

# A NEW GENUS OF CERATOCANTHIDAE FROM THE ORIENTAL REGION (COLEOPTERA: SCARABAEOIDEA)\*

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## ABSTRACT

**A new genus of Ceratocanthidae from the Oriental region (Coleoptera: Scarabaeoidea).**

*Paulianostes* **gen. n.** is described to accommodate the Sundaic species *Cyphopisthes georyssoides* Gestro, 1899 (which is considered a valid species and designated as the type species of the new genus) and *C. acromialis* (Pascoe, 1860); furthermore *P. panggoling* **sp. n.** from Borneo is described. The genus forms a homogeneous group with the genera *Cyphopisthes* Gestro, 1899 and *Ebbrittoniella* Martínez, 1962 and the affinities among these three genera are briefly discussed.

**Key words:** Coleoptera, Scarabaeoidea, Ceratocanthidae, new genus, new species, new combination, taxonomy, Oriental Region.

## INTRODUCTION

In a recently accomplished paper (BALLERIO, in press b) I provided a re-definition of the genus *Ebbrittoniella* Martínez, 1962. According to the criteria followed in the definition of this genus, the closely related genus *Cyphopisthes* Gestro, 1899 resulted in being polyphyletic. It is actually composed of two distinct groups of species, one formed by the type species *C. amphicyllis* (Sharp, 1875) and allied species, and the other formed by *C. georyssoides* Gestro, 1899, *C. acromialis* (Pascoe, 1860) and another species new to science. The present paper aims to create a new genus to accommodate the aforesaid second group of species, as well as to describe the concerned new species.

## METHODS AND ACRONYMS

I refer to BALLERIO (in press a; in press b) for methods and terminological conventions. In giving label data the / indicates a different label and author's comments are in square brackets.

EL maximum elytral length  
EW maximum total elytral width  
HL maximum head length

\* 6th contribution to the knowledge of the Ceratocanthidae.

HW	maximum head width
L	length
PL	maximum pronotal length
PW	maximum pronotal width
W	width
ABCB	A. Ballerio private collection, Brescia (Italy)
BMNH	The Natural History Museum, London
MCSN	Museo Civico di Storia Naturale «Giacomo Doria», Genova
MNHN	Muséum national d'Histoire naturelle, Paris
MZUF	Museo Zoologico «La Specola», Firenze
NHMW	Naturhistorisches Museum, Wien
NMPC	National Museum (Natural History), Praha
SACF	S. Adebatt private collection, Frinnaryd/Boxholm (Sweden)

## TAXONOMY

### *PAULIANOSTES* gen. n.

Type species: *Cyphopisthes georyssoides* Gestro, 1899

#### Description

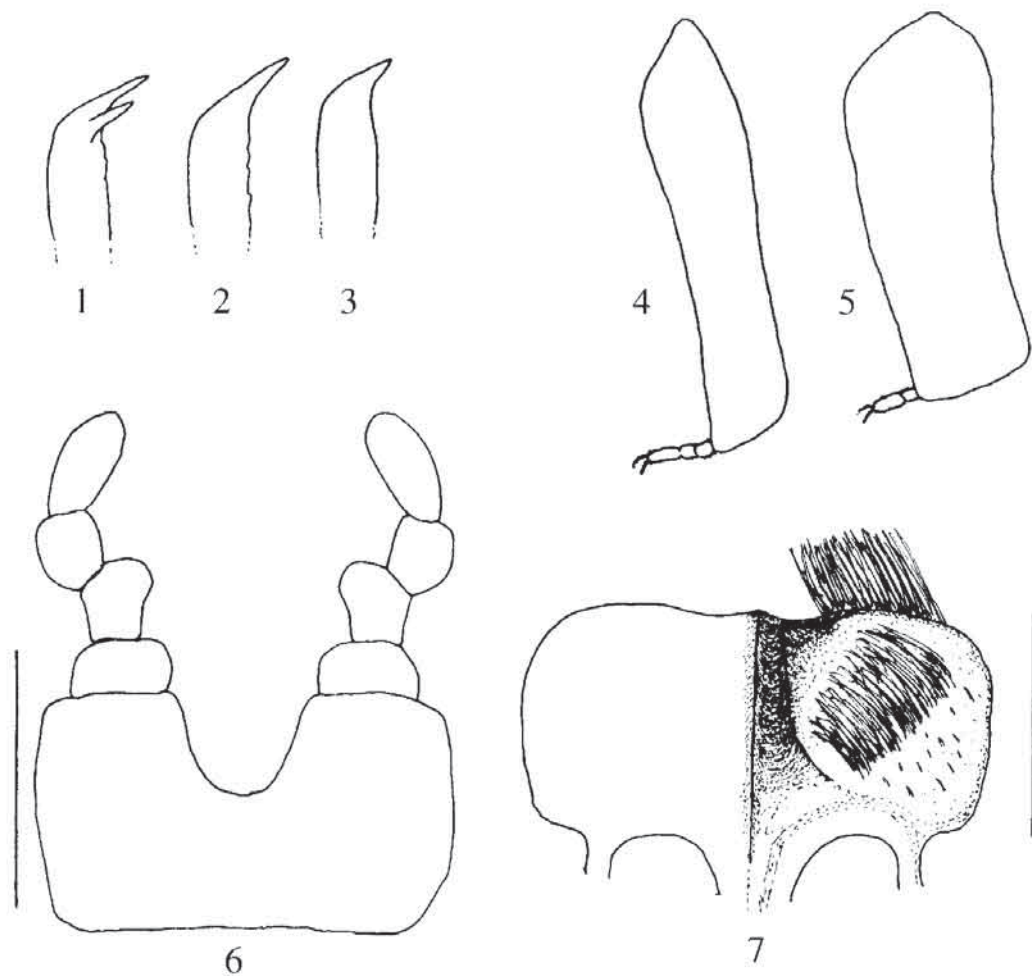
Medium Ceratocanthidae, body dorsally shiny, ventrally alutaceous; «rolling up» coaptations perfect; winged.

Head wide (W/L ratio = 1.38), subpentagonal, fore margin forming an obtuse angle (about 150°) in the middle, scarcely protruding forward and with apex blunt, both sides of the angle smooth and almost rectilinear, not reflexed upward; genae aligned with fore margin, forming a right angle with genal canthus; genal canthus narrow, straight and complete, touching the occipital area; dorsal ocular area small, dorsal interocular area about 16 times the maximum width of the dorsal ocular area, ventral ocular area very large; head surface plane, with variable punctures, transversal striae and pubescence.

