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A first phylogenetic appraisal of two allied genera of Afrotropical Ceratocanthinae: *Melanophilharmostes* and *Pseudopterorthochaetes* (Coleoptera: Hybosoridae)

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Abstract
Two genera of Ceratocanthinae (Coleoptera Scarabaeoidea Hybosoridae), *Melanophilharmostes* Paulian, 1968 and *Pseudopterorthochaetes* Paulian, 1977, are evaluated through a cladistic morphological approach, resulting in the transfer of *Melanophilharmostes demirei* Paulian, 1977 to *Pseudopterorthochaetes*. All species are catalogued and all except two are keyed. Three new species are described: *Melanophilharmostes poggii* n. sp. from Annobon island (Ecuatorial Guinea), *Pseudopterorthochaetes genierorum* n. sp. and *P. miomboincola* n. sp., both from Mozambique. *Melanophilharmostes zicsii* (Paulian, 1968) is recorded for the first time for Burkina Faso, marking the northernmost record for African Ceratocanthinae. The records in Sudanian savannas and Miombo woodlands extend the ecological range of the subfamily.

Key words: Mozambique, Annobon island, Miombo woodland, Sudanian savanna, cladistics, taxonomy, new species, new combination.

Introduction

The genera *Melanophilharmostes* Paulian, 1968 and *Pseudopterorthochaetes* Paulian, 1977 are two closely related genera of Ceratocanthinae (Coleoptera Scarabaeoidea Hybosoridae) (Ballerio & Grebennikov 2016) occurring in the Afrotropical region with respectively 17 and 6 species, thus representing an important portion of the diversity of the Ceratocanthinae recorded from continental Africa (56 species). Our knowledge of the diversity of these two genera is very poor, since their study is made difficult by many factors: few specimens are known for each species, some species are known by one sex only, some types are lost or inaccessible and, above all, the definition of these genera, as provided by Paulian (1977), is not satisfactory and has not been used consistently. Furthermore the examination of all known species demonstrates that, although the majority of species attributed to these two genera can be assigned to two discrete groups, there are species which show some intermediate characters. The first group includes dorsally setose species with male mesotibia ending with the inner apical spur bent inwards, roughly corresponding to *Melanophilharmostes* sensu Paulian, 1977; the second group includes dorsally glabrous species with male mesotibia ending with two straight apical spurs, roughly corresponding to *Pseudopterorthochaetes* sensu Paulian 1977. Intermediate characters between these two groups are observed in other species such as *Melanophilharmostes ashantii* (Paulian, 1974) and *M. endroedyi* (Paulian, 1968). The goals of the present work are therefore:

1) to assess the phylogenetic position and the monophyly of each of the genera using data of adult phenotypes;
2) to describe three new species which significantly extend the geographical and ecological range of the group;
3) to provide an updated overview of all species by reporting their type specimen labels, depositories, synonyms, chresonyms and known distribution;
4) to offer an indentification key for each genus.

Methods and abbreviations

Methods and terminological conventions follow Ballerio & Grebennikov (2016) and references therein quoted. Label data are provided verbatim only for holotypes, with a slash to separate labels. In giving collecting data for holotypes, author's comments are in square brackets, while depository collection acronyms are in parenthesis unless otherwise stated. Photographs were taken with a Canon Eos D5 MII with a macro objective MP 65 mm and Kenko extension tubes. Multi-layer images were then assembled using Zerene Stacker software and cleaned and unmasked using a photo processing software. SEMs were obtained with a Zeiss EVO 40 XVP Scanning Electron Microscope at MUSE (Trento, Italy) after gold coating.

To assess phylogenetic relationships of *Melanophilharmostes* and *Pseudopterorthochaetes* (= the ingroup), a parsimony phylogenetic analysis was perfomed using morphological characters of the adults. For this purpose, a matrix (Table 1) was created in Winclada (Nixon 2002) to include 33 terminals (the list of examined specimens besides types is in Table 3) and 18 parsimoniously informative characters (Table 2). The ingroup contained 25 valid species of both genera (including three newly described herein and excluding two from Angola). Eight additional species representing eight closely and more distantly related Ceratocanthinae genera as detected in Ballerio & Grebennikov (2016) were included as outgroups. All topologies were rooted on a representative of the most distantly related genus *Ceratocanthus*. Analysis was run with all characters as unweighted and unordered, except for character #14 (hind wing development), which was ordered. The matrix was spawned from Winclada to Hennig86 (Farris 1989) and the most parsimonious (=shortest) topologies were searched for by using the command <mhennig*> (constructing several trees and then applying branch-swapping to each) followed by the command <bb*> (branch-swapping to trees constructed by mhennig* and retaining the shortest trees up to the limits of the computer memory space).

The resulting shortest topologies were saved as a tree file by command <tsave> and then opened and further explored in Winclada by applying unambiguous character optimization to individual or by exporting the data to Nona (Goloboff 1999) for bootstrap analysis with 1000 replications.

This is not a complete revision of the involved genera, therefore in the catalogue all geographical records taken from literature have not been critically reviewed.

Abbreviations: EL maximum elytral length; EW maximum total elytral width; HL maximum head length; HW

Table 1 – Data matrix of 18 adult morphological characters and 33 terminals (taxa) used for the phylogenetic analysis.

	5 10 15
Ceratocanthus amazonicus	010001020---100010
Philharmostes werneri	0100020010-012--10
Synarmostes sp.	110002010---12--01
Pseudosynarmostes mitsinjo	111000010--0-1--01
Cryptosphaeroides hystrix	111000010--011--01
Goudotostes sp.	110002010--012--01
Anopsiostes punctatus	010002020--1110000
Astaenomoechus criberrimus	010002010--0100001
Melanophilharmostes ashantii	1010011----1------
Melanophilharmostes bicarinatus	-010000112-11---01
Melanophilharmostes burgeoni	-010000112-0------
Melanophilharmostes carinatus	-011111-10011---11
Melanophilharmostes cf. carinatus Ethiop.	0011111-10-1-011--
Melanophilharmostes demirei	100012020--10---01
Melanophilharmostes donisi	-010000111101---00
Melanophilharmostes endroedyi	-0100111---1------
Melanophilharmostes ghanae	-011120112-1----01
Melanophilharmostes ocellatus	0010000112-0------
Melanophilharmostes palustris	0011110111111-----
Melanophilharmostes poggii	0011120110-1-1----
Melanophilharmostes posthi	0011111-10-1------
Melanophilharmostes puncticeps	0011111110-1101111
Melanophilharmostes pseudoposthi	0011011-10-1------
Melanophilharmostes pygmaeus	-010000112-0------
Melanophilharmostes vincenti	-01111011101100000
Melanophilharmostes zicsii	0111120212-1101101
Pseudopterorthochaetes cambeforti	-00002020--00---00
Pseudopterorthochaetes criberrimus	100002020--000--00
Pseudopterorthochaetes elytratus	-00001020--10-----
Pseudopterorthochaetes endroedyi	100012020--10---00
Pseudopterorthochaetes genierorum	10002-120--1001101
Pseudopterorthochaetes kumasii	100001020--10---01
Pseudopterorthochaetes miomboincola	100012120–11011011

maximum head width; L length; PL maximum pronotal length at middle; PW maximum pronotal width at middle; W width.

ABCB: Alberto Ballerio Collection, Brescia, Italy.
CMN: Canadian Museum of Nature, Ottawa, Canada.
CNC: Canadian National Collection of Insects, Arachnids and Nematodes, Ottawa, Canada.
FGIC: François Génier Collection, Ottawa, Canada.
FMNH: Field Museum of Natural History, Chicago, U.S.A.
HNHM: Hungarian Natural History Museum, Budapest, Hungary.
MCSN: Museo Civico di Storia Naturale "Giacomo Doria", Genova, Italy.
MHNG: Muséum d'histoire naturelle, Geneva, Switzerland.
MNHN: Muséum National d'Histoire Naturelle, Paris, France.
MRAC: Musée Royal de l'Afrique Centrale, Tervuren, Belgium.

Table 2 – List of 18 morphological traits used in the phylogenetic analysis.

1. Head, anterior projection of clypeal apex in females: absent = 0; present = 1.
2. Head, dorsal punctures: shallow = 0; deep = 1.
3. Body, dorsal surface, setae: absent = 0; present = 1.
4. Body, dorsal surface, fine punctures: absent = 0; present = 1.
5. Pronotum, transverse lines: absent = 0; present, straight = 1; present, wrinkle-shaped = 2.
6. Pronotum, larger punctures on disc, shape: ocellate = 0; horseshoe-shaped = 1; comma-shaped (including deep simple punctures) = 2.
7. Elytra, longitudinal rows of short lines: absent = 0; present = 1.
8. Elytra, larger punctures: ocellate = 0; large horseshoe-shaped = 1; small horseshoe or comma-shaped = 2.
9. Elytra, carina delimiting pseudoepipleuron: absent = 0; present = 1.
10. Elytra, carina delimiting pseudoepipleuron, when present: complete = 0; interrupted at middle = 1; limited to apical third = 2.
11. Elytra, carinae delimiting pseudoepipleuron, when present and when interrupted: aligned to each other = 0; not aligned to each other = 1.
12. Elytra, longitudinal lines forming sculpturing of pseudoepipleuron: absent = 0; present = 1.
13. Mesotibiae, orientation of inner apical spur in males: parallel to tibial axis = 0; bent inwards at a right angle = 1.
14. Hind wings: fully developed and potentially functional = 0; meiopterous, shortened and potentially not functional = 1; micropterous, not functional = 2.
15. Hind wings, vein CuA, distal fork: absent = 0; present = 1.
16. Hind wings, distal expansion of vein MP 1+2: absent = 0; present = 1.
17. Male genitalia, length ratio of parameres to phallobasis: 2x = 0; 3x = 1.
18. Male genitalia, spiculum gastrale, shape: subtriangular = 0; with manubrium not aligned with basal triangle = 1.

Table 3 – List of material used for the matrix other than the holotypes listed in the main text.

