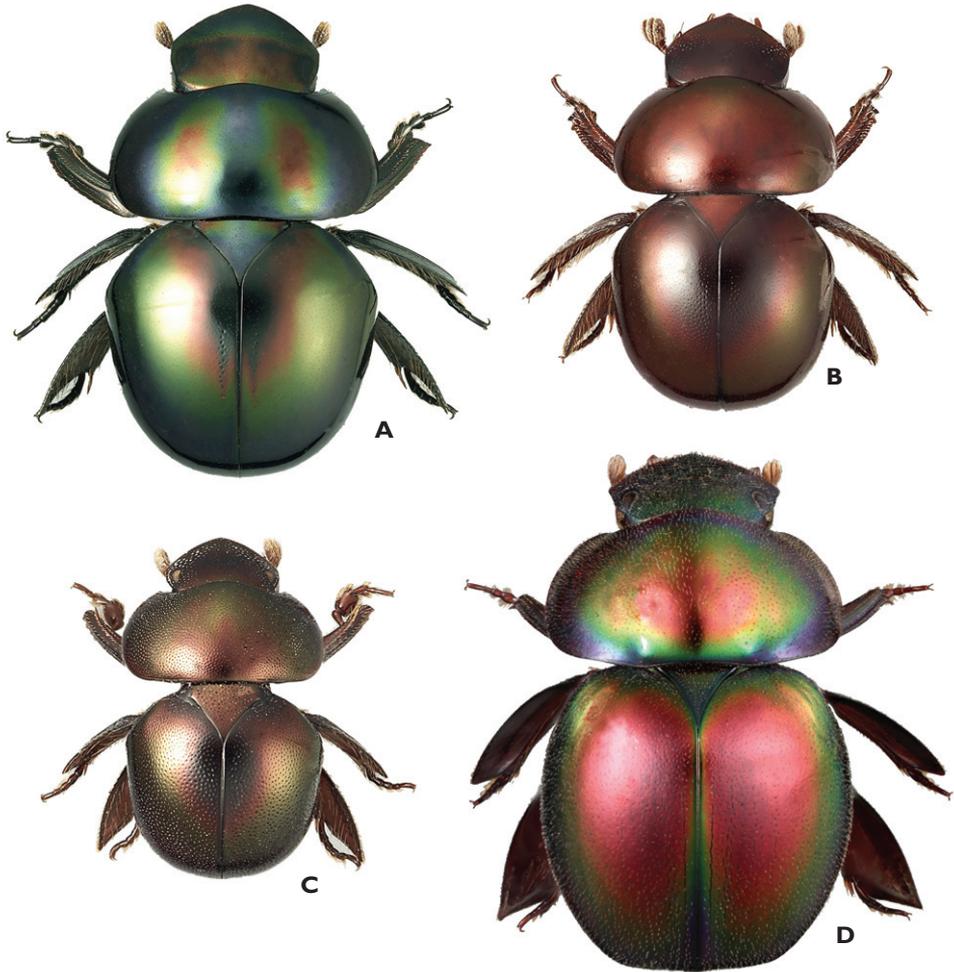
(Fig. 3C, D)

**Type locality:** West Malaysia: Ulu Gombak (Selangor), 3°19'N 101°45' E.

**Material examined.** *Holotype*, male: West Malaysia, Selangor, Ulu Gombak, 250 mt., 29.IV.2007, Leg. M. Maruyama / *Pterorthochaetes tsurui* sp. n. det. Ballerio & Maruyama 2009 Holotypus (KUM). [distended specimen glued on a card, dissected,



**Figure 3.** Ceratocanthinae of Ulu Gombak. **A** *Pterorthochaetes insularis* habitus dorsal **B** *Pterorthochaetes* sp. habitus dorsal **C** *Pterorthochaetes tsurui* sp. n. habitus dorsal **D** idem habitus lateral **E** *Cyphopisthes* sp. habitus dorsal.