Pronotum distinctly wider than long (W/L ratio = 1.9-2), about as wide as elytra; fore margin finely beaded and feebly bisinuate; fore angles slightly but distinctly protrudent forward, acute, although slightly blunt at apex; sides finely beaded, obtusely rounded; base narrow, very finely beaded; pronotal surface embossed; base with two weak callosities or carinae and other two variable callosities at each side of disc; fore margin usually more or less raised in the middle, with respect to the pronotal disc, which in turn is slightly concave.

Scutellum very large, longer than wide (W/L ratio = 0.8-0.9), sides proximally subparallel and distinctly notched by elytral articular process (and a little also by the apical portion of mesepisternum), then convergent to form a triangle with very elongate, acute apex and sides curved inward. Apical portion of mesepisterna (see BALLERIO, in press a) visible from above, slightly smaller than elytral articular process, subrectangular, having the same surface sculpturing of elytra and scutellum.

Elytra slightly longer than wide (W/L ratio = 0.96), apical fourth subtruncate (dorsal view), apex fairly re-entering inward (lateral view); elytra unevenly convex: slightly flattened on disc, then abruptly convex at sides to form a pseudoepipleuron; elytral suture very feebly raised, sutural stria extremely fine and approaching to suture, limited to distal third; inferior sutural stria present, delimiting a rather



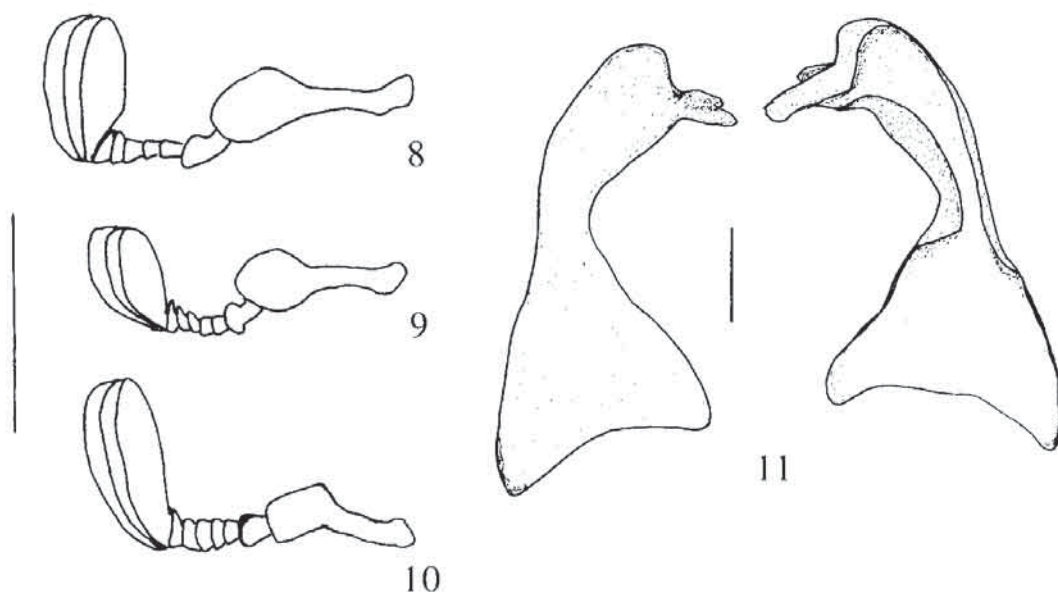
Figs. 1-7: Apical portion of female protibia (dorsal aspect): *P. acromialis* (Pascoe) (1); *P. georyssoides* (Gestro) (2); apical portion of male protibia (dorsal aspect) of *P. acromialis* (Pascoe) (3); outline of mesotibia: *Paulianostes* (4); *Ebbrittoniella* (5); outline of mentum and labial palpi of *P. acromialis* (Pascoe) (5), scale bar 0.5 mm; epipharynx of *P. acromialis* (Pascoe) (7), scale bar 0.5 mm.

developed marginal elytral area, with same surface sculpturing as pseudoepipleuron; striated articular area narrow, visible in lateral view; humeral and apical callus present; elytral articular process well developed, smooth and shiny.

Apical extremity of clypeus (see BALLERIO, in press a) short and transversely grooved at each side. Labrum wide and short, proximally with surface microreticulated, distally abruptly truncate, truncature marked dorsally by a slight carina bearing a row of long, erect, distally curled, fine setae; truncature in frontal view forming an irregularly elliptical plate, with very coarse surface, bearing several long setae. Distal epipharynx (Fig. 7) longitudinally divided by a very sharp strong anterior median process, distally very raised; pariae distinctly raised with respect to the haptolachus and the sides of the median process to form apically a dentate process parallel to the apex of median process; median brush and corypha absent; apical fringe made of long fine setae, absent in the middle, lateral combs made of long fine setae. Mentum (Fig. 6) ventrally flat, deeply emarginated in the middle,

emargination regularly wide-U-shaped; labial palpi (including palpiger) four jointed, first joint short and transverse, joints two and three short, joint four subconical, all joints, apart from the last one, 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 short thick bi- or triphid setae (galeal brush), maxillary palpi (including palpiger) four jointed, palpiger very small, joint two wide and relatively short, distinctly wider than the following joints, joint three about as wide as long, joint four long and subconical, slightly longer than the preceding two together, apically bearing some short sensilla. Mandibles relatively short, slightly asymmetrical, apical portion bent at about a right angle, a distinct broad emargination before the angle, apiculus relatively long and acutely pointed, exceeding the mesal brush by one third of the length, mesal brush narrow and well developed, conjunctive present, molar lobe very strong. Antennae 10-jointed (Fig. 8), scape long (about half the total length of antenna), distally strongly subcarinate (securiform), distally bearing some setae, funicle short with pedicellum plump and rounded, the remaining joints very short, distinctly wider than long, antennal club three-jointed, joints hairy, relatively narrow.

Ventral areas of prothorax, apart from the sides, setigerously punctured, setae long and recumbent. Sides of propleura smooth, very excavated and folded in. Procoxae transversely oriented, apices nearly touching each other; fore trochanters relatively wide, with fore tips bearing a tuft of long setae; profemora slender (W/L ratio = 0.3) almost rectilinear, edges without emargination, surface smooth with few recumbent setae; protibiae almost straight, only very slightly curved along the outer edge, smooth at low magnification (at most very slightly serrate: few feeble denticles visible at 45x), apical fourth emarginated along inner margin, apical spur relatively long, sharp, distally curved downward, protarsi with first article as long as the following three together, articles two and three slightly dilated, article five slightly longer than the former, bearing two short curved claws, each tarsomere, with the exception of the last one, ventrally bearing a tuft of coarse fine setae (Fig. 20). Mesosternum narrow, short and plump, forming a sharp and fine carina protruding between mesocoxae and joining metasternum, mesocoxae large, almost adjacent to each other, longitudinally oriented, trochanters narrow, with hind tip acute, mesofemora slender (W/L ratio = 0.35), surface smooth, with hind edge emarginated at distal third, emargination preceded by a small distinct tooth; mesotibiae slender (W/L ratio = 0.2) (Fig. 4), inner angle of apex with two straight apical spurs, mesotarsi inserted near the inner angle of apical edge, slightly longer than apical edge of tibia (exceeding it for the length of the last three tarsomeres), with first three articles subequal, fourth shorter, fifth almost as long as the preceding two, bearing two small curved claws; each tarsomere, with the exception of the last one, ventrally bearing a tuft of coarse setae; trochanters of metafemora narrow, with hind tip acute, metafemora plumper than mesofemora (W/L ratio = 0.3), surface hairy, hind edge distally with a small emargination, metatibiae triangular, wide, flat (W/L ratio = 0.4), 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 three together, fifth almost as long as the first one, 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 short impressed lines varying from longitudinal to transverse and short erect setae through the whole surface.