Ceratocanthus amazonicus:	French Guiana, Regina (ABCB)
Philharmostes werneri:	Tanzania, East Usambara, Amani (ABCB)
Synarmostes sp.:	Madagascar, Montagne d'Ambre (ABCB)
Pseudosynarmostes mitsinjo:	Madagascar, Andasibe, Mitisinjo Forest Reserve (ABCB)
Cryptosphaeroides hystrix:	Madagascar, Antsiranana, Réserve Spéciale d'Ambre (ABCB)
Goudotostes sp.:	Madagascar, Antisranana, Foret de l'Oragea (ABCB)
Anopsiostes punctatus:	Ecuador, Orellana, Tiputini (ABCB)
Astaenomoechus criberrimus:	French Guiana, Regina (ABCB)
Melanophilharmostes demirei:	Cameroon, Mt. Kupé, Nyasoso (ABCB)
Melanophilharmostes donisi:	Democratic Republic of Congo, Kivu, Mwenga (MRAC)
Melanophilharmostes ghanae:	paratype from Ghana, Bobiri forest (MNHN)
Melanophilharmostes palustris:	paratype from type locality (MRAC)
Melanophilharmostes puncticeps:	paratype from Democratic Republic of Congo: Moto (MRAC)
Melanophilharmostes vincenti:	paratype from type locality (MNHN)
Melanophilharmostes zicsii:	Cameroon, Bakingili (ABCB)
Pseudopterorthochaetes criberrimus:	paratype from type locality (MRAC)
Pseudopterorthochaetes endroedyi:	Cameroon, Mt. Kupé, Nyasoso (ABCB)
Pseudopterorthochaetes kumasii:	paratype from Ghana, Ashanti, Kumasi (MNHN)

Taxonomic history

The first *Melanophilharmostes* to be described was *Philharmostes posthi* Paulian, 1937 from Ivory Coast, described when the known continental African fauna of Ceratocanthinae scored only two species. In 1946 Paulian transferred *P. posthi* to the genus *Pterorthochaetes* Gestro, 1898 (a genus previously known only from the Indo-Malayan region) and three more species were added to the list (*P. burgeoni* Paulian, 1946 and *P. puncticeps* Paulian, 1946, both from the Democratic Republic of Congo, and *P. elytratus* from Cameroun). In 1955, Basilewsky added one more species, which, following Paulian's new classification, was included in the genus *Pterorthochaetes* (*P. donisi* Basilevsky, 1955 from the Democratic Republic of Congo). Basilewsky added some more faunistic records for the other species. In 1968, Decelle added new faunistic data for Ivory Coast following Paulian's classification. In the same year, thanks to the availability of more material, Paulian (1968) was able to decide that the placement within *Pterorthochaetes* was wrong and transferred all the African *Pterorthochaetes* back to the genus *Philharmostes*, at the same time isolating those species by erecting the subgenus *Melanophilharmostes*, which was then characterized by the shape of head, fore angles of pronotum rounded or truncate, body black and convex, and interrupted lateral carina of elytra. He included also four new species (*P. zicsii*, *P. endroedyi*, *P. vincenti* and *P. ocellatus*, all them described from the Republic of Congo) in the subgenus and designated *P. zicsii* as the type species of the subgenus. In the same year Petrovitz (1968) described one more species from the Democratic Republic of Congo, placed in the genus *Philharmostes* (*P. palustris*) withouth further discussion. In 1974, new findings from Ghana led Paulian to question his previous classification and to go back to the use of *Pterorthochaetes* for some species and of *Philharmostes* (without subgenus) for others. In particular, two new species were assigned to *Pterorthochaetes* (*P. endroedyi* and *P. kumasii*) and four new species were assigned to *Philharmostes* (*P. ashantii*, *P. carinatus*, *P. bicarinatus* and *P. ghanae*). In 1970, Martínez restricted the use of *Pterorthochaetes* to the Indo-Malayan and Australian species only and transferred *P. puncticeps*, *P. posthi*, *P. burgeoni*, *P. elytratus* (together with other species which do not belong to the taxa herein dealt with) to the genus *Astaenomoechus* Martínez & Pereira, a genus previously known only from the Neotropical region. He added new faunistic data for Angola and described three new species, two of them belonging to the taxa herein dealt with (*A. carvalhoi* and *A. machadoi*). Martínez's paper sets a first obstacle to a complete revision of the involved taxa since the holotypes are deposited in the Museu do Dundo in Angola, currently inaccessible and whose collections' fate is unknown. In 1977, in the framework of a complete revision of the continental African fauna of Ceratocanthinae, Paulian re-defined all known genera and distributed all the species above listed between two genera based mainly on shape and size of fore tibiae apical teeth and on the presence or absence of the carina delimiting pseudoepipleuron:

a) *Melanophilharmostes* (elevated to genus), which included *M. puncticeps*, *M. vincenti*, *M. posthi*, *M. carinatus*, *M. palustris*, *M. zicsii*, *M. ghanae*, *M. donisi*, *M. bicarinatus*, *M. burgeoni*, *M. pygmaeus*, *M. endroedyi* (described as *Philharmostes endroedyi* in 1968), *M. ocellatus* and *M. ashantii* and two new species *M. demirei* from Cameroon and *M. pseudoposthi* from the Democratic Republic of Congo;
b) *Pseudopterothochaetes* (apparently the longest genus name within Coleoptera), a newly erected genus which included *P. elytratus* (designated as the type species), *P. kumasii* and *P. endroedyi* (described as *Pterorthochaetes endroedyi* in 1974) and the new species *P. criberrimus* from the Democratic Republic of Congo.

In an addenda to the revision the author provided a critical review of Martínez's paper, although, not being able to examine the types, he simply suggested new combinations and synonymies. In the following years, only few data increased our knowledge of the two genera: a faunistic paper by Paulian (1979) added some data for Gabon, Ivory Coast, Liberia and the Democratic Republic of Congo; the description of *Pseudopterorthochaetes cambeforti* Paulian, 1981 from Ivory Coast; and the description of *P. hystrix* Paulian, 1991 from Madagascar. Ocampo & Ballerio (2006) listed all known species. Ballerio (2008) transferred *P. hystrix* to the Madagascan endemic genus *Cryptosphaeroides* Ballerio, 2008 (on the grounds of various morphological characters related to male genitalia, antennal morphology and sexual dimorphism). Ballerio et al. (2011) revised the Ceratocanthinae fauna of Cameroon and published some more faunistic data as well as some critical remarks on *M. demirei*. Finally, Ballerio & Grebennikov (2016) provided a phylogenetic framework to address relationships of *Melanophilharmostes* and *Pseudopterorthochaetes*, suggesting close relationship between these two genera, which clustered together in the same clade.

Distribution, habitat and life history

The genus *Melanophilharmostes*, as re-defined in the present paper, has its main center of distribution in the Guineo-Congolian rainforest block, occurring from Liberia in the West to the Kakamega forest in Kenya (*Melanophilharmostes* sp., Kenya, Kakamega Forest, light trap, 23.II.2002, ABCB) in the East. The northern borders of its distribution range are marked by two eccentric locations, i.e. Burkina Faso (see below under *M. zicsii*) and Ethiopia (see below under *M. carinatus*), while the southern borders reach Central Angola (Martínez 1970). There is also an insular record for Equatorial Guinea, Annobon island (see below under *M. poggii* n. sp.). Most records come

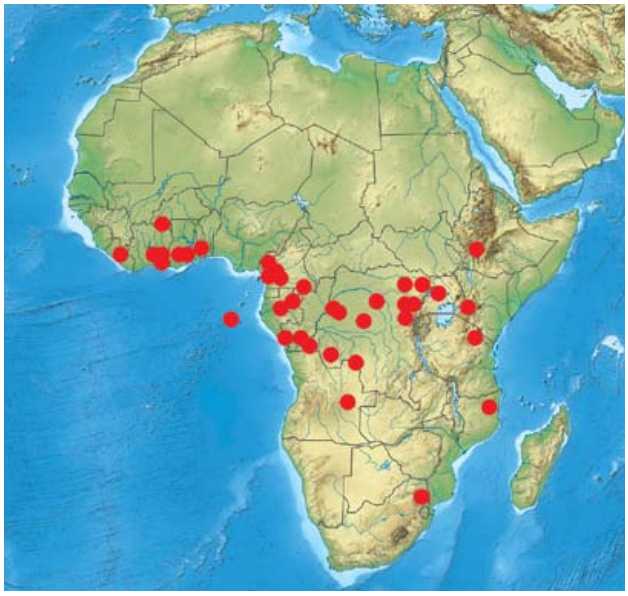

Fig. 1 – Map showing all known localities (red dots) where species of *Melanophilharmostes* and/or *Pseudopterorthochaetes* have been collected based on both published and unpublished data (blank map source: Wikimedia Commons).

Fig. 2 – Habitat of *Melanophilharmostes zicsii* (West Sudanian savanna). Burkina Faso: Comoé, Koflandé (photo F. Génier 2006).

from lowland and montane forests (up to 1600-1800 m, *M. palustris*; 1614 m, *M. carinatus* from Ethiopia), mostly gallery forests and rainforests, but we know at least one record from a Western Sudanian savanna in Burkina Faso (Fig. 2) (see below under *M. zicsii*).

The genus *Pseudopterorthochaetes*, as re-defined in the present paper, occupies a wide portion of the Guineo-Congolian rainforest block, from Ivory Coast in the West to Uganda in the East (*Pseudopterorthochaetes* sp., Uganda, Masindi District, Budongo Forest near Sonso, 1.45N, 31.35E, 19-30 June 1995, Thomas Wagner leg., ABCB). Several new eccentric records provided in this paper extend the distribution eastwards to Tanzania (a single female of a still undescribed species from Arusha-Chini, old collection, HNHM), and southwards to northern Mozambique (see below under *P. genierorum* n. sp. and *P. miomboincola* n. sp.) and to South Africa (a single female of a still undescribed species from Kruger National Park, CMN). Most records come from lowland and montane forests (up to 1550 m, *P. endroedyi*), mostly gallery forests

Fig. 3 – Habitat of *Pseudopterorthochaetes miomboincola* n. sp. (Miombo woodland). Mozambique: Cabo Delgado, Ravia (site 6), Parque Nacional das Quirimbas (photo F. Génier 2012).