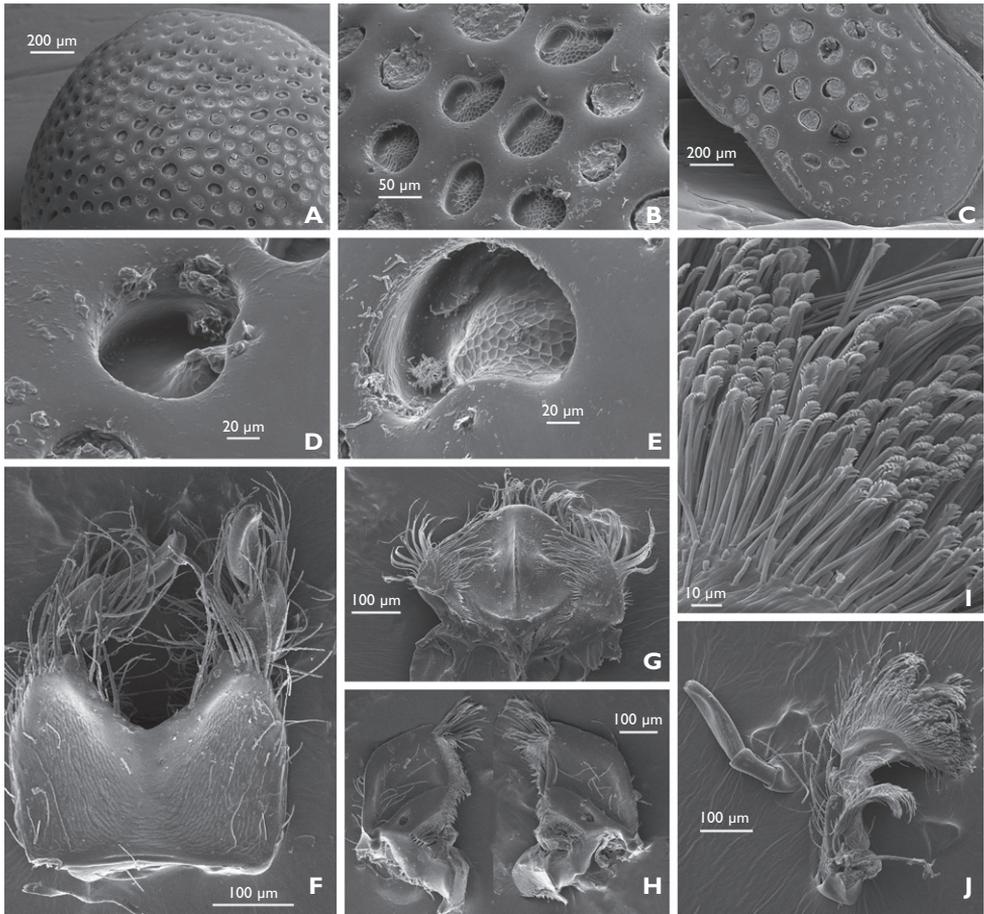
**Figure 4.** Ceratocanthinae of Ulu Gombak. **A** *Eusphaeropeltis* sp. a habitus dorsal **B** *Eusphaeropeltis* sp. b habitus dorsal **C** *Eusphaeropeltis* sp. c habitus dorsal **D** *Ebbrittoniella ignita* habitus dorsal.

genitalia mounted in DMHF resin on a separate card, same pin]. *Paratypes* [one male and four females dissected]: 15.IV.2007, M. Maruyama (1 male); 26.IV.2007, M. Maruyama (1 female and 1 male); 28. IV. 2007, M. Maruyama (1 female); 29. IV. 2007, M. Maruyama (1 female); 30. IV. 2007, M. Maruyama (1 male and female); 3. V. 2007, M. Maruyama (1 female); 4. V. 2007, M. Maruyama (1 female). All from termite nest(s). (2 ABCB, 7 KUM)

**Description.** HL = 0.69 mm; HW = 1.44 mm; PL = 1.38 mm; PW = 2.33 mm; EL = 2.36 mm; EW = 2.27 mm.

Medium sized *Pterorthochaetes*, surface shiny, setose; “rolling up” coaptations perfect; volant.

Dorsum brown, setation yellowish, sternum reddish, antennae reddish.