Figs. 8-11: Antenna: *Paulianostes* (8); *Ebbrittoniella* (9); *Cyphopisthes* (10); scale bar 0.5 mm. First axillary of *P. panggoling* sp. n. (11), scale bar 0.1 mm.

Wings (Lwing/Lelytron ratio = 2.1-2.3): fully developed.  $MP_{1+2}$  - RP loop present with RP relatively long (although weakly sclerotized),  $MP_4$  medium sized, apical field with a vertical secondary sclerification (as in *Ebbrittoniella*), near the radial cell. First axillary apparently without appreciable differences at species level (Fig. 11).

Sexual dimorphism: ♀♀ have the apical tooth of protibiae distinctly sharper and more protruding outward and forward than in ♂♂ (Figs. 1-2), moreover, with the only exception of *C. georyssoides*, the apical tooth of ♀♀ is preceded by another sharp tooth, very close to it, but slightly shorter and not aligned with the axis of the apical tooth, while in males there is only one apical tooth (Fig. 3); ♀♀ mesotibiae with the inner apical spur straight and approximately as long as the outer, while in ♂♂ it is bent inward at a right angle (hooked).

Male genitalia: genital segment Y-shaped as in *Ebbrittoniella* (no appreciable differences at species level), fairly sclerotized, with a distinct manubrium about as long as the basal triangle, branches forming the manubrium apparently not fused together although connected by a transparent membrane (after treatment with KOH), base of triangle very weakly sclerotized. Overall shape of aedeagus as in *Ebbrittoniella*: basal piece of aedeagus large and twisted, about two times the length of parameres; internal sac large about two times as long as tegmen, internal sac distally with coarse spicules and setae; temones present; parameres short and slightly asymmetrical, laterally flattened; between parameres a narrow subtriangular mobile sclerite lies dorsally.

Female genitalia: overall shape as in *Ebbrittoniella*. Bursa copulatrix with one small symmetrical subcircular or subtriangular sclerite (very variable in shape and without appreciable differences at species level) with a hole in the middle. Spermatheca strongly sclerotized, large and distinctly wide-U-shaped; genital palpi weakly sclerotized, subcircular, relatively small and short.

### Identification

The genus can be identified by the following combination of characters: labrum distally truncate, truncature marked dorsally by a slight carina bearing a row of long erect fine setae, truncature in frontal view forming a plate approximately elliptical, with surface very coarse, bearing several long setae; eye canthus complete, touching the occipital area; dorsal ocular area very small; fore angles of pronotum triangular; pronotum embossed with fore margin more or less distinctly raised in the middle; elytra subparallel with cariniform humeral callus; mesotibiae slender and relatively narrow (W/L ratio  $\cong$  0.2), in males with apical inner spur bent inward at a right angle; protibiae with outer edge smooth, ending with one tooth in males (and in the female of *C. georyssoides*) and with two apical teeth in females.

### Etymology

I am pleased to dedicate the new genus to Prof. Renaud Paulian, in acknowledgement of his contribution to the study of the Ceratocanthidae. The gender is masculine.

### Remarks

In addition to the three species listed below, I examined a single large female (HL = 1.3 mm, PL = 1.7 mm, EL = 3.6 mm), from Sumatra, kept in MCSN and labelled: Palembang, 1900, D. Bouchard / Lahat, D. Bouchard, 1900 / *Cyphopisthes* *pr. acromialis* Pascoe, R. Paulian det. 1984. It is very similar to *C. georyssoides* because of the presence of two tubercles at the base of each elytron, between the elytral articular process and the humeral carina, and also because of the punctures of elytra, but differs from it in the sculpturing of pronotum, which has the fore margin strongly raised and the carinae and tubercles at the sides of disc more pronounced, as well as the sculpturing made of very dense small transverse comma-shaped punctures, and in the presence of two teeth at the apex of protibiae. Very probably it represents a new species, but lacking more material, I prefer to not describe it.

***Paulianostes georyssoides*** (Gestro, 1899) comb. n. (Figs. 2, 12, 15, 18-21)

*Cyphopisthes georyssoides* Gestro, 1899: 490 (description and key)

*Cyphopisthes georyssoides* Gestro: Arrow, 1912: 44 (catalogue)

*Philharmostes georyssoides* (Gestro): Paulian, 1942: 70 (new combination and key)