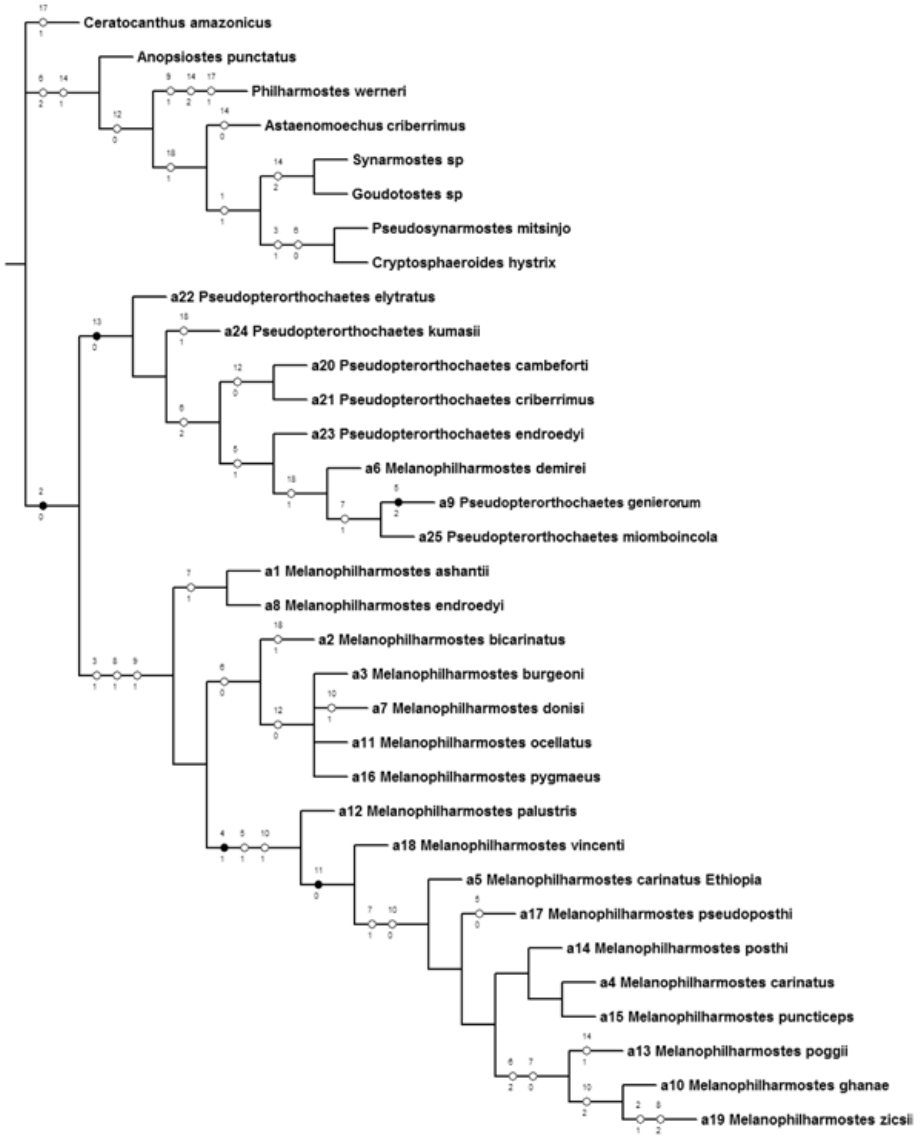

Fig. 4 – Randomly selected tree with unambiguously optimized characters shown on internodes.

and rainforests, but the two new species from Mozambique were collected in Miombo woodland (Fig. 3), i.e. from an ecologically quite different habitat, drier than rainforests and gallery forests and subject to relatively short seasonal rains.

Very little is known about the biology of these two genera. Most records have been done through sifting of leaf litter/humus or rotten wood in forest (Ballerio et al. 2011). *Melanophilharmostes pseudoposthi* was collected in a nest of *Nasutitermes latifrons* (Sjöstedt, 1896) (Paulian 1977). There are several collecting records of specimens attracted to light (Paulian 1977). There are some flightless species, some of them occurring through wide geographical areas, such as *P. endroedyi* occurring in Ghana, Ivory Coast, Cameroon and Gabon (Ballerio et al. 2011). Preimaginal stages are unknown. In Fig. 1, a map summarizes all known records for both the genera.

Cladistic analysis

The phylogenetic analysis resulted in an overflow of 2807 shortest trees, each with the length of 54 steps, consistency index of 0.42 and retention index 0.79. A randomly selected tree with unambiguously optimized characters shown on internodes is depicted in Fig. 4, while the bootstrapping consensus topology is shown on Fig. 5. The ingroup was recovered as a moderately supported clade (bootstrap support 78%, Fig. 5). Both *Pseudopterorthochaetes* and *Melanophilharmostes* were recovered as monophyletic with moderate bootstrap support of 80% and 77%, respectively (except *M. demirei*, which was nested within *Pseudopterorthochaetes*). Although the two genera have a relatively uniform morphology, sharing several apomorphies and having at least two species which show some intermediate morphology between the two genera, the cladistic analysis did not provide enough evidence for synonymizing them.

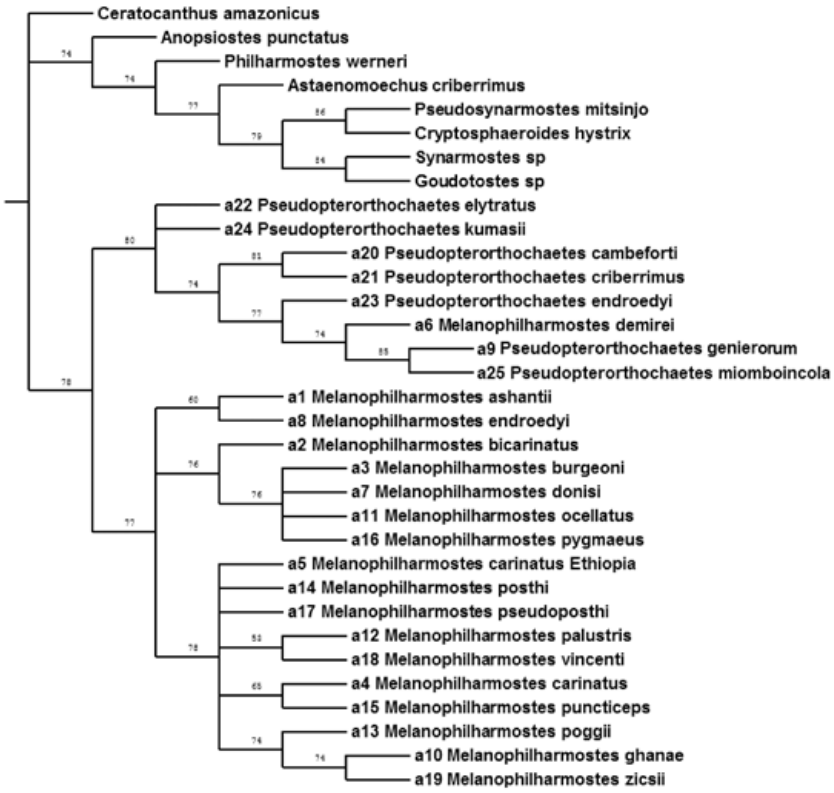

Fig. 5 – Bootstrapping consensus topology.

Therefore, also on the grounds that the examined material was fragmentary, I deem more prudent to leave them as separate genera, awaiting for more material and evidence before to synonymize them.

Catalogue and description of new species

Melanophilharmostes Paulian, 1968

Philharmostes (*Melanophilharmostes*) Paulian, 1968

Type species (by original designation): *Philharmostes* (*Melanophilharmostes*) *zicsii* Paulian, 1968.

Generic diagnosis

Adults display a relatively uniform morphology. Small Ceratocanthinae, reddish-brown, brown or black, with complete enrollment coaptations. Dorsum setose (40x). Dorsal ocular area always visible and genal canthus complete. Antennae with ten antennomeres. Mouthparts with mandibles with sharp apex (Figs 6 a, b), mesal brush narrow and well-developed, molar lobe very strong and labium with U-shaped emargination and thin palpi (Fig. 6 c), the last palpomere being longer than the preceding palpomeres. Epipharynx as in Fig. 6 d. Maxilla as in Figs 6 e, f. Wings (Fig. 11 j), when fully developed (there are some flightless species) have a distal fork at the end of vein CuA, and a distal expansion of vein MP 1+2. Dorsal sculpture consists of a variety of mostly shallow punctures and/or lines. Several species have a distinct pseudoepipleure delimited by a carina (Fig. 11 l), often interrupted or incomplete. Sexual dimorphism involves the following traits: the apex of clypeus, which in the females of some species is elongate (Fig. 11 b); the apex of female protibiae, which are elongate and have apical teeth more developed than in males; male mesotibiae which have the inner apical spur bent inwards at a right angle (Fig. 11 i). Spiculum gastrale and parameres have varied shapes and are useful for species-level differentiation (parameres can be flattened dorsally or laterally, glabrous or setose, some species have parameres which remain separated making visible a median lobe and are useful for species distinction). Besides male genitalia other characters useful for species differentiation are found in the punctation of head, pronotum and elytra, setation and shape of carina delimiting pseudoepipleure.

Melanophilharmostes ashantii (Paulian, 1974)

Philharmostes ashantii Paulian 1974: 206 (description, distribution); *Melanophilharmostes ashantii*: Paulian 1977 (key, description, distribution); Ocampo & Ballerio 2006 (listing).

Holotype, ♀ (HNHM), **Ghana**: / Ghana: Ashanti region, Ofinso, 259 m, N 6 54 – W 1 39, Dr. S. Endrody-Younga

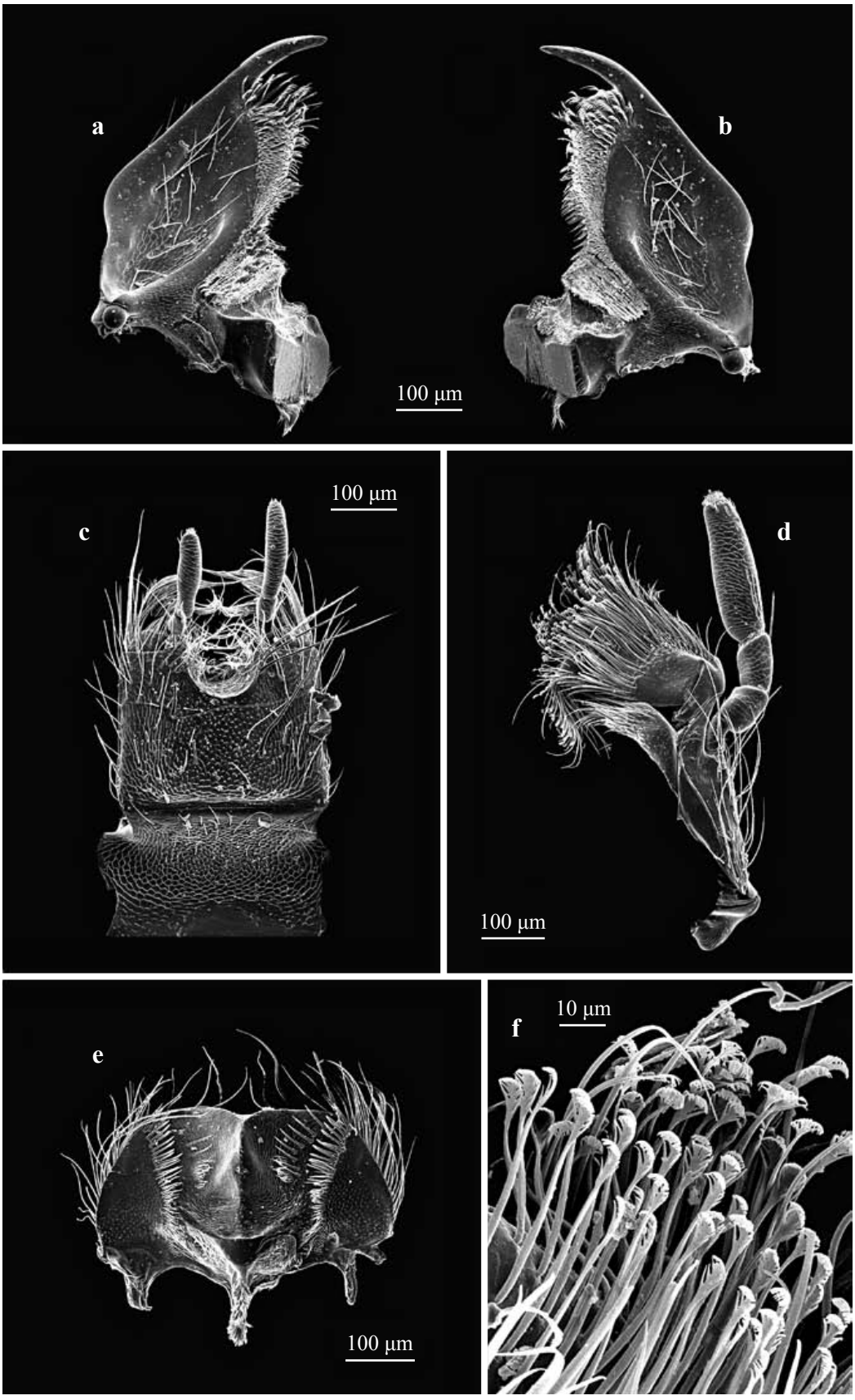

Fig. 6 – *Melanophilharmostes* sp. (Cameroon, Mt. Kupé, Nyasoso), SEM of mouthparts **a**, **b** mandibles in ventral view; **c**, labium and labial palpi; **d**, maxilla and maxillary palpus; **e**, distal epipharynx; **f**, detail of galeal brush.

