Descriptions of two new endemic genera and four new species of Ceratocanthinae (Insecta, Coleoptera, Scarabaeoidea, Hybosoridae) from Madagascar

Alberto BALLERIO
Viale Venezia 45, I-25123 Brescia (Italy)
alberto.ballerio.bs@numerica.it

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new combinations.

ABSTRACT
Two new endemic genera of Ceratocanthinae are described from Madagascar. *Cryptosphaeroides* n. gen. includes *C. hystrix* (Paulian, 1991) n. comb., *C. tenrec* n. sp., *C. hippocrepis* n. sp. and *C. ankaranensis* n. sp. The genus seems to be restricted to the dry forests of North and West Madagascar. *Pseudosynarmostes* n. gen. includes *P. mitsinjo* n. sp. and *P. perrieri* (Fairmaire, 1898) n. comb. This genus is known from East and West Madagascar and shows a very unusual morphology which makes its position very isolated within all other known Ceratocanthinae.

MOTS CLÉS
Insecta,
Coleoptera,
Scarabaeoidea,
Hybosoridae,
dimorphisme sexuel,
pièces buccales,
nid de *Nasutitermes*,
Madagascar,
genres nouveaux,
espèces nouvelles,
combinaisons nouvelles.

RÉSUMÉ
Description de deux nouveaux genres endémiques et de quatre nouvelles espèces de Ceratocanthinae (Insecta, Coleoptera, Scarabaeoidea, Hybosoridae) de Madagascar.
Deux nouveaux genres de Ceratocanthinae endémiques de Madagascar sont décrits. *Cryptosphaeroides* n. gen. comprenant *C. hystrix* (Paulian, 1991) n. comb., *C. tenrec* n. sp., *C. hippocrepis* n. sp. et *C. ankaranensis* n. sp. Ce nouveau genre semble être répandu dans les forêts sèches du nord et de l'ouest de Madagascar. *Pseudosynarmostes* n. gen. présente une morphologie singulière qui lui confère une position isolée au sein de la sous-famille Ceratocanthinae. Distribué à l'est et à l'ouest de Madagascar, ce genre inclut *P. mitsinjo* n. sp. et *P. perrieri* (Fairmaire, 1898) n. comb.

INTRODUCTION

The Ceratocanthinae Martínez, 1968 (Coleoptera, Scarabaeoidea, Hybosoridae) are a group of small oddly shaped beetles, characterized by the ability to roll their body up in order to form a compact ball for defensive purposes. Previously treated as a separate family within the Scarabaeoidea, they are here considered as a subfamily of Hybosoridae Erichson, 1847 following Ocampo (2006), due to the increasing evidence of paraphyly of Hybosoridae (*sensu auctorum*) with respect to the Ceratocanthidae, a view supported by larval and adult morphology and molecular data (Nikolajev 1999; Grebennikov *et al.* 2004; Ocampo 2006; Ocampo & Hawks 2006). These beetles, which are supposed to feed on soft food, probably fungi, live in leaf litter, rotten wood, termite nests and in the forest canopy (Scholtz & Grebennikov 2005). They are mostly diverse in the forests of intertropical regions, where over 90% of the 340 known species occur (Ocampo & Ballerio 2006). Madagascar represents a hot spot of diversity for Ceratocanthinae, with a fauna comprising 21 species divided in four genera. Paulian (1979) provided the last existing revision of the group by recognizing 20 species in three genera (*Synarmostes* Germar, 1843, *Goudotostes* Paulian, 1979 and *Philharmostes* Kolbe, 1895), the first two genera are endemic to Madagascar (*Synarmostes* extending to the Comoros) and the third is shared with continental Africa. Subsequently Paulian (1991) described one further species by placing it in a genus known up to then only from the Guineo-Congolian rainforest block (*Pseudopterorthochaetes* Paulian, 1977). Paulian's revision was mainly based on the material preserved in the Muséum national d'Histoire naturelle, Paris, particularly copious for the genus *Philharmostes*. From 1992 to the present, an intensive sampling effort done by Brian L. Fisher (California Academy of Sciences) and collaborators, who mainly aimed to collect ants, ended up also providing a large amount of leaf litter beetles, many of which were Ceratocanthinae. The study of the rich material collected in this way is still in progress, although it has become obvious since the beginning that the number of species of Ceratocanthinae from Madagascar is destined to more than double. Soon after starting the study of this interesting material, I informed Prof. Renaud Paulian about the exciting new discoveries I was making and he suggested me to write a new volume of the series *Faune de Madagascar* about these beetles. The present paper is a preliminary note to the Ceratocanthinae section of *Faune de Madagascar*, where two distinctive new genera are described. This should result in new combinations for two species previously placed respectively in *Pseudopterorthochaetes* and in *Philharmostes*, as well as in the description of four new species.