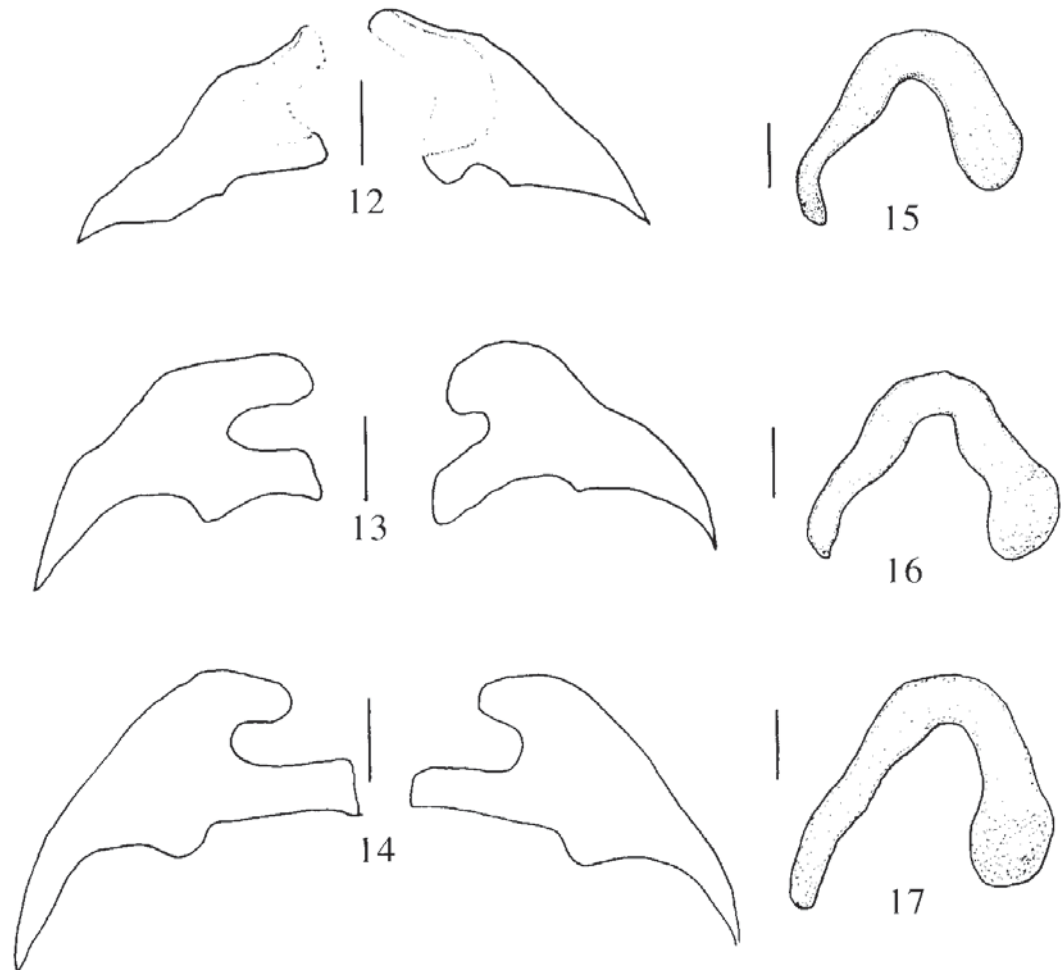
*Cyphopisthes georyssoides* Gestro: Paulian, 1978: 513 (synonymy with *Cyphopisthes acromialis*)

### Material examined

Holotype, ♂ (MCSN): Sumatra, Si Rambé, XII.90-III.91, E. Modigliani / Typus / *Cyphopisthes georyssoides* Gestro / *Cyphopisthes georyssoides* Gestro Typus! / Holotypus *Cyphopisthes georyssoides* Gestro / Museo di Genova / A. Ballerio dissecuit 1999 / *Paulianostes georyssoides* (Gestro) n. comb. det. A. Ballerio 1999. [specimen in good conditions, glued on a card, genitalia mounted in DMHF resin on a separate card, same pin]. Further 13 specimens (5 ♂ and 2 ♀ dissected): 1 ♂, Malaysia W. – Pahang: 30 km E of Ipoh, 1,500 m, Cameron Highlands, Tanah rata, 14-17.III.1998, P. Čechovský leg. (ABCB); 10 ♂ & 2 ♀, Malaysia W. – Pahang: Benom Mts. 3,53 N 102,01 E, 15 km E of Kampong Dong, 24.III-15.IV.1998, 300-1,000 m, D. Hauck leg. (ABCB).

HL = 1-1.1 mm; HW = 1.5-1.6 mm; PL = 1.3-1.6 mm; PW = 2.5-2.9 mm; EL = 2.7-3 mm; EW = 2.6-2.9 mm.

Dark brown to reddish brown, shiny; underside alutaceous, reddish brown; head, pronotum, margins of pronotum and elytra with yellowish very fine, sparse, short pubescence (15x).



Figs. 12-17: left and right parameres: *P. georyssoides* (Gestro) (Benom Mts.) (12); *P. acromialis* (Pascoe) (Korbu Mt.) (13); *P. panggoling* sp. n. (holotype) (14); spermatheca: *P. georyssoides* (Gestro) (Benom Mts.) (15); *P. acromialis* (Pascoe) (Korbu Mt.) (16); *P. panggoling* sp. n. (allotype) (17). Scale bars = 0.1 mm.

Head: frons and vertex with impressed simple large punctures (their distance > their diameter), clypeus proximally with sparse punctures and near fore margin with few transversal irregular lines.

Pronotum: surface irregular with two weak transversal callosities at the base corresponding to the sides of scutellum and two other very weak callosities at each side of disc; fore margin very feebly raised; surface completely covered by very dense (density  $\approx 25$  punctures  $\times 0.3$  mm<sup>2</sup>, almost adjacent to each other), horseshoe-shaped punctures opened forwards, well impressed, their distance from each other distinctly inferior to their diameter. Scutellum: punctures as on pronotum, although opened backwards. Elytra: humeral callus marked by a longitudinal short blunt carina, base with two blunt tubercles between the humeral carina and the articular process of the elytron, one or two very fine longitudinal lines between the tubercles and the humeral carina; pseudoepipleura with two or three longitudinal lines (in addition to the inferior sutural stria), apical callus blunt; elytral surface very densely

punctured: proximal two thirds near suture and on disc with longitudinal comma-shaped impressed punctures mixed with few simple impressed punctures (density >30 punctures × 0.3 mm<sup>2</sup>), distal third, margins and pseudoepipleura with paired comma like punctures, fused near the margins and at the apex of elytra, to form closed horseshoe-shaped punctures.

Female protibia with a single apical tooth, sharper than the male one.

Parameres: figure 12. Spermatheca: figure 15.

#### Variability

Very slight variability, mostly in the development of the longitudinal lines of pseudoepipleura, which sometimes have a slight hint of a longitudinal carina near the apical callus.

#### Identification

*P. georyssoides* is well differentiated from the other species by the characters indicated in the key as well as by the shape of parameres and spermatheca, and therefore the synonymy with *C. acromialis* proposed by PAULIAN (1977) does not seem acceptable. Besides the characters in the key, *P. georyssoides* differs from the other species in the humeral carina which is blunt and not sharp, in the punctures of pronotum which are smaller and denser than the ones of *P. acromialis*, in the pronotal sculpture which is very weak with respect to the other species (the Sem micrographs does not emphasize this character) and in the elytral punctures which are much denser and smaller than in *P. acromialis*.

#### Distribution and habitat

Known from Sumatra and Peninsular Malaysia.

#### Remarks

I selected this species as the type species of the genus because its type is well preserved and was dissected, while the lectotype of *P. acromialis* is a very poorly preserved specimen.