/ Nr. 37, sifting, 18.VII.1965 / Holotypus 1974, *Philharmostes ashanti* Paulian /Holotype / *Philharmostes ashanti* n. sp. R. Paulian det. / *Melanophilharmostes ashantii* (Paulian) det. A. Ballerio '97 /

Distribution. Ghana (Paulian 1974).

Remarks. Very similar to *M. endroedyi*, of which it could be a synonym. The only noticeable difference is the punctation of dorsum which in *M. ashantii* is more impressed. Both species share the following combination of characters: dorsum setose, lack of fine punctation, presence of nine pairs of longitudinal fine lines on elytral distal third, lateral carina of elytra almost invisible and limited to distal third. The holotype of *M. ashantii*, the only known specimen of that species, has the clypeal apex elongate, probably a sexually dimorphic character of females, typically found in *Pseudopterorthochaetes* and not in *Melanophilharmostes*.

***Melanophilharmostes bicarinatus* (Paulian, 1974)**
Philharmostes bicarinatus Paulian 1974: 208 (description, distribution); *Melanophilharmostes bicarinatus*: Paulian 1977 (key, description, distribution); Ocampo & Ballerio 2006 (listing).

Holotype, ♂ (HNHM), **Ghana**: / Ghana: Ashanti region, Bobiri forest res., 320 m, N 6 40 – W 1 15, Dr. S. Endrody-Younga / Nr. 142, sifting, 27.III.1966 / Holotypus 1974, *Philharmostes bicarinuatus* Paulian /Holotype / *Philharmostes bicarinatus* n. sp. R. Paulian det. / *Melanophilharmostes bicarinatus* (Paulian) det. A. Ballerio '97 /

Distribution. Ghana (Paulian 1974).

Remarks. Easily separable from all other known species by the interrupted elytral carina delimiting pseudoepipleuron. The carina starts at the medial third, it is interrupted at the beginning of the distal third, and then continues along the distal third (this third portion of carina is not aligned with the medial one) in combination with ocellate punctation on pronotum. The closest species to it is *M. ocellatus*, which however has a continuous carina (although slightly sinuate in correspondence of the interruption in *M. bicarinatus*). Aedeagus and spiculum gastrale as in Figs 12 g-h.

***Melanophilharmostes burgeoni* (Paulian, 1946)**
Pterorthochaetes burgeoni: Paulian 1946: 201 (description, distribution); Basilewsky 1955 (distribution); Decelle 1968 (distribution); *Astaenomoechus burgeoni*: Martínez 1970 (iconography, key, description, distribution); *Melanophilharmostes burgeoni*: Paulian 1977 (key, iconography, description, distribution); Ocampo & Ballerio 2006 (listing).

Holotype, sex unknown (MRAC), **Democratic Republic of Congo**: / Typus *Pe. Burgeoni* Paul. / Musée du Congo / Haut-Uele: Yebo Moto III-1926 L. Burgeon / R. det. E. 5093 / *Pterorthochaetes burgeoni* n. sp. R. Paulian det. / *Melanophilharmostes burgeoni* (R Paul) R. Paulian det. /

Distribution. Democratic Republic of Congo (Paulian 1946, 1977; Basilewsky 1955), Cameroon (Paulian 1977), Angola (?) (Martínez 1970), Ivory Coast (?) (Decelle 1968).

Remarks. The ocellate punctation of pronotal disc combined with sparse horseshoe-shaped punctures on elytra (mixed to very few simple punctures) and the shape of elytral carina delimiting pseudoepipleuron (limited to distal half) allow the identification of this species. The species most similar to it is *M. donisi*, which however has denser elytral punctation and a larger number of simple punctures mixed to horseshoe-shaped punctures on elytra.

***Melanophilharmostes carinatus* (Paulian, 1974)**
Philharmostes carinatus Paulian 1974: 207 (description, distribution); *Melanophilharmostes carinatus*: Paulian 1977 (key, description, distribution); Ocampo & Ballerio 2006 (listing).

Holotype, ♂ (HNHM), **Ghana**: / Ghana: Ashanti region, Kumasi, 330 m, N 6 43 – W 1 36, Dr. S. Endrody-Younga / Nr. 39, sifting, 2.VII.1965 / Holotypus 1974, *Philharmostes carinatus* Paulian /Holotype / *Philharmostes carinatus* n. sp. R. Paulian det. / *Melanophilharmostes carinatus* (Paulian) ♂ /

Distribution. Ghana (Paulian 1974), Ethiopia (?) (see below under remarks).

Remarks. *Melanophilharmostes carinatus* is extremely similar to *M. posthi* and *M. puncticeps*. Thanks to the courtesy of V. V. Grebennikov (Ottawa, Canada) I have also observed a single female from Ethiopia (Bonga, 7.1954N 36.2812E, 1614 m, 10 November 2014, sift 29, local collector, CNC) which shows the same outer morphology of *M. carinatus*. Examination of more material and dissection of males is needed in order to better evaluate the status of these species and of the Ethiopian population. All them belong to the group of species characterized by the presence of fine punctation on pronotum and elytra and formed by *M. zicsii*, *M. carinatus*, *M. ghanae*, *M. palustris*, *M. posthi*, *M. pseudoposthi*, *M. puncticeps* and *M. vincenti*. Aedeagus and spiculum gastrale as in Figs 12 i-j.

***Melanophilharmostes carvalhoi* (Martínez, 1970)**
Astaenomoechus carvalhoi: Martínez 1970: 20 (iconography, key, description, distribution); *Melanophilharmostes*

carvalhoi: Paulian 1977 (discussion); Ocampo & Ballerio 2006 (listing).

Holotype, ♂ (according to original publication), in coll. Museo do Dundo, Dundo, **Angola:** "Angola, Moxico: detritos vegetales del suelo de la selva en galería de la margen izquierda del río Lumeje (11°40'S, 20°36'E), cerca de una picada que sale de la estación de Sandando, 17-I-1955 (A. De Barros Machado-coll.)".

Distribution. Angola (Martínez 1970).

Remarks. Based on the original description, Paulian (1977) stressed close similarity with *M. vincenti* and I concur with him, however, since the fate of the collections of the Museo do Dundo in Angola is unknown and nobody has ever examined the types of *M. carvalhoi* and *P. machadoi* after the description, it is not possible to draw any final decision on the synonymy. The identity of *M. carvalhoi* and *P. machadoi* remains therefore doubtful.

***Melanophilharmostes donisi* (Basilewsky, 1955)**
Pterorthochaetes donisi: Basilewsky 1955:17 (description, distribution); *Astaenomoechus donisi*: Martínez 1970 (key, distribution); *Melanophilharmostes donisi*: Paulian 1977 (iconography, key, description, distribution); Paulian 1979 (distribution); Ocampo & Ballerio 2006 (listing).

Holotype, sex unknown (MRAC), **Democratic Republic of Congo**: / Holotypus / Yangambi. 1953 C. Donis z A / coll. R. Mayné com. Èt. Bois Congo R. 2467 / coll. – Mus. Congo Don R. Mayné / A. Jannssens det. 1954 *Pterorthochaetes Donisi* n. sp. / *Pterorthochaetes Donisi* n. sp. P. Basilewsky det., 1955 / *Melanophilharmostes donisi* (Basilew) det. R. Paulian 1976 /

Distribution. Democratic Republic of Congo (Basilewsky 1955; Paulian 1977, 1979).

Remarks. See under *M. burgeoni*.

***Melanophilharmostes endroedyi* (Paulian, 1968)**
Philharmostes (Melanophilharmostes) endroedyi: Paulian 1968: 93 (iconography, description, distribution); *Melanophilharmostes endroedyi*: Paulian 1977 (key, description, distribution); Ocampo & Ballerio 2006 (listing).

Holotype, ♂ (HNHM), **Republic of Congo**: / Soil-Zoological Exp., Congo-Brazzaville, Kindamba, Meya, Louolo river / 2.11.1963. No. 78, sifted litter, leg. Endrödy-Younga / Type / Holotypus *Philharmostes endroedyi* Paul. / *Philharmostes endroedyi* Paulian n. sp. / Type /

Distribution. Republic of Congo (Paulian 1968, 1977).

Remarks. See under *M. ashantii*. Aedeagus and spiculum gastrale as in Figs 12 e-f.

***Melanophilharmostes ghanae* (Paulian, 1974)**
Philharmostes ghanae: Paulian 1974: 208 (description, distribution); *Melanophilharmostes ghanae*: Paulian 1977 (key, description, distribution); Ocampo & Ballerio 2006 (listing).

Holotype, ♀ (HNHM), **Ghana**: / Ghana: Ashanti region, Kumasi, 330 m, N 6 43 – W 1 36, Dr. S. Endrody-Younga / Nr. 39, sifting, 2.VII.1965 / Holotypus 1974, *Philharmostes ghanae* Paulian /Holotype / *Philharmostes ghanae* n. sp. R. Paulian det. / *Melanophilharmostes ghanae* (Paulian) ♀ /

Distribution. Ghana (Paulian 1974, 1977), Togo (Paulian 1977).

Remarks. Due to the sparse horseshoe-shaped elytral punctures, this species is similar to *M. vincenti* from which can be easily separated by the different punctation of elytral base. The correct type locality is Kumasi, the type locality reported in Paulian (1977), i.e. Bobiri, is wrong.