METHODS

I refer to Ballerio (2000a, b, 2001, 2004) for methods and terminological conventions. Label data are presented in quotation marks, the "/" indicates a different label, author's comments are in square brackets, while depository collection acronyms are in round brackets.

Micrographs were obtained with a Zeiss EVO 40 XVP Scanning Electron Microscope at the Museo Tridentino di Scienze Naturali (Trento, Italy), after gold coating. Habitus photographs have all been made using the auto-montage software by Syncroscopy with a Canon PowerShot S-40 digital camera.

The aedeagus of the species of *Cryptosphaeroides* n. gen. is strongly twisted and parameres are very asymmetrical, therefore the appearance of these structures may change dramatically with small changes of the angle at which the object is viewed. Because of this, it is also arbitrary to state which side is dorsal or ventral. In order to cope with this problem I strove to provide drawings showing the aedeagus from different angles, without stating whether ventral or dorsal, therefore caution must be exercised when making use of them.

Abbreviations

EL	maximum elytral length;
EW	maximum total elytral width;
HL	maximum head length;
HW	maximum head width;
L	length;
PL	maximum pronotal length at middle;
PW	maximum pronotal width at middle;

W width;
coll. ABCB collection A. Ballerio, Brescia, Italy;
CASC California Academy of Sciences collection, San Francisco, USA;
MNHN Muséum national d'Histoire naturelle collection, Paris, France;
MZUF Museo Zoologico "La Specola" collection, Firenze, Italy.

SYSTEMATICS

Family HYBOSORIDAE Erichson, 1847
Subfamily CERATOCANTHINAE Martínez, 1968
Tribe CERATOCANTHINI Martínez, 1968

Genus *Cryptosphaeroides* n. gen.

TYPE SPECIES. — *Pseudopterorthochaetes hystrix* Paulian, 1991.

ETYMOLOGY. — After the ancient Greek κρυπτός (hidden) and σφαιροειδής (subspherical). The name refers to the subspherical appearance typical of the Ceratocanthinae once they assume the rolled up posture, while at the same time highlighting the difficulties of detecting such small beetles in the field. The gender is masculine.

DISTRIBUTION AND HABITAT. — Seemingly restricted to northern and western Madagascar, where all known species have been found by sifting leaf litter in dry seasonal forests. For more details see under individual species.

DIAGNOSIS. — The genus can be easily identified among all other Malagasy Ceratocanthinae genera because of the following combination of characters: 1) body covered by sparse long erect clavate setae; 2) body lacking carinae or tubercles and microsculpture made of large, very sparse punctures; 3) pronotum posteriorly with surface gradually declivous toward posterior margin; 4) sexual dimorphism involving the shape of protibiae and fore part of head; 5) protibiae almost straight; 6) antennae with pedicellus strongly bent backward (many other Ceratocanthinae genera have a bent pedicellus, but none in such an extreme way); and 7) parameres strongly asymmetrical.

DESCRIPTION

Small Ceratocanthinae, body dorsally shiny, ventrally alutaceous; setose; "rolling up" coaptations perfect; flightless.

Head wide (W/L ratio = 1.2-1.5), subpentagonal, fore portion triangular, apex sexually dimorphic, forming an obtuse angle (about 120°, excluding apical acute process), both sides of the angle smooth and almost rectilinear, not reflexed upward; genae almost aligned with fore margin, although a little more prominent forward (Fig. 4D), forming a right angle with genal canthus; genal canthus acutely protruding outwards, completely fused with occipital area; dorsal ocular area extremely small, reduced to a circle made of less than 10 ommatidia (Fig. 4D), next to the hind angles of head, ventral ocular area narrow, only slightly visible from above; head surface almost plane, with variable punctures, transversal striae and pubescence.

Pronotum distinctly wider than long (W/L ratio = 1.6-1.8), very slightly wider than elytra; fore margin feebly bisinuate; fore angles distinctly protrudent forward, sexually dimorphic, subtruncate at apex; sides obtusely rounded; the whole pronotal margins completely beaded by a shallow narrow continuous stria; pronotal surface regularly convex.

Scutellum wider than long (W/L ratio = 1.4), sides proximally subparallel and distinctly notched by elytral articular process, then convergent to form a triangle with elongate, acute apex and sides slightly curved inward. Surface slightly depressed in the middle. Apical portion of mesepisterna hardly visible from above, distinctly smaller than elytral articular process.