***Paulianostes acromialis*** (Pascoe, 1860) comb. n. (Figs. 1, 3, 6, 7, 13, 16, 22-24)

*Sphaeromorphus acromialis* Pascoe, 1860:42

*Acanthocerus acromialis* (Pascoe): Preudhomme de Borre, 1886: 79 (catalogue)

*Sphaeromorphus acromialis* Pascoe: Gestro, 1899: 492 (comment)

*Cyphopisthes acromialis* (Pascoe): Arrow, 1912: 44 (catalogue)

*Cyphopisthes acromialis* (Pascoe): Paulian, 1978: 513 (redescription, iconography, distribution and key)

*Philharmostes Arrowi* Paulian, 1942: 70 (description and key)

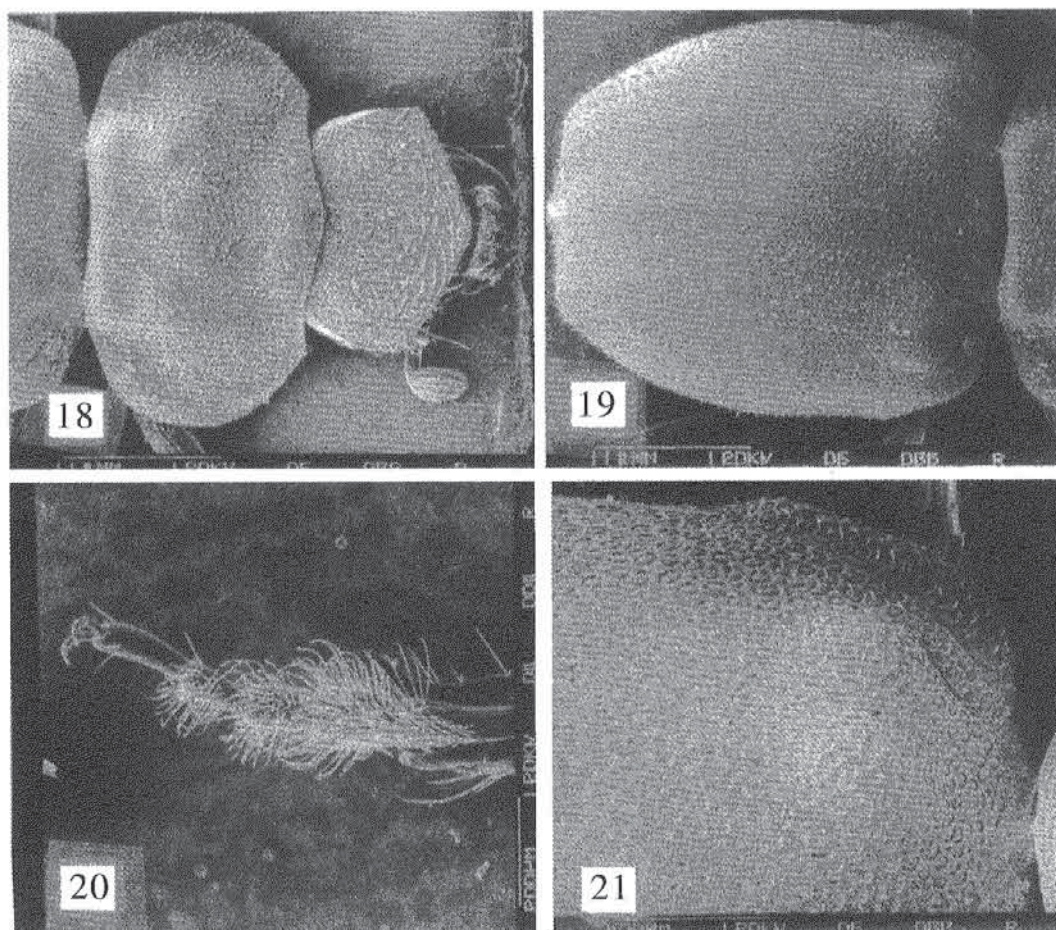
*Philharmostes Arrowi* Paulian: Paulian 1978: 513 (synonymy with *C. acromialis*)

#### Material examined

Lectotype of *C. acromialis* (sex unstated) (BMNH): Lectotype. / Pascoe Coll.93-60. / Singapore / Acromialis Type Pas./ *Cyphopisthes acromialis* (Pasc.) R.Paulian det. [rolled up specimen, pinned and in bad conditions] (BMNH); Type of *P. Arrowi* (sex unstated) (BMNH): Sarawak, Mt. Dulit, 4,000 ft., moss forest, 27.X.1932 / Oxford Univ. Exp. B.M. Hobby & A. W. Moore, B. M. 1933-254.

Further 14 specimens (1 ♂ and 9 ♀ dissected): 2 ♀, Sarawak Wall.[Wallace] / ex Museo N. Van de Poll / Muséum Paris 1938 coll. A. Boucumont (MNH); 1C, Sarawak: Mt. Dulit, 4,000 ft., moss forest, 27.X.1932 / light trap / Oxford Univ. Exp. B.M. Hobby & A. W. Moore, B. M. 1933-254 (MNH); 1 ♀, Sarawak: Mt.





Figs. 18-21: *P. georyssoides* (Gestro) (male from Malaysia, Pahang, 15 km E of Kampong Dong), SEM micrographs: pronotum and head (18); elytra (19); protarsus (ventral aspect) (20); tubercles between humeral carina and elytral articular process (21).

Dulit, 4000 ft., moss forest, 25.X.1932 / beating moss forest / Oxford Univ. Exp. B.M. Hobby & A. W. Moore, B. M. 1933-254 / *Cyphop.* [sic!] *arrowi* Paul. / cotype (MNHN); 1 C, Borneo Sarawak, ca. 40 km SE Kapit, 03.1994, J. Kodada (NHMW); 3 ♀, Sarawak, Kapit dist., Sebong, Baleh Riv., 9-21.3.1994, Bílý leg. (NMPC); 1 ♀, Malaysia: Sabah, Sipitang, Mendolong, T1A/W4, 18.XII.1987, leg. S. Adebratt, 30 09, 2859D (SACF); 1 ♀, Malaysia: Pahang, Bukit Fraser (1,000 m), Jeriau Waterfalls, 24.XI.1987, S. Taiti e L. Bartolozzi / in a nest of *Hospitalitermes* sp. prope *medioflavus* (ex larva) (MZUF); 1 ♂ & 3 ♀, Malaysia – W., Perak: 25 km NE of Ipoh, 2,100 m Banjaran Titi Wangsa mts, Korbu Mt., 4-13.III.1998, P. Čechovský leg. (ABCB).

HL = 1-1.2 mm; HW = 1.4-1.7 mm; PL = 1.3-1.6 mm; PW = 2.7-3 mm; EL = 2.8-3.1 mm; EW = 2.7-3 mm.

Dark brown to reddish brown, underside alutaceous, reddish brown. Head, pronotum, margins of pronotum and elytra with a yellowish, fine, sparse, short pubescence (15x).

Head: frons and vertex with impressed simple large punctures (their distance > their diameter), clypeus with few transverse semilunar punctures, becoming transversal irregular lines near fore margin.