***Melanophilharmostes ocellatus* (Paulian, 1968)**
Philharmostes (Melanophilharmostes) ocellatus: Paulian 1968: 94 (iconography, description, distribution); *Melanophilharmostes ocellatus*: Paulian 1977 (iconography, key, description, distribution); Ocampo & Ballerio 2006 (listing).

Holotype, ♀ (HNHM), **Republic of Congo**: / Soil-Zoological Exp., Congo-Brazzaville, Bouenza, catarract / 30.11.1963. No. 308, sifted, in float, leg. Endrödy-Younga / Holotypus, *Philharmostes ocellatus* Paul. / *Philharmostes ocellatus* n. sp. / type / *Melanophilharmostes ocellatus* (Paulian), det. A. Ballerio '97 /

Distribution. Republic of Congo (Paulian 1968, 1977).

Remarks. See under *M. bicarinatus*.

***Melanophilharmostes palustris* (Petrovitz, 1968)**
Philharmostes palustris: Petrovitz 1968: 255 (description, distribution); *Melanophilharmostes palustris*: Paulian 1977 (key, description, distribution); Ocampo & Ballerio 2006 (listing).

Holotype, sex unknown (MRAC), **Democratic Republic of Congo**: / Holotypus / Biot. N. 101 Bord petit marais en foret (Mus. Roy. Afr. Centr. Tshuapa: Terr. Ikela, riv. Gombe, IX-1959 B. 101 N. leleup / Typus / *Philharmostes*

palustris nov. 1963 Petrovitz / *Philharmostes palustris* Petr. Det. R. Paulian 1976/
Distribution. Democratic Republic of Congo (Petrovitz 1968; Paulian 1977).

***Melanophilharmostes poggii* sp. n.** (Figs 7 a, b)
urn:lsid:zoobank.org:act:61AD2199-F2CE-40AE-8227-E5FFE88D475A

Type series. Holotype, ♀ in coll. MCSN, **Equatorial Guinea**: / Is. Annobon 400-500 m. IV-V 1902 L. Fea / *Melanophilharmostes poggii* sp. n. A. Ballerio det. 2015 ♀ / Museo Civico di Genova /

Diagnosis. *Melanophilharmostes poggii* n. sp. is a small *Melanophilharmostes* which belongs to the group of species characterized by the presence of fine punctation on pronotum and elytra. It differs from all other species belonging to the aforesaid group by the following combination of characters: a) shiny dorsum, b) lateral elytral carina complete, c) presence of a longitudinal wide smooth elytral stria without any punctures, d) the lack of longitudinal rows of lines, which are replaced by irregular rows of horseshoe-shaped punctures and e) flightlessness.

Description. Size: HL = 0.63 mm; HW = 1.13 mm; PL = 1.10 mm; PW = 1,86 mm; EL = 2.13 mm; EW = 2.00 mm. Overall morphology as in generic diagnosis. Small *Melanophilharmostes*. Light brown, shiny, setate, fore margins of clypeus, sternum, tarsi and antennae reddish-brown. Flightless.

Head: interocular distance about ten times the maximum width of dorsal ocular area, frons smooth, clypeus completely covered by comma-shaped punctures with opening oriented forwards, each one having one or two simple punctures inside, sometimes bearing a long fine erect seta, fore margin with some irregular deep transverse lines.
Pronotum: setate, setae relatively long, thin, erect, clavate. Margin complete, fore angles subtruncate, completely covered by long, transverse irregular shallow lines, sometimes anastomizing, mixed to dense simple fine punctures. Scutellum: covered by horseshoe-shaped punctures with opening backwards mixed to dense fine punctures.
Elytra: setate (setae erect, sparse, relatively long, thin, clavate), ovate, humeral callus indistinct, periscutellar area with at first some transverse lines and then large horseshoe-shaped punctures. Elytra covered by longitudinal irregular rows of large horseshoe-shaped punctures, mixed to sparse fine punctures, at middle a longitudinal smooth stria without any punctures. Lateral carina complete. Pseudoepipleura with some irregular longitudinally oriented straight shallow lines.
Flightless (brachypterous).
Sexual dimorphism: unknown. The female holotype however lacks any clypeal projection. Fore tibiae are as in other *Melanophilharmostes* females.

Etymology. Named after Roberto Poggi, former director of MCSN, who lent me the new species for study. Noun in the masculine genitive singular case.

Distribution and habitat. Annobon Island (Equatori-

Fig. 7 – Holotype of *Melanophilharmostes poggii* n. sp. holotype: **a**, dorsal view; **b,** lateral view. Scale bar: 1 mm.

al Guinea). According to a letter that Leonardo Fea sent to Raffaello Gestro dated 5 April 1902 (R. Poggi pers. comm.), when Fea collected the holotype the island was partly covered by degraded secondary lowland rainforest.

Remarks. This is the first insular record for *Melanophilharmostes*.

***Melanophilharmostes posthi* (Paulian, 1937)**
Pterorthochaetes posthi: Paulian 1937: 431 (key, description, distribution); Paulian 1946 (key, description, distribution), Decelle 1968 (distribution); *Astaenomoechus posthi*: Martínez 1970 (key, distribution); *Melanophilharmostes posthi*: Paulian 1977 (iconography, key, description, distribution); Ocampo & Ballerio 2006 (listing).

Holotype, ♀ (MNHN), **Ivory Coast**: / Museum Paris, Cote d'Ivoire, env. de Dimbokro, Capitaine Posth 1911/ Type / *Pterorthochaetes posthi* n. sp. Det. R. Paulian 1937/

Distribution. Ivory Coast (Paulian 1937, 1946, 1977; Decelle 1968), Liberia (Paulian 1979), Togo (Paulian 1977).

Remarks. See under *M. carinatus*.

***Melanophilharmostes pseudoposthi* Paulian, 1977**
Melanophilharmostes pseudoposthi: Paulian 1977: 297 (key, description, distribution); Ocampo & Ballerio 2006 (listing).

Holotype, ♀ (FMNH), **Democratic Republic of Congo**: / Camp Putnam, Epulu, Belg. Congo May 15 : 1948 AE Emerson leg. / Host : *Nasutitermes latifrons* Siöst / Holotype / *Melanophilharmostes pseudoposthi* n. sp. R. Paulian det. /

Distribution. Democratic Republic of Congo (Paulian 1977).

***Melanophilharmostes puncticeps* (Paulian, 1946)**
Pterorthochaetes puncticeps: Paulian 1946: 200 (key, description, distribution); Basilewsky 1955 (distribution); *Astaenomoechus puncticeps*: Martínez 1970 (key, distribution); *Melanophilharmostes puncticeps*: Paulian 1977 (iconography, key, description, distribution); Paulian 1979 (distribution); Ocampo & Ballerio 2006 (listing).

Holotype, sex unknown (MRAC), **Democratic Republic of Congo**: / Holotypus / Musée du Congo Equateur: Flandria XI-1929 R. P. Hulstaert / R. det. C. 5093 / *Pterorthochaetes puncticeps* n. sp. R. Paulian det. / *Melanophilharmostes puncticeps* (R. Paul.) R. Paulian det. /

Distribution. Democratic Republic of Congo (Paulian 1946, 1977, 1979; Basilewsky 1955), Liberia (Paulian 1977).

Remarks. See under *M. carinatus*.

***Melanophilharmostes pygmaeus* (Petrovitz, 1968)**
Pilharmostes pygmaeus: Petrovitz 1968: 256 (description, distribution); *Melanophilharmostes pygmaeus*: Paulian 1977 (key, description, distribution); Ocampo & Ballerio 2006 (listing).

Holotype, ♀ (MHNG), **Democratic Republic of Congo**: / Yangambi / Congo Belge / Typus / *Philharmostes pygmaeus* nov. 1968 Petrovitz / coll. Petrovitz /

Distribution. Democratic Republic of Congo (Petrovitz 1968; Paulian 1977).

***Melanophilharmostes vincenti* (Paulian, 1968)**
Philharmostes (Melanophilharmostes) vincenti: Paulian 1968: 92 (iconography, description, distribution); *Melanophilharmostes vincenti*: Paulian 1977 (iconography, key, description, distribution); Ocampo & Ballerio 2006 (listing).

Holotype, ♀ (HNHM), **Republic of Congo**: / Soil-Zoological Exp., Congo-Brazzaville, Kindamba, Meya, Louolo river / 2.11.1963. No. 78, sifted litter, leg. Endrödy-Younga / Type / Holotypus *Philharmostes vincenti* Paul. / *Philharmostes vincenti* Paulian n. sp. / *Melanophilharmostes vincenti* (Paulian) ♀/

Distribution. Republic of Congo (Paulian 1968, 1977).

Remarks. See under *M. ghanae*. Aedeagus and spiculum gastrale as in Figs 12 k-l.

***Melanophilharmostes zicsii* (Paulian, 1968)**
Philharmostes (Melanophilharmostes) zicsii: Paulian 1968: 91 (iconography, description, distribution); *Melanophilharmostes zicsii*: Paulian 1977 (iconography, key, description, distribution); Paulian 1979 (distribution); Ocampo & Ballerio 2006 (listing); Ballerio et al. 2011 (iconography, key, distribution).

Holotype, ♀ (HNHM), **Republic of Congo**: / Soil-Zoological Exp., Congo-Brazzaville, galery [sic] forest 20 km W from Loudima / 9.12.1963. No. 422, sifted fungous trunks, leg. Endrödy-Younga / Holotypus *Philharmostes zicsii* Paul. / Type / *Philharmostes zicsii* Paulian n. sp. / *Melanophilharmostes zicsii* (Paulian) ♂/

Distribution. Republic of Congo (Paulian 1968, 1977),

Gabon (Paulian 1979), Cameroon (Paulian 1979; Ballerio et al. 2011). I also know two specimens recently collected in Burkina Faso, which are tentatively assigned to *M. zicsii* (new country record): they are 1 male and 1 female, labeled as follows: Burkina Faso: Comoé, Koflandé (village), 290m 10.14.42 N 004.27.50 W, 4 July 2006, "zone soudanienne, savane boisée, piége lumineux", F. & S. Génier 2006-01 (FGIC).