Elytra slightly longer than wide (W/L ratio = 0.93), apical 4th regularly rounded (dorsal view), apex slightly re-entering inward (lateral view); elytra convex, with maximum convexity at distal third; elytral suture raised only apically, sutural stria extremely fine and usually limited to distal third; inferior sutural stria present, reaching humeral area, delimiting a rather developed marginal elytral area; striated articular area narrow, made of 3-5 striae, visible in lateral view; humeral area rounded, lacking a distinct humeral callus; elytral articular process normally developed, smooth and shiny.

Apical vertical extremity of clypeus very short and transversely slightly grooved at each side. Labrum wide and short, setose, distally depressed at middle. Distal epipharynx (Fig. 2H) semicircular, longitudinally divided by a weak anterior median process; pariae slightly raised with respect to the haptolachus; median brush and corypha absent; apical fringe made of long fine setae, absent in the

middle. Labium (Fig. 2E) ventrally flat, emarginated in the middle, emargination regularly wide-U-shaped; labial palpi (including palpiger) 4 jointed, first joint short and transverse, joint 2 short, joint 3 longer and plumper than preceding one, joint 4 subconical, apically bearing some short sensilla, all joints, apart from the last one, fringed with long setae. Maxillae (Fig. 2F) with an elongate single membranous lacinia, covered with fine long setae, monolobed galea proximally sclerotized and distally clothed with very coarse long fine setae with comb-like tip (galeal brush) (Fig. 2G), maxillary palpi (including palpiger) 4 jointed, palpiger very small, joint 2 and 3 wide and relatively short, wider than the following joint, joint 4 long and subconical, distinctly longer than the preceding 2 together, apically bearing some short sensilla. Mandibles (Fig. 2A-D) slightly asymmetrical, regularly curved, apiculus relatively long and acutely pointed, slightly exceeding the mesal brush, mesal brush narrow and well-developed, molar lobe very strong. Antennae 10-segmented (Fig. 3G), scape long (about half of the total length of antenna), distally slightly clavate/securiform, pedicellus bent at about a right angle with respect to the longitudinal axis of scape, flagellum short, made of very short articles distinctly wider than long, antennal club made of 3 articles, articles hairy, relatively small.

Ventral areas of prothorax setigerously punctured. Hypomeron smooth, very 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, fore margin slightly curved inwards, surface almost smooth with few recumbent setae; protibiae straight, elongate (Fig. 3B, F), apical spur relatively long, sharp, distally curved downward, protarsi with first article distinctly longer than the following articles together, article 5 slightly longer than the 4th article, bearing 2 short curved fine claws, each tarsomere, except the last one, ventrally bearing a tuft of fine setae. Mesosternum narrow, short and plump, forming a sharp and fine carina protruding between mesocoxae and joining metasternum, mesocoxae large, almost adjacent to each other, transversely oriented, trochanters narrow, with hind tip acute, mesofemora slender, surface smooth, with hind edge emarginated at distal 3rd; mesotibiae slender (Fig. 3C), inner angle of apex with 2 straight apical spurs, mesotarsi inserted near the inner angle of apical edge, slightly longer than apical edge of tibia, with first 4 articles subequal, 5th slightly longer than the preceding one, bearing 2 small curved fine claws; each tarsomere, except the last one, ventrally bearing a tuft of coarse setae; trochanters of metafemora narrow, with hind tip acute, metafemora plumper than mesofemora, surface hairy, hind edge distally with a small emargination, metatibiae triangular (Fig. 3D), elongate, flat, ending with 2 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 3 together, 5th 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 mesotibiae and metatibiae with longitudinal striae along inner margin and a variable sculpturing and setation along outer margin.

Wings (Fig. 3A): flightless (micropterous: wings extremely reduced).

Sexual dimorphism: females have the apex of head protruding forwards with a narrow acute process bent upwards (Fig. 4D), fore angular areas of pronotum more protruding forwards, protibiae (Fig. 3E, F) apically elongate to fit to the head acute process while in the rolled up posture, and ending with 2 outer teeth, one directed outwards and the other directed downwards, apical spur of protibiae plumper than in males and with distal 3rd more dramatically bent downwards, mesotibiae more narrowed apically, with apical spur straight, whereas males have apex of head without any distinct acute process (e.g., Fig. 6A), protibiae ending with a single small acute outer tooth, apical spur slender and more gently bent downwards, mesotibiae with the inner apical spur bent inward at a right angle (hooked) (Fig. 3C).