**Figure 5.** SEM photographs of: **A** *Madrasotes clypeale*: male pronotum **B** detail of male pronotum puncture **C** female pronotum **D** detail of female pronotum punctures **E** and **F** *Madrasotes mirificum* sp. n. mouthparts: labium **G** epipharynx **H** mandibles **I** detail of galear brush **J** maxilla.

*Head*: subrectangular, wider than long, fore margin irregularly sinuated, serrated, tip acute, interocular distance about 9 times the maximum width of dorsal ocular area, dorsal ocular area large, sculpure distally made of very coarse and deep wrinkles and proximally of impressed small dense horseshoe-shaped punctures, each one having a pore in the middle bearing an erect simple seta.

*Pronotum*: wider than long (W/L ratio= 1.68), fore angles normally shaped, elytral lateral margins fringed with a row of long simple setae, spaced out by an interval about half of their length, the whole pronotal surface covered by medium sized round, shallow, ocellate punctures, each one having a pore in the middle bearing a long simple erect seta; puncturation relatively dense, the distance between punctures being inferior to their diameter, denser on disc and at sides, only at sides the ocellate punctures are replaced by horseshoe-shaped punctures with openings outwards. Pronotal pubescence relatively long, approximately as long as marginal setae.

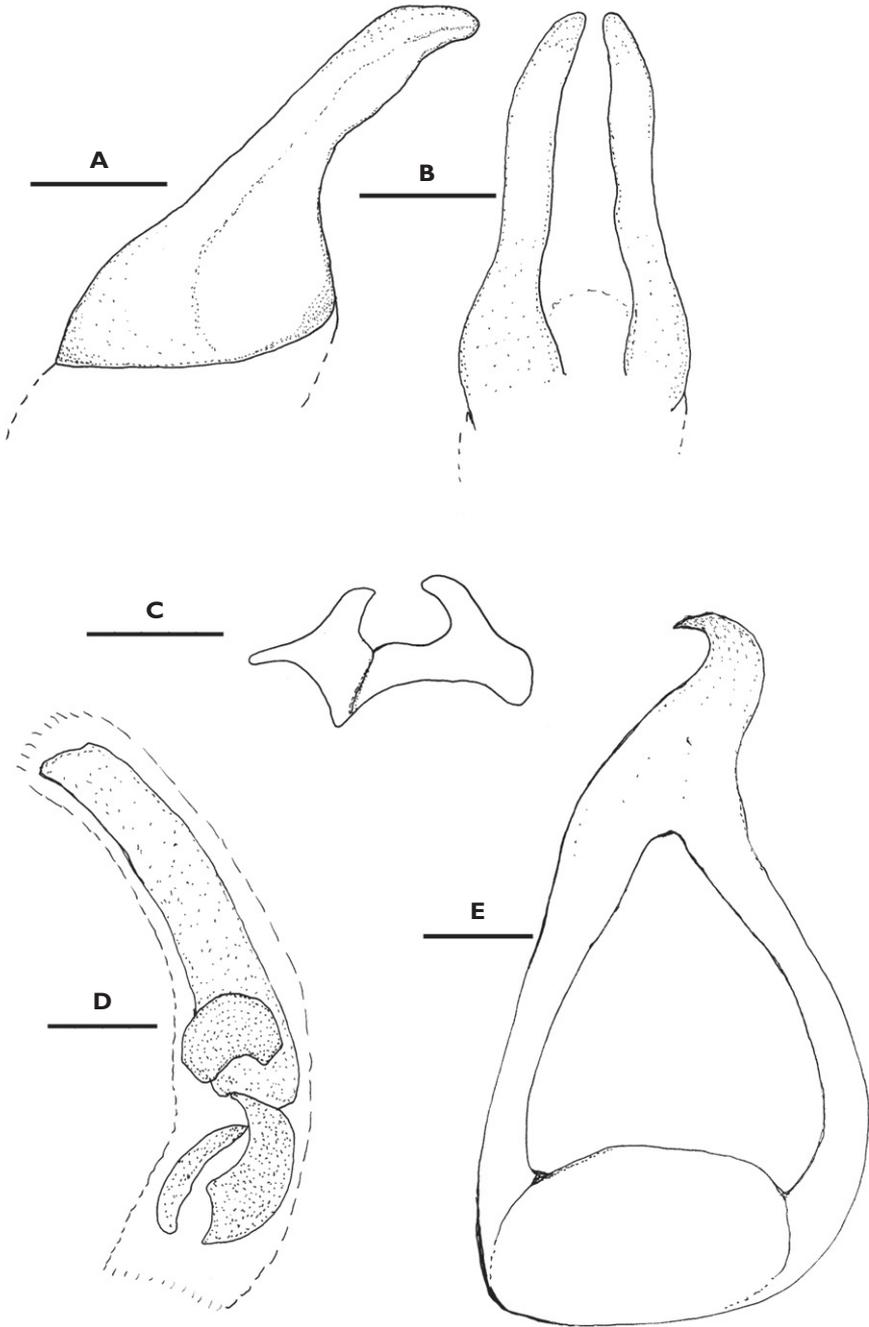


**Figure 6.** Photos of alive specimens taken in habitat at Ulu Gombak (photos © M. Maruyama, 2008). **A** *Madrasostes variolosum* **B** *Madrasostes agostii* **C** *Madrasostes chypeale* male **D** idem female **E** *Eusphaeropeltis* sp. b **F** *Eusphaeropeltis* sp. c.

*Scutellum*: punctures horseshoe-shaped, thick and coarse.

*Elytra*: shape oval, longer than wide (W/L ratio= 0.96); elytral surface covered by medium sized shallow horseshoe-shaped punctures with opening directed backwards, spaced out by an interval inferior to their diameter. Each horseshoe-shaped puncture containing a pore bearing a long erect simple seta.

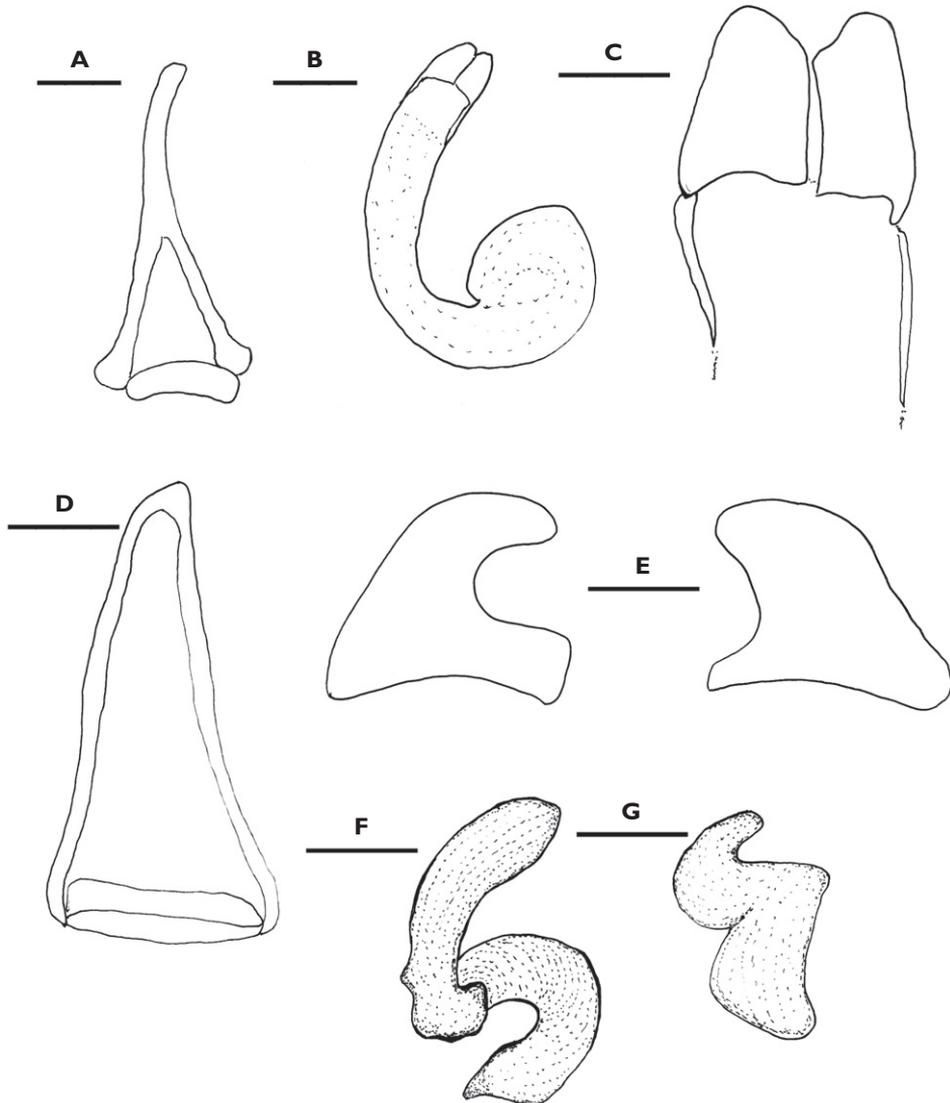
*Male genitalia*: parameres about as long as basal piece, slightly asymmetrical (Fig. 7A, B), apex distinctly bent, internal sac armed with longitudinal subrectangular sclerotization about as long as the basal piece with three short distal sclerites (Fig. 7D), genital segment with manubrium long but strongly bent/twisted, so that in dorsal view it appears very short (Fig. 7E).