Remarks. Aedeagus and spiculum gastrale as in Figs 12 m-o. The new record from Burkina Faso is particularly interesting: it marks the northernmost record of Ceratocanthinae for Africa and comes from an unusual habitat, i.e. the West Sudanian savanna, consisting mainly of woodlands (Fig. 2). All other known records of *Melanophilharmostes zicsii* comes from moister habitats, i. e. rainforests or gallery forests. The two specimens from Burkina Faso

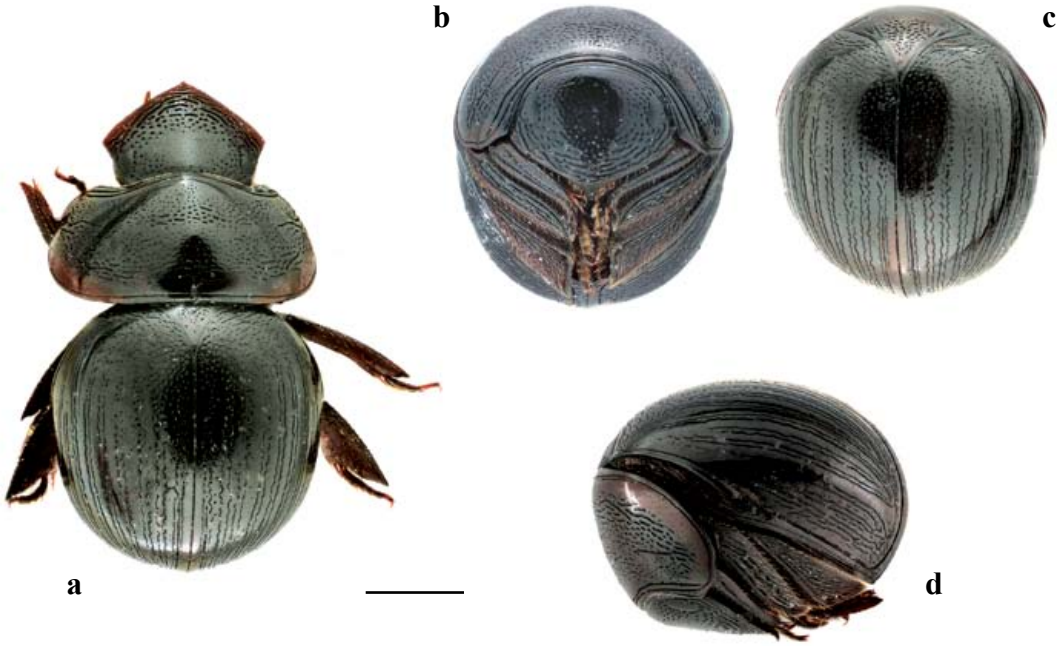

Fig. 8 – *Pseudopterorthochaetes genierorum* n. sp.: **a**, holotype male dorsal view; **b**, enrolled female paratype from Namaluco, ventral view; **c**, enrolled female paratype from Namaluco, dorsal view; **d**, enrolled female paratype from Namaluco, lateral view. Scale bar: 1 mm.

Fig. 9 – *Pseudopterorthochaetes miomboincola* n. sp.: **a**, female paratype from Namaluco dorsal view; **b**, enrolled holotype, ventral view; **c**, enrolled holotype, dorsal view; **d**, enrolled holotype, lateral view. Scale bar: 1 mm.

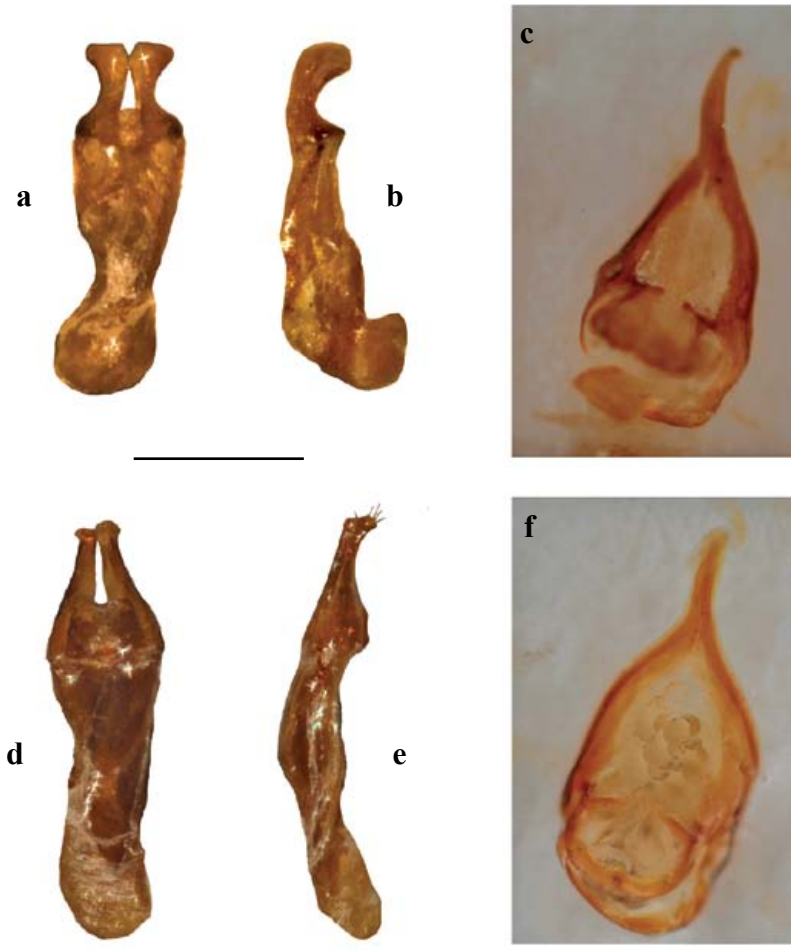

Fig. 10 – *Pseudopterorthochaetes genierorum* n. sp.: **a**, aedeagus in dorsal view; **b**, aedeagus in lateral view; **c**, spiculum gastrale; *Pseudopterorthochaetes miomboincola* n. sp.; **d**, aedeagus in dorsal view; **e**, aedeagus in lateral view; **f**, spiculum gastrale. Scale bar: 0,3 mm.

however differ from all other *M. zicsii* known to the author because of the sculpturing of elytra, which has larger and denser horsesehoe-shaped punctures, aligned on longitudinal rows, much denser and deeper transverse lines on pronotum and, overall, a less convex dorsum; conversely, male genitalia (parameres and spiculum gastrale) are almost identical to the ones of the holotype of *M. zicsii* from Congo and of the specimens from Cameroon. I therefore prudentially assign the Burkina Faso specimens to *M. zicsii*, awaiting for more evidence before to separate them from *M. zicsii*.

***Pseudopterorthochaetes* Paulian, 1977**

Type species (by original designation): *Pterorthochaetes elytratus* Paulian, 1946.

Generic diagnosis

Adults display a relatively uniform morphology. Small Ceratocanthinae, dark-brown to black, with complete enrollment coaptations. Dorsum glabrous (40x). Dorsal ocular area always visible and genal canthus complete. Antennae with ten antennomeres. Mouthparts similar to the ones of *Melanophilharmostes*, with mandibles with sharp apex, mesal brush narrow and well-developed, molar lobe very strong and labium with U-shaped emargination and thin palpi, the last palpomere being longer than the preceding palpomeres. Wings (Fig. 11 j), when fully developed (there are some flightless species) have a distal fork at the end of vein CuA, and a distal expansion of vein MP 1+2. Dorsal sculpture consists of a variety of mostly shallow punctures and/or lines. All known species lack the carina delimiting the pseudoepipleure, which is therefore hardly discernable (Fig. 11 k). Sexual dimorphism involves the apex of clypeus which in the females of all known species is elongate (Fig. 11 b), female protibiae, which are elongate and have apical teeth more developed than in males, male mesotibiae which have two straight apical spurs (a very unusual feature). Spiculum gastrale and parameres have varied shapes and are useful for species differentiation. Besides male genitalia, other characters useful for species differentiation are found in the punctation of head, pronotum and elytra.

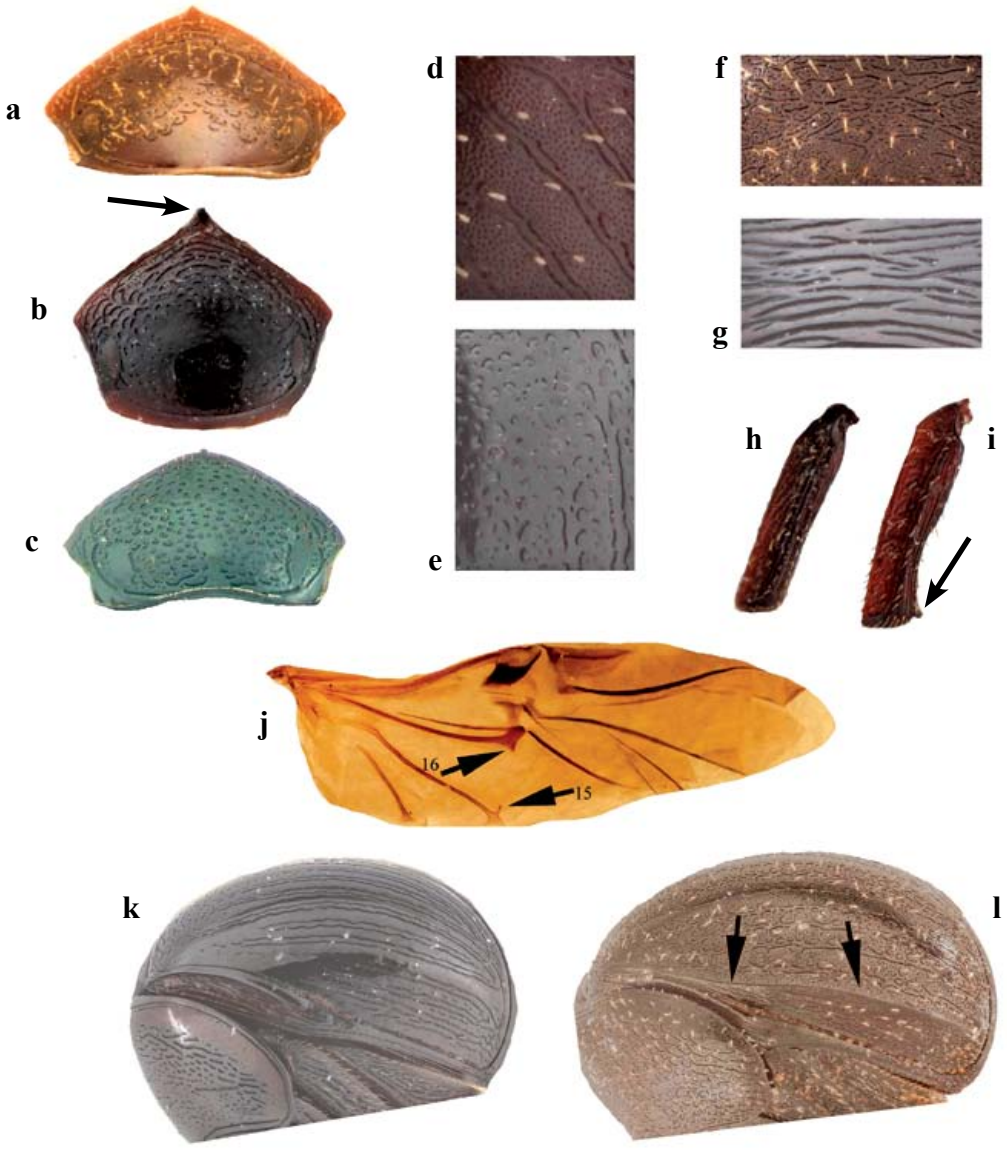

Fig. 11 – Some characters used for the cladistic analysis: **a**, characters 1.0 and 2.0; **b**, character 1.1 (arrow indicates the projection of clypeus); **c**, character 2.1; **d**, characters 3.1 and 4.1; **e**, characters 3.0 and 4.0; **f**, character 5.1; **g**, character 5.2; **h**, character 13.0; **i**, character 13.1 (arrow indicates the bent inwards apical spur); **j**, characters 15.1 and 16.1; **k**, character 9.0; **l,** character 9.1 and 10.0 (arrows indicate the carina).