Male genitalia: genital segment fairly sclerotized, variably shaped with conspicuous differences at species level. Aedeagus with basal piece twisted, about as long as or slightly longer than parameres; internal sac relatively small; temones present; parameres strongly asymmetrical.

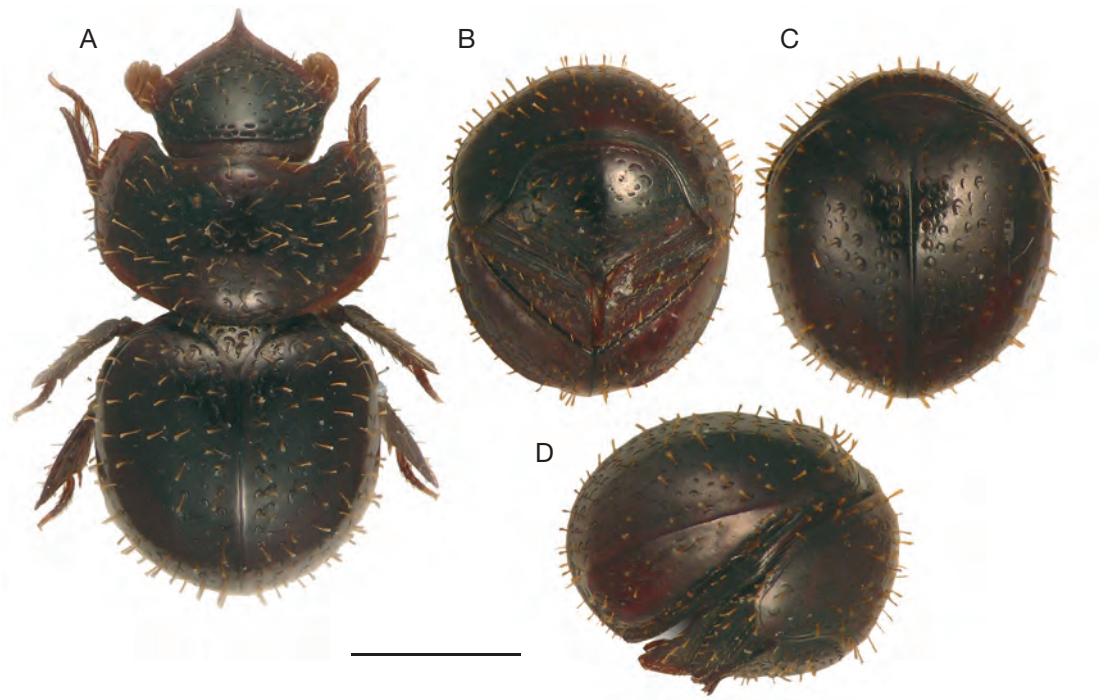

FIG. 1. — *Cryptosphaeroides hystrix* (Paulian, 1991), Montagne des Français: **A**, female dorsal view; **B**-**D**, rolled up female specimen; **B**, ventral view; **C**, dorsal view; **D**, lateral view. Scale bar: 1 mm.

Female genitalia: no bursal sclerites and spermatheca weakly sclerotized; genital palpi weakly sclerotized, subcircular, relatively small and short.

REMARKS

On the basis of a preliminary analysis based on morphological characters of adults, the closest genus to *Cryptosphaeroides* n. gen. seems to be the other Malagasy endemic *Goudotostes*. *Goudotostes* presently contains only one described species: *G. scabrosus* (Laporte de Castelnau, 1840). However in the material collected by Brian Fisher several undescribed species are present, which will be the subject of a subsequent paper. Comparison between *Cryptosphaeroides* n. gen. and a number of undescribed species of *Goudotostes* reveals that the latter shares with *Cryptosphaeroides* n. gen. the same basic morphology of mouthparts, the same shape and orientation of antennal pedicellus, the same pattern of sexual dimorphism (Ballerio 2006) and the strongly asymmetrical parameres. The main differences between the two genera reside in the sculpturing of head, pronotum and elytra: *Goudotostes* has a glabrous dorsal body surface that is strongly sculptured, with carinae, tubercles and deep, dense puncturation, while *Cryptosphaeroides* n. gen. has a smooth dorsal surface with sparse large horseshoe-shaped punctures and erect setae. Moreover, the pronotum of *Goudotostes* has a prominently raised posterior margin, whereas in *Cryptosphaeroides* n. gen. the pronotum is evenly convex, without any raised posterior margin.