Pronotum: base near scutellum with two sharp transversal carinae corresponding to the sides of scutellum and two small tubercles at each side of disc; fore margin distinctly raised; surface completely covered by dense (density  $\approx 25 < \text{punctures} \times 0.3 \text{ mm}^2$ ), horseshoe-shaped punctures opening forwards, well impressed, their distance inferior to their diameter. Scutellum: punctures as on pronotum, although denser and opening backwards. Elytra: humeral callus marked by a longitudinal short sharp carina, base with one large blunt tubercle between the carina and the articular process of the elytron, one or two very fine longitudinal lines between the tubercles and the humeral carina; pseudoepipleura with two or three longitudinal lines (in addition to the inferior sutural stria), apical callus marked by a very feeble smooth carina; elytral surface punctured: proximal two thirds near suture and on disc with sparse comma-shaped, impressed punctures mixed to several, simple, impressed, fine punctures (density  $\approx 25 < \times 0.3 \text{ mm}^2$ ), distal third, margins and pseudoepipleura with paired, comma-shaped punctures, fused near the margins, on pseudoepipleura and at the apex of elytra, to form closed, horseshoe-shaped punctures.

Female protibia with two apical teeth.

Parameres: figure 13. Spermatheca: figure 16.

#### Variability

There is slight variability in the development of punctures of elytra and in the development of the carina of apical callus; in few specimens the pseudoepipleura are delimited by a very weak carina.

#### Identification

See under *P. georyssoides*.

#### Distribution and habitat

Known from Peninsular Malaysia and Borneo (Sarawak and Sabah), from both lowland and montane rainforests. The record from Jeriau Waterfalls is the first record of the genus in a nest of termites, the single adult was reared in laboratory (L. Bartolozzi, in litteris). The single female from Sabah was collected in the same circumstances as *P. panggoling* sp. n. (see below).

#### Remarks

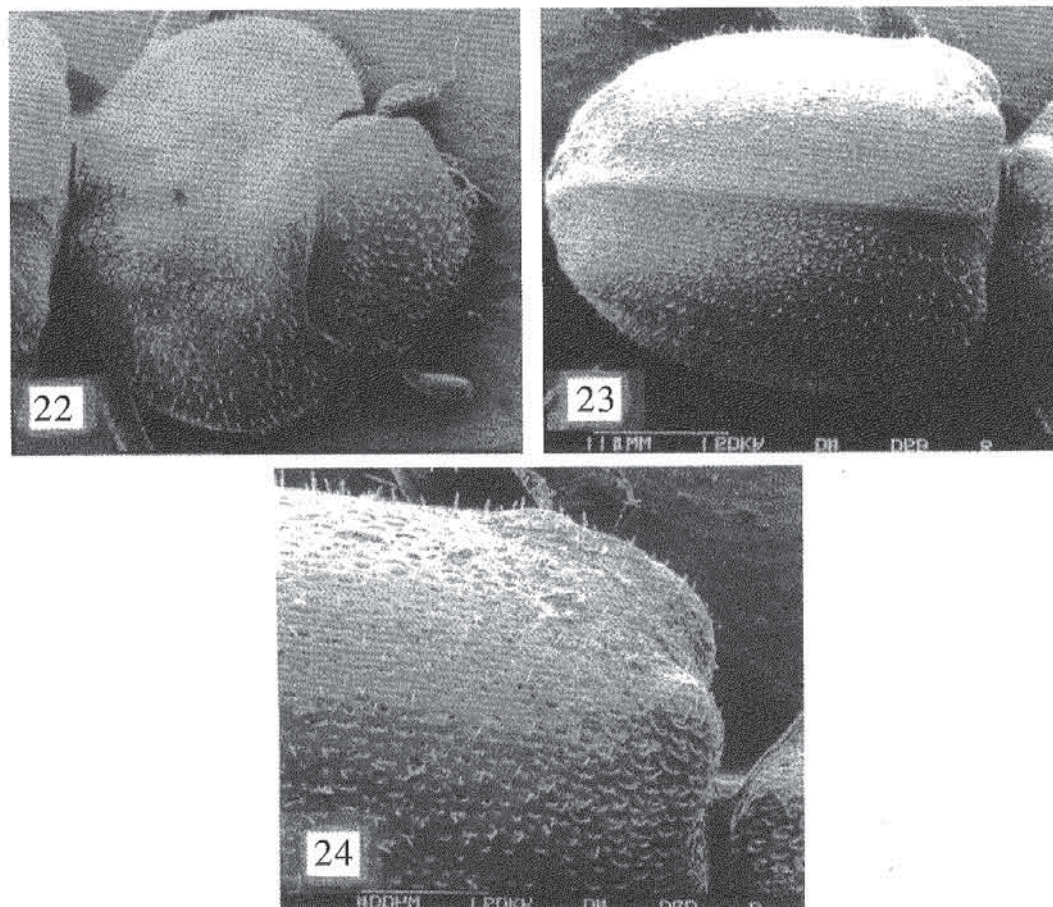
GESTRO (1898) and PAULIAN (1977) quote the year 1862 as the date of description, but the correct year is 1860.

#### *Paulianostes panggoling* sp. n. (Fig. 11, 14, 17, 25-28)

Holotype, ♂ (BMNH) : Brunei: E115 7' N4 34', Kuala Belalong FSC, Dipterocarp Forest, BM(NH) 1991-173 / Fog 34: site 20-2, 615 m alt., 13.iii.92, N. Mawdsley NM 357 / 173 / tray 9 / 1796. [specimen in good condition, glued on a card, genitalia mounted in DMHF resin on a separate card, same pin]. Allotype ♀ (BMNH): Malaysia, Sabah, Sipitang, Mendolong, T5/R 31.III.1989, leg. S. Adebratt / 2859E / 32 21. Paratypes: 1 ♀ (ABCB): Malaysia, Sabah, Sipitang, Mendolong, T1A/W4 4.XII.1987, leg. S. Adebratt / 29 91 / 2859E [extremely damaged specimen]; 1 ♀ (SACF): Malaysia, Sabah, Sipitang, Mendolong T6/R 24.II.1989, leg. S. Adebratt / 32 40 / 2859E [damaged specimen].

HL = 1.2-1.4 mm; HW = 1.7-1.8 mm; PL = 1.6-1.8 mm; PW = 3.1-3.5 mm; EL = 3.5-3.8 mm; EW = 3.3-3.6 mm.

Dark brown to black, shiny, underside alutaceous, reddish brown; head with fine, short, sparse pubescence and few recumbent or erect scales on the vertex;



Figs. 22-24: *P. acromialis* (Pascoe) (female from Malaysia, Perak, Korbu Mt.), SEM micrographs: pronotum and head (22); elytra (23); tubercles between humeral carina and elytral articular process (24).

pronotum, scutellum and elytra covered by large yellowish recumbent scales or tufts of erect scales.