***Pseudopterorthochaetes cambeforti* Paulian, 1981**
Pseudopterorthochaetes cambeforti: Paulian 1981: 329 (description, distribution); Ocampo & Ballerio 2006 (listing).

Holotype, ♂ (MNHN), **Ivory Coast**: / Lamto (Toumodi), Cote d'Ivoire, XI.1980, Y. Cambefort leg. / tamisage litière de forêt galerie / holotype / *Pseudopterorthochaetes cambeforti* n. sp. R. Paulian det. /

Distribution. Ivory Coast (Paulian 1981).

Remarks. This species is very similar to *P. elytratus* and *P. kumasii*. Only examination of more material will allow a better evaluation of the status of these three species since the holotypes of the other two species are females. Aedeagus and spiculum gastrale in Figs 12 a-b.

***Pseudopterorthochaetes criberrimus* Paulian, 1977**
Pseudopterorthochaetes criberrimus: Paulian 1977 (iconography, key, description, distribution); Paulian 1979 (distribution); Ocampo & Ballerio 2006 (listing).

Holotypus, ♀ (MRAC), **Democratic Republic of Congo**: / Holotypus / Biot. N° 72 Foret marécageuse tete de source / Holotype / I.R.S.A.C. Mus. Congo Kwango: Feshi, source de la Kikoli III-1959 B. 72 Mme J. Leleup / *Pseudopterorthochaetes criberrimus* n. sp. R. Paulian det. /

Fig. 12 – Male genitalia of some species of *Melanophilharmostes* and *Pseudopterorthochaetes*: **a**, aedeagus in ventral view of the holotype of *P. cambeforti*; **b**, spiculum gastrale of the holotype of *P. cambeforti*; **c**, aedeagus in dorsal view of the holotype of *P. demirei*; **d**, aedeagus in dorsal view of the holotype of *P. endroedyi*; **e**, aedeagus in dorsal view of the holotype of *M. endroedyi*; **f**, spiculum gastrale of the holotype of *M. endroedyi*; **g**, spiculum gastrale of the holotype of *M. bicarinatus*; **h**, aedeagus in dorsal view of the holotype of *M. bicarinatus*; **i**, spiculum gastrale of the holotype of *M. carinatus*; **j**, aedeagus in ventral view of the holotype of *M. carinatus*; **k**, spiculum gastrale of a paratype of *M. vincenti*; **l**, aedeagus in lateral view of a paratype of *M. vincenti*; **m**, spiculum gastrale of the holotype of *M. zicsii*; **n**, aedeagus in dorsal view of the holotype of *M. zicsii*; **o**, aedeagus in lateral view of the holotype of *M. zicsii*.

Distribution. Democratic Republic of Congo (Paulian 1977), Gabon (Paulian 1979).

Remarks. Because of its dense and small elytral punctation, this species can be easily differentiated from all other known species of the genus.

***Pseudopterorthochaetes demirei* (Paulian, 1977) comb. nov.**
Melanophilharmostes demirei: Paulian 1977: 294 (iconography, key, description, distribution); Ocampo & Ballerio 2006 (listing); Ballerio et al. 2011 (iconography, key, distribution, discussion).

Holotype, ♂ (MNHN), **Cameroon**: / Mt. Febé 29-VI-66 / Muséum Paris, Cameroun, B. de Miré / Holotype / *Melanophilharmostes demiréi* n. sp. R. Paulian det. /

Distribution. Cameroon (Paulian 1977; Ballerio et al. 2011).

Remarks. Ballerio et al. (2011) suggested that the correct placement of this species should have been within the genus *Pseudopterorthochaetes*, mainly on the grounds of sexual dimorphism. The cladistic analysis herein performed confirms this hypothesis and therefore the species is formally transferred to *Pseudopterorthochaetes*. Ballerio et al. (2011) remarked that there are slight differences between the two known populations (Mt. Kupé and Mt. Febé, both in Cameroon): the differences are mainly in the punctures of pronotum and elytra, which are larger and sparser in the Mt. Kupé population, while the aedeagus does not show appreciable differences. The lack of additional material from the type locality (only the holotype is known from there) makes it impossible to draw any conclusion about any possible specific separation of these two populations. The species more similar to *M. demirei* is *M. endroedyi*. Both species are flightless. Besides the characters indicated in the key, *M. demirei* has more parallel sides of elytra. Aedeagus as in Fig. 12 c.

***Pseudopterorthochaetes elytratus* (Paulian, 1946)**
Pterorthochaetes elytratus: Paulian 1946: 201 (key, description, distribution); Basilewsky 1955 (distribution); *Astaenomoechus elytratus*: Martínez 1970 (distribution); *Pseudopterorthochaetes elytratus*: Paulian 1977 (key, description, distribution); Paulian 1979 (distribution); Ocampo & Ballerio 2006 (listing); Ballerio et al. 2011 (key, distribution).

Holotypus, sex unknown (MRAC), **Cameroon**: / Musée du Congo Kamerun: Joko Coll. Clavareau / R. det. D 5093 / *Pseudopterorthochaetes elytratus* (Paul) R. Paulian det. / *Pterorthochaetes elytratus* n. sp. R. Paulian det. / Typus *Pt. Elytratus* Paul /

Distribution. Cameroon (Paulian 1946, 1977; Ballerio et al. 2011), Democratic Republic of Congo (Paulian 1946, 1977).

Remarks. See under *P. cambeforti*.

***Pseudopterorthochaetes endroedyi* (Paulian, 1974)**
Pterorthochaetes endroedyi: Paulian 1974: 205 (description, distribution); *Pseudopterorthochaetes endroedyi*: Paulian 1977 (key, description, distribution); Paulian 1979 (distribution); Ocampo & Ballerio 2006 (listing); Ballerio et al. 2011 (iconography, key, distribution).

Holotype, ♂ (HNHM), **Ghana**: / Ghana, Central region, Kibi, 274 m, N 6 10 – W 0 34, Dr. S. Endrody-Younga / Nr. 351, sifting, 11.V.1969 / Holotypus 1974, *Pterorthochaetes endroedyi* Paulian / *Pterorthochaetes endroedyi* R. Paulian det. / Holotype / *Pseudopterorthochaetes endroedyi* (Paulian) det. A. Ballerio '97 /

Distribution. Ghana (Paulian 1974, 1977), Ivory Coast (Paulian 1979), Cameroon and Gabon (Ballerio et al. 2011).

Remarks. For morphological comparison see under *P. demirei*. Aedeagus as in Fig. 12 d.

***Pseudopterorthochaetes genierorum* sp. n.** (Figs 8 a-d)
urn:lsid:zoobank.org:act:9B4ABE47-4B91-40FF-98F3-9274862EC92E

Type series. Holotype, ♂ in coll. CMN, **Mozambique**: / Moz.: Cabo Delgado, Mareja (site 1), P. N. Quirimbas 100m 12°50'36"S 40°10'53"E 23.12.2012, degraded eastern Miombo woodlands, light trap, F. & S. Génier & M. Denja, 2012-05 / *Pseudopterorthochaetes genierorum* sp. n. A. Ballerio det. 2015 ♂/ [distended, glued on card, dissected, male genitalia glued on a separate card, same pin] Paratypes: 3 ♀♀ in coll. FGCI (2) and ABCB (1): Moz.: Cabo Delgado, Namaluco (site 6), P. N. Quirimbas 230m 12.17.40S 40.13.19E 23 december 2012, degraded eastern Miombo woodlands, light trap, F. & S. Génier & M. Denja, 2012-22.

Diagnosis. *Pseudopterorthochaetes genierorum* n. sp. due to the presence of longitudinal lines on elytra can be confused only with *P. miomboincola* n. sp. from which however differs not only by the lack of deep wrinkles on pronotum but also because of the small size of horseshoe-shaped punctures on elytra and the much sparser simple and comma-shaped punctures between lines. The shape of aedeagus is also similar to the one of *P. genierorum* and possibly to the one of *P. machadoi*, which, however, according to the original description, has a completely different pattern of punctation on pronotum and elytra.

Description. Size: HL = 1.14 mm; HW = 1.40 mm; PL = 1.22 mm; PW = 2.71 mm; EL = 2.28 mm; EW = 2.37 mm. Overall morphology as in generic diagnosis. Large *Pseudopterorthochaetes*. Black, shiny, glabrous (40X), fore margins of clypeus, sternum, tarsi and antennae reddish-brown. Volant.
Head: interocular distance about ten times the maximum width of dorsal ocular area, disc with very fine spare punctation, sides with some deep larger and denser simple punctures, becoming comma-shaped distally, fore margin with some irregular deep transverse lines.
Pronotum: margin complete, fore angles subtruncate, surface, with the exception of sides and base, completely covered by sparse small comma-shaped punctures, with opening oriented forwards, some long transverse lines are present at each side, mainly basally, and on disc (but shorter than the ones at sides).
Scutellum: covered by relatively deep small comma-shaped punctures with opening backwards.
Elytra: humeral callus indistinct, proximal third with at first some transverse short shallow lines or comma-shaped punctures becoming small irregularly distributed horse-shoe-shaped punctures distally, medial and distal third characterized by the presence of eight longitudinal pairs of lines (excluding the sutural one) with very rare simple punctures in the middle. Lateral carina absent. Pseudoepipleura with longitudinally oriented straight dense irregular lines.
Metathoracic wings fully developed.
Sexual dimorphism: male mesotibia ending with two straight apical spurs, female clypeus ending with a distinct long projection slightly bent upwards.
Male genitalia: aedeagus with parameres relatively long, dorsally flattened, as in Figs 10 a-b, spiculum gastrale with distinct manubrium, as in Fig. 10 c.

Etymology. Named after François and Simon Génier (Ottawa, Canada), collectors of the type series. Noun in the masculine genitive plural case.

Distribution and habitat. Known from the type locality only, the Quirimbas national park, a coastal protected area in northern Mozambique. The area is characterized by the presence of wide expanses of Miombo woodland (e.g. Fig. 3). The whole type series was collected at light.