Cryptosphaeroides hystrix (Paulian, 1991) n. comb.
(Figs 1-3; 4A-D)

Pseudopterorthochaetes hystrix Paulian, 1991: 143 (description and iconography). — Ocampo & Ballerio 2006: 190 (catalogue).

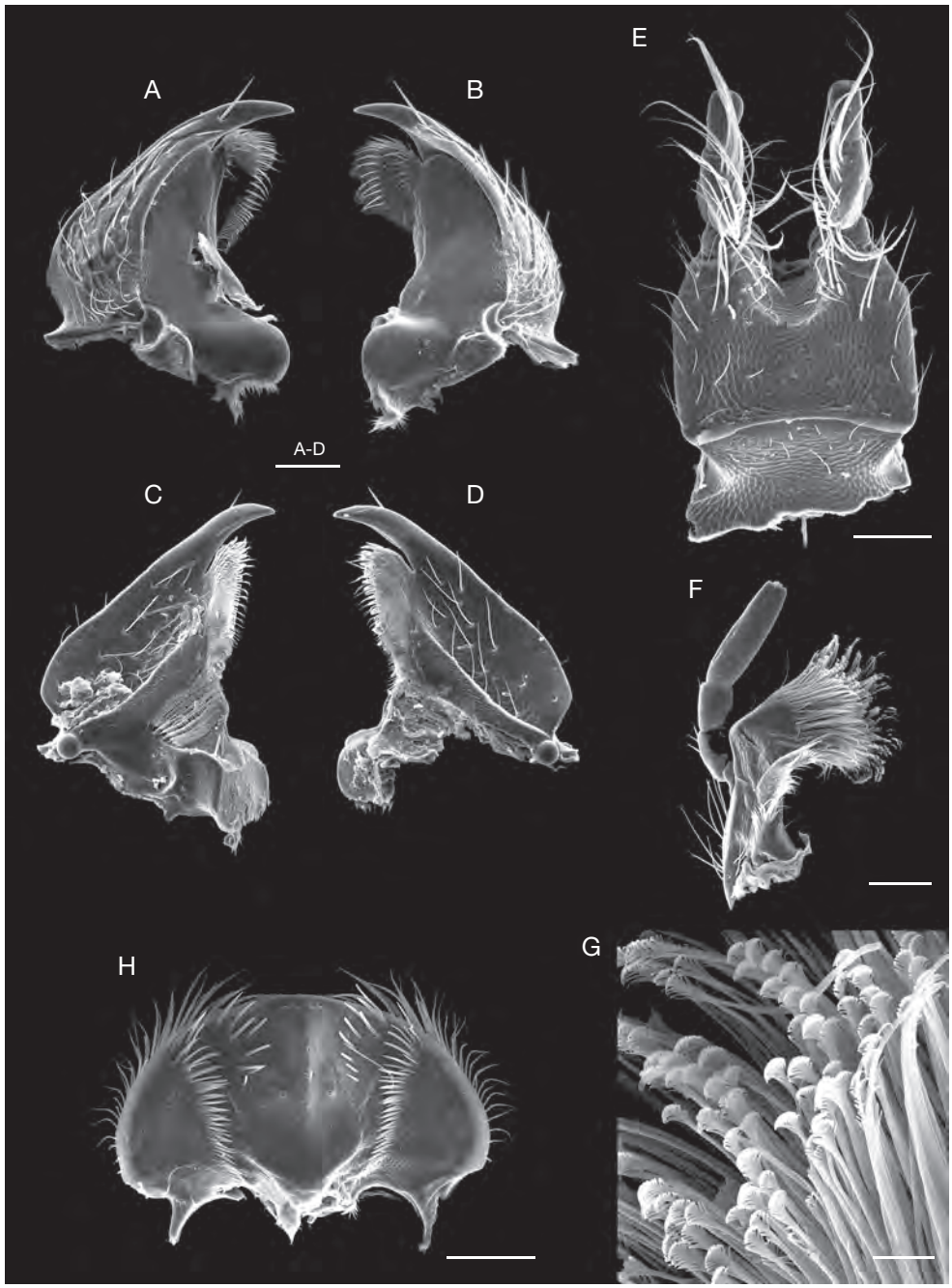

FIG. 2. — *Cryptosphaeroides hystrix* (Paulian, 1991) mouthparts: **A**, **B**, mandibles in dorsal view; **C**, **D**, mandibles in ventral view; **E**, labium and labial palpi; **F**, maxilla and maxillary palpus; **G**, detail of galeal brush; **H**, distal epipharynx. Scale bars: A-F, H, 80 µm; G, 10 µm.