Head: vertex with simple dense impressed punctures, disc surface with sparse, transverse, impressed punctures, few transversal irregular lines near fore margin.

Pronotum: base near scutellum with two sharp transversal carinae corresponding to the sides of scutellum and two small tubercles at each side of disc; fore margin distinctly raised; surface completely covered by dense recumbent scales, hence surface almost invisible, the few punctures visible are small simple or comma-shaped punctures, which near base and fore angles become horseshoe-shaped. Scutellum: horseshoe-shaped punctures opening backwards. Elytra: humeral callus marked by a large, longitudinal, very sharp short carina, no true tubercles between humeral carina and scutellum, apical callus present, elytral surface covered by large recumbent scales or by tufts of erect scales, one tuft replacing the tubercle between humeral carina and articular process; few smooth areas visible, with fine simple punctures and few, sparse, larger, impressed punctures, horseshoe-shaped punctures present only on pseudoepipleura and at apex.

Outer surface of meso- and metatibiae covered by short yellowish fine pubescence, no scales present.

Female protibia with two apical teeth.  
Parameres: figure 14;. Spermatheca: figure 17.

#### Variability

The three females have a small carina starting approximately near the humeral carina and irregularly delimiting the pseudoepipleura up to the apical callus.

#### Identification

Because of the presence of the scales, this species cannot be mistaken for any other known Ceratocanthidae. It differs also in the punctures of pronotum and elytra which are finer and less dense than in the other two species as well as in the development of the humeral carina, which in this species reaches its maximum development within the genus.

#### Etymology

*panggoling* (noun in apposition), from the Malay «pang-goling», meaning «that which rolls itself up»; the name indicates the pangolins (Mammalia: Pholidota: Manidae), which recall the new species also because of the large scales that cover the body.

#### Distribution and Habitat

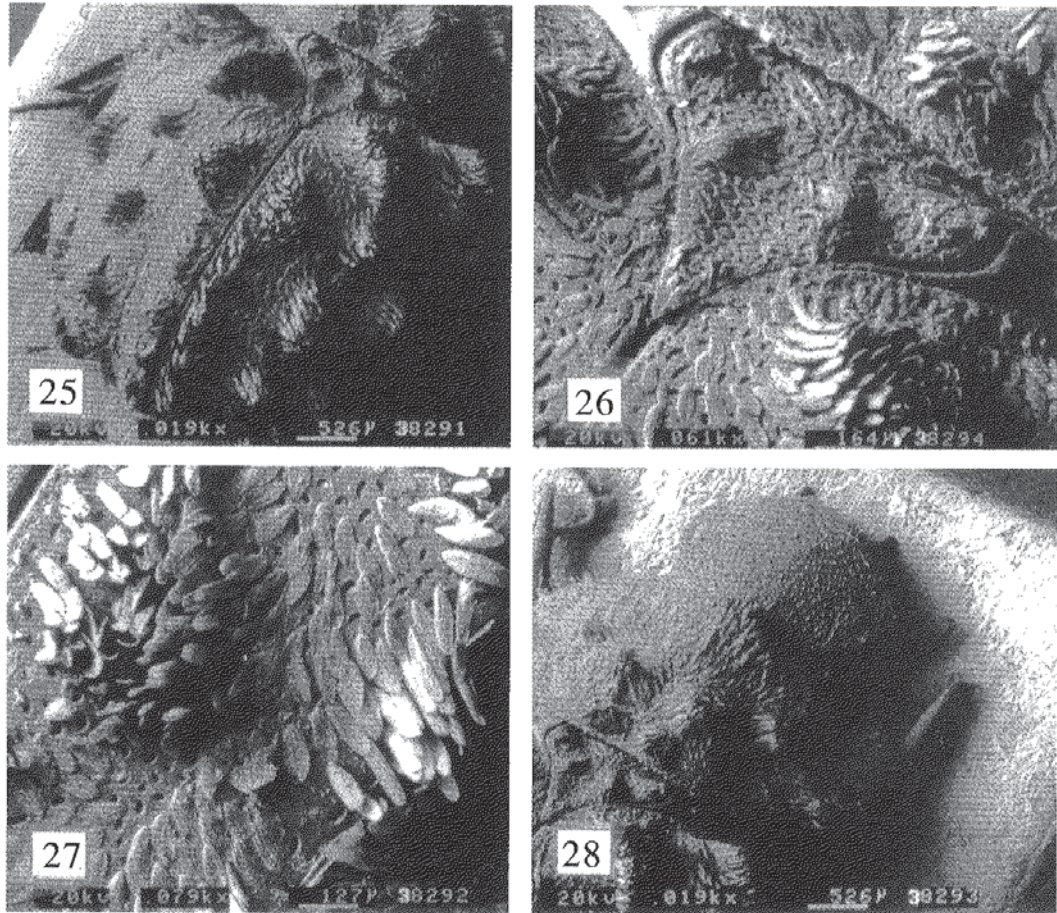
Known only from North Eastern Borneo (Brunei and Sabah). The type locality, Kuala Belalong FSC (=Field Studies Centre), is set within the Batu Apoi Forest Reserve in the Temburong District (CRANBROOK & EDWARDS, 1994). Interestingly the holotype was collected by canopy fogging, together with a large series of another Ceratocanthidae (*Eusphaeropeltis* sp.). Other records of Ceratocanthidae collected by canopy fogging exist in the literature (HAMMOND, 1990, STORK & al., 1997, WAGNER, 1997) and this suggests that some species of Ceratocanthidae could be canopy dwellers (one paper is in preparation about this subject by Th. Wagner and the author). The allotype and the paratypes were collected by means of a window trap placed 50 cm above the ground, at an altitude of 600-700 m a.s.l., at the edge of a small clearing in a lowland primary, mixed, dipterocarp rainforest (S. Adebratt, *in litteris*).

#### Remarks

*P. panggoling* n. sp. is the only Ceratocanthidae which exhibits such large flattened scales, with vertical cuticular bars visible (Fig. 27).