***Pseudopterorthochaetes kumasii* (Paulian, 1974)**
Pterorthochaetes kumasii: Paulian 1974: 206 (description, distribution); *Pseudopterorthochaetes kumasii*: Paulian 1977 (key, description, distribution); Paulian 1979 (distribution); Ocampo & Ballerio 2006 (listing).

Holotypus, ♀ (HMNH), **Ghana**: / Ghana: Ashanti region, Bobiri forest res., 320 m, N 6 40 – W 1 15, Dr. S. Endrody-Younga / Nr. 142, sifting, 27.III.1966 / Holotypus 1974, *Pterorthochaetes kumasii* Paulian / *Pterorthochaetes kumasii* R. Paulian det. / Holotype / *Pseudopterorthochaetes endroedyi* (Paulian) det. A. Ballerio '97 /

Distribution. Ghana (Paulian 1974, 1977), Gabon (Paulian 1979).

Remarks. See under *P. cambeforti*.

***Pseudopterorthochaetes machadoi* (Martínez, 1970)**
Astaenomoechus machadoi: Martínez 1970: 31 (iconography, key, description, distribution); *Pseudoptrorthochaetes machadoi*: Paulian 1977 (discussion); Ocampo & Ballerio 2006 (listing).

Holotype (according to original publication), ♂ in coll. Museo do Dundo, Dundo, **Angola**: "Angola, Dundo: naciente del río Dundo (07°25'S, 20°47'E), en los detritos del suelo de la selva en galería, 16-III-1954 (A. De Barros Machado y Ed. Luna de Carvalho-coll.)."
Distribution. Angola (Martínez 1970).

Remarks. Based on the original description, Paulian (1977) suggested close similarity with *P. elytratus*. See also under *M. carvalhoi*.

***Pseudopterorthochaetes miomboincola* sp. n.** (Figs 9 a-d)
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Type series. Holotypus, ♂ in coll. CMN, **Mozambique**: / Mozambique: Cabo Delgado, Ravia (site 6), Parque Nacional das Quirimbas 380 m 12°31'02"S 39°18'38"E 3.1.2013, eastern Miombo woodlands, light trap, F. & S. Génier & M. Denja, 2013-35 / *Pseudopterorthochaetes miomboincola* sp. n., A. Ballerio det. 2015 ♂/ [distended, glued on card, dissected, male genitalia glued on a separate card, same pin]. Paratypes: 2 ♀♀ in coll. FGIC (1) and ABCB (1): Mozambique: Cabo Delgado, Namaluco (site 6), P. N. Quirimbas 230 m 12.17.40S 40.13.19E 23 December 2012, degraded eastern Miombo woodlands, light trap, F. & S. Génier & M. Denja, 2012-22. 1 ♀ (FGIC): Mozambique: Cabo Delgado, Taratibu (site 7), P. N. Quirimbas, 310 m, 12.48.25S 39.42.20E, 10 January 2013, eastern Miombo woodlands, light trap prairie edge, F. & S. Génier & M.Denja, 2013-68.

Diagnosis. *Pseudopterorthochaetes miomboincola* n. sp. can be easily distinguished from all other known *Pseudopterorthochaetes* by the deeply wrinkled pronotum. The species closest to it is *P. genierorum* n. sp. with which it shares the presence of longitudinal lines on elytra, although in *P. miomboincola* these are denser, the simple punctures between lines are denser too. The shape of aedeagus is also similar to the one of *P. genierorum* and pos-

sibly to the one of *P. machadoi*, which, however, according to the original description, has a completely different pattern of punctation on pronotum and elytra.

Description. Size: HL = 1.00 mm; HW = 1.28 mm; PL = 1.14 mm; PW = 2.50 mm; EL = 2.22 mm; EW = 2.14 mm. Overall morphology as in generic diagnosis. Large *Pseudopterorthochaetes*. Black, shiny, glabrous (40X), fore margins of clypeus, sternum, tarsi and antennae reddish-brown. Volant.
Head: interocular distance about ten times the maximum width of dorsal ocular area, disc with very fine spare punctation, sides with deep larger and denser comma-shaped punctures centrifugally oriented, fore margin with some irregular deep transverse lines.
Pronotum: margin complete, fore angles subtruncate, completely covered by deep long, sometimes anastomizing, transverse lines, occupying most of the surface with the exception of sides and base. Surface between lines with very few sparse small shallow simple punctures.
Scutellum: covered by relatively deep wide comma-shaped punctures with opening backwards.
Elytra: humeral callus indistinct, proximal third with at first some transverse short lines or comma-shaped punctures becoming small irregularly distributed horseshoe-shaped punctures distally, medial and distal third characterized by the presence of eight longitudinal pairs of lines (excluding the sutural one) with simple punctures or very short comma-shaped punctures in the middle. Lateral carina absent. Pseudoepipleura with longitudinally oriented straight dense irregular lines.
Metathoracic wings fully developed.
Sexual dimorphism: male mesotibia ending with two straight apical spurs, female clypeus ending with a distinct long projection slightly bent upwards.
Male genitalia: aedeagus with parameres relatively long, dorsally flattened, as in Figs 10 d-e, spiculum gastrale with distinct manubrium, as in Fig. 10 f.

Etymology. Named after its peculiar habitat, the Miombo woodland (Miombo, the local name of *Brachystegia* spp., plus Latin noun "*incola*" meaning "dweller"). Noun in apposition (hence not subject to gender agreement).

Distribution and habitat. Known from the type locality only, the Quirimbas National Park in Northern Mozambique, for details see under *P. genierorum* sp. n.

Key to species
Pseudopterorthochaetes machadoi and *Melanophilharmostes carvalhoi* are excluded from the key, due to lack of specimens available for comparison.

1. dorsum glabrous (40X), male mesotibiae ending with two straight apical spurs (*Pseudopterorthochaetes*) 2
- dorsum setose (40X), male mesotibiae ending with inner apical spur bent inwards at a right angle (Fig. 11 i) (*Melanophilharmostes*) 9
2. elytra with some pairs of longitudinal lines (excluding sutural line) at least on medial and distal third 3
- elytra without longitudinal lines, apart from sutural line ... 4
3. pronotum with several deep transversal lines, intervals between the pairs of longitudinal lines of elytra with dense simple fine punctation (Fig. 9) ..... *P. miomboincola* sp. n.
- pronotum with sparse punctation made of simple punctures and comma-shaped punctures, with only few shallow short transverse lines, intervals between the pairs of longitudinal lines of elytra with very few sparse simple fine punctation (Fig. 8) ..... *P. genierorum* sp. n.
4. elytra with dense punctation, distance between punctures inferior to their diameter, punctures small, mostly narrow horseshoe-shaped mixed to a few ocellate punctures .... *P. criberrimus*
- elytra with less dense punctation, distance between punctures subequal or larger than their diameter, punctures comma-shaped or wide horseshoe-shaped 5
5. pronotum with small transverse comma-shaped and/or horseshoe-shaped punctures 6
- pronotum with shallow large transverse comma-shaped punctures, often anastomizing 8
6. punctation of elytra made of transverse wide horseshoe-shaped punctures uniformly distributed ..... *P. kumasii*
- punctation of elytra made of horseshoe-shaped punctures (sometimes resembling transverse large comma-shaped punctures) mixed to longitudinally oriented comma-shaped punctures or simple punctures 7
7. punctation of elytra near base made of dense large wide transverse horseshoe-shaped punctures, an area without horseshoe-shaped punctures near elytral suture with only sparse longitudinally oriented comma-shaped punctures and simple punctures at proximal third, medial and distal third with only hoseshoe-shaped punctures ..... *P. elytratus*
- punctation of elytra near base made of sparse small transverse wide horseshoe-shaped punctures, an area without horseshoe-shaped punctures near elytral suture with only sparse longitudinally oriented short comma-shaped punctures and simple punctures at proximal third, medial and distal third with hoseshoe-shaped punctures mixed to transverse comma-shaped punctures ..... *P. cambeforti*
8. elytral punctation larger, aedeagus as in Fig. 12 c .... *P. demirei*
- elytral punctation smaller, aedeagus as in Fig. 12 d .... *P. endroedyi*
9. elytra and pronotum covered by dense fine simple punctures (Fig. 11 d) in addition to the larger sculpturing (horseshoe- and comma-shaped punctures, transverse lines) 10
- elytra and pronotum only with larger sculpturing (horseshoe- and comma-shaped punctures, transverse lines) (Fig. 11 e), at most some sparse fine punctures between larger punctures 16
10. elytra without longitudinal rows of paired short lines or horseshoe/comma-shaped punctures 11
- elytra with longitudinal rows of paired short lines or horseshoe/comma-shaped punctures 15
11. head with deep punctation (Fig. 11 c), elytra with sparse small horseshoe-shaped punctures ..... *M. zicsii*
- head with shallow punctation (Fig. 11 a), elytra with larger and denser horseshoe-shaped punctures 12
12. elytra with very sparse large horseshoe-shaped punctures, also on disc. Flightless. Annobon island ..... *M. poggii* sp. n.
- elytra with small and dense horseshoe-shaped punctures .. 13
13. elytral disc with dense fine simple punctation and dense horseshoe-shaped punctation ..... *M. palustris*

- elytral disc with sparser horseshoe-shaped punctation and sparser fine simple punctation 14
14. elytral base with large horseshoe-shaped punctures .... *M. vincenti*
- elytral base with transverse comma-shaped punctures .... *M. ghanae*
15. elytra with rows of short longitudinal pairs of short comma-shaped punctures becoming continuous lines along the distal third, totally nine rows of continuous pairs of lines .... *M. pseudoposthi*
- elytra with rows of paired longitudinal comma-shaped punctures along the whole length of elytra .... *M. posthi, M. carinatus, M. puncticeps*
16. ponotum with ocellate punctures absent or present only at sides, disc with horseshoe- or comma-shaped punctures 17
- pronotum with ocellate punctures even on disc 18
17. dorsum with impressed punctation ..... *M. ashantii*
- dorsum with shallow punctation ..... *M. endroedyi*
18. ocellate punctation on pronotal disc sparse, horseshoe-shaped punctation on elytra sparse ..... *M. burgeoni*
- ocellate punctation on pronotal disc and hoseshoe-shaped elytral punctation denser 19
19. elytral punctation with some simple punctures mixed to the horseshoe-shaped punctures ..... *M. donisi*
- elytral punctation made only of horseshoe-shaped punctures or comma-shaped punctures 20
20. elytral lateral carina starting at the median third, continuous and almost straight along the medial and distal part of elytra ..... *M. pygmaeus*
- elytral lateral carina starting at the median third, continuous and slightly sinuate just before distal third ..... *M. ocellatus*
- elytral carina starting at the medial third then interrupted and continuing along the distal third (this third portion of carina not aligned with the medial one) ..... *M. bicarinatus*

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