**Figure 7.** *Pterorthochaetes tsurui* sp. n.: **A** parameres in lateral view (scale bar: 0,1 mm) **B** parameres in dorsal view (scale bar: 0,1 mm) **C** female bursal sclerites (scale bar: 0,1 mm) **D**, sclerites of the internal sac of aedeagus (scale bar: 0,1 mm) **E** male genital segment (scale bar: 0,1 mm).

*Female genitalia*: bursal sclerites weakly sclerotized and shaped as in Fig. 7C.

**Identification.** This species is characterized by the following combination of characters: a) pronotal puncturation made of ocellate, shallow, medium sized punctures, b) lateral margins of pronotum fringed by long, simple setae, setae relatively spaced out, c) elytral puncturation made of medium sized horseshoe-shaped punctures with opening backwards and bearing a long erect seta, d) shape of parameres (about as long as



**Figure 8.** *Madrasostes mirificum* sp. n.: **A** male genital segment (scale bar: 0,2 mm) **B** aedeagus (scale bar: 0,1 mm) **C** parameres in dorsal view (scale bar: 0,05 mm) **D** *Madrasostes hasimi* sp. n.: male genital segment (scale bar: 0,1 mm) **E** parameres (scale bar: 0,1 mm) **F** sclerite of internal sac of aedeagus (scale bar: 0,1 mm) **G** *Madrasostes depressum*: sclerite of internal sac of aedeagus (scale bar: 0,1 mm).

basal piece and with bent apex, e) shape of genital segment of males, with manubrium strongly twisted, f) shape of female bursal sclerites and, g) head subrectangular, with fore margin somewhat sinuated in a way very unusual for *Pterorthochaetes*. Perhaps the species closest to it could be *Pterorthochaetes brevisetosus*, which, however, has pronotal and elytral puncturation much less dense and shorter setae.

**Variability.** The type series shows a strong uniformity as for size, shape, setation and microsculpturing.

**Etymology.** Dedicated to Mr. Tomoyuki Tsuru, who found the huge termite nest from which the junior author collected more than 400 Ceratocanthinae, among which *P. tsurui* sp. n.

**Distribution and habitat.** This new species is known only from the type locality. For details on collecting circumstances see the introductory paragraphs.

## Acknowledgements

We thank Giulio Cuccodoro (MHNG), Olivier Montreuil (MNHN), and Roberto Poggi (MCSN) for permission to study material kept in the collections under their care. Nicola Angeli and Valeria Lencioni (Museo Tridentino di Scienze naturali, Trento, Italy) are thanked for SEM photographs. Alberto Ballerio thanks Petr Chceovsky (Brno, Czech Republic) for providing Malaysian Ceratocanthinae. Munetoshi Maruyama thanks Shinichi Befu, Rosli Hashim, Takashi Komatsu, Yoko Matsumura, Tomoyuki Tsuru, and Yoshihiro Senda for their assistance in the field, and Alfred F. Newton and Margaret K. Thayer for allowing to use Microptic System at the Field Museum of Natural History.

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