#### Key to the genus *Paulianostes*

- 1 Labrum distally distinctly truncate, truncature marked dorsally by a slight carina bearing a row of long, fine, erect setae, truncature in frontal view forming a plate irregularly elliptical or semicircular ..... 2
- Labrum without distinct truncature marked by a carina ..... other Ceratocanthidae
- 2 Fore angles of pronotum broadly rounded; mesotibiae short and wide (W/L ratio  $\cong$  0.3) (Fig. 5); apex of protibiae ending with a single tooth in both sexes; apical spur of protibiae fine and very gently and regularly bent downwards .....  
..... *Ebbrittoniella* Martínez
- Fore angles of pronotum triangular; mesotibiae slender and relatively narrow (W/L ratio  $\cong$  0.2) (Fig. 4); apex of protibiae usually ending with two teeth in the female (one known exception); apical spur of protibiae larger, apically distinctly bent downwards ..... 3



Figs. 25-28: *P. panggoling* sp. n. (holotype), E-SEM micrographs (© The Natural History Museum, London): elytra (25); scutellum (26); scales near elytral suture (27); pronotum and head (28).

- 3 Pronotum regularly convex, with fore margin not raised; humeral callus not marked by any distinct, longitudinal, short, cariniform process; interocular distance variable (although in most species about 7 times the maximum width of the dorsal ocular area); profemora plumper (W/L ratio 3.1); antennal club distinctly longer than funicle ..... *Cyphopisthes* Gestro
- Pronotum embossed, with fore margin more or less distinctly raised; humeral callus marked by a distinct longitudinal, short carina; dorsal ocular area always small (interocular distance about 16 times the maximum width of the dorsal ocular area); profemora slender (W/L ratio 3.3); antennal club about as long as the funicle ..... *Paulianostes* **gen. n.** 4
- 4 Body at least partly covered by large scales; each elytron without true tubercles between the humeral carina and the elytral articular process; female protibiae ending with two apical teeth ..... *P. panggoling* **sp. n.**
- Body glabrous or covered by very short, fine, erect hairs; each elytron with one or two tubercles between the humeral carina and the elytral articular process; female protibiae ending with one or two apical teeth ..... 5

- 5 Base of each elytron with one tubercle between the humeral carina and the elytral articular process; female protibiae ending with two apical teeth .....  
 ..... *P. acromialis* (Pascoe)
- Base of each elytron with two tubercles between the humeral carina and the elytral articular process; female protibiae ending with one apical tooth.....  
 ..... *P. georyssoides* (Gestro)

## DISCUSSION

*Paulianostes* forms a natural group with *Ebbrittoniella* and *Cyphopisthes*. The differential characters between these three genera are summarized in Tab. 1. The generic group is defined by the following synapomorphies (BALLERIO, in press b): a) labrum distally truncate, truncature marked dorsally by a slight carina bearing a row of long, fine, erect setae, truncature in frontal view forming an irregularly elliptical or semicircular plate, b) sexual dimorphism involving the shape of the apical teeth of protibiae, c) spermatheca strongly sclerotized, d) metathoracic wings: apical field with a vertical secondary sclerification near the radial cell. Characters a) and b) are autoapomorphic

After the new combinations established in the present paper and in the revision of the genus *Ebbrittoniella* (BALLERIO, in press b), the genus *Cyphopisthes* now numbers ten species (PAULIAN, 1978, 1980, 1981) and ranges from North Eastern India (Assam) to New Guinea and Australia (Queensland), with a doubtful record for New Caledonia (PAULIAN, 1991). The only species of *Cyphopisthes* which is still in need of adjustment is *C. inexpectatus* Paulian, 1981 from the Philippines. This species does not share any genus specific character with *Cyphopisthes*, *Ebbrittoniella* and *Paulianostes*, and seems to represent a distinct genus, possibly close to *Madrasostes* Paulian, 1975. Apart from the aforesaid exception, the genus seems now relatively homogeneous, although groups of species are recognizable and there are two species which show some atypical features. These two species are: a) one so far undescribed, flightless species from Mount Kinabalu (Borneo), in MNHN collection, which exhibits a very reduced dorsal ocular area and a strong lateral carina completely delimiting the pseudoepipleura; b) *Cyphopisthes crux* (Sharp, 1875), which has extremely short protibial teeth as well as bidentate mandibles. In both cases however, the male genitalia (with parameres dorsally flattened with an acute short apophysis at each side), the female genitalia (with spermatheca slightly reniform) and the development of antennal club (distinctly longer than the funicle) are all typical of the genus *Cyphopisthes*. The genus seems therefore monophyletic (with the single exception listed above) and the presence of recognizable groups of species doesn't seem to justify any further splitting.

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Table 1: Differential characters of the genera *Ebbrittoniella*, *Paulianostes* and *Cyphopisthes*.

	<i>Ebbrittoniella</i>	<i>Paulianostes</i>	<i>Cyphopisthes</i>
1) Labial palpi	3 <sup>rd</sup> joint = 2 <sup>nd</sup> joint (Fig. 6)	3 <sup>rd</sup> joint = 2 <sup>nd</sup> joint (Fig. 6)	3 <sup>rd</sup> joint longer than the 2 <sup>nd</sup>
2) Mentum	Mentum with a deep U-shaped emargination (Fig. 6)	Mentum with a deep U-shaped emargination (Fig. 6)	Mentum with a slight semicircular emargination
3) Dorsal ocular area	Very large (interocular distance about 5 times the maximum width of dorsal ocular area)	Very small (interocular distance about 16 times the maximum width of dorsal ocular area)	Variable (although in most species interocular distance about 7 times the maximum width of dorsal ocular area)
4) Antennal club	Small (L funicle/L lamellae = 2.1) (Fig. 9)	Large (L funicle/L lamellae = 1.7) (Fig. 8)	Very large (L funicle/L lamellae = 1.3) (Fig. 10)
5) Fore angles of pronotum	Broadly rounded	Triangular	Triangular
6) Surface of pronotum	Regularly convex (sometimes few feeble depressions visible)	Embossed, with fore margin raised.	Regularly convex (sometimes few feeble depressions visible)
7) Apical portion of mesepisternum	Smooth	Same surface sculpturing as elytra	Smooth
8) Humeral callus	Not marked by a carina	Marked by a carina	Not marked by a carina (one known exception)
9) Apical spur of protibiae	Fine and very gently bent downwards	Strong and apically distinctly bent downwards	Strong and apically distinctly bent downwards
10) Number of apical teeth of female protibiae	One	Two (one known exception)	Two
11) W/L ratio of profemora	≈4.1	≈3.3	≈3.1
12) W/L ratio of mesotibiae	>0.3 (Fig. 5)	≈0.2 (Fig. 4)	≈0.2 (Fig. 4)
13) Inner apical spur of male mesotibiae	Straight and extremely short	Bent inwards at a right angle	Bent inwards at a right angle
14) Sclerite of bursa copulatrix	Present	Present	Absent
15) Shape of spermatheca	U-shaped	U-shaped	Only slightly curved
16) Parameres	Laterally flattened	Laterally flattened	Dorsally flattened, with an acute outer apophysis at the base of each paramere
17) Accessory sclerite between parameres	Present	Present	Absent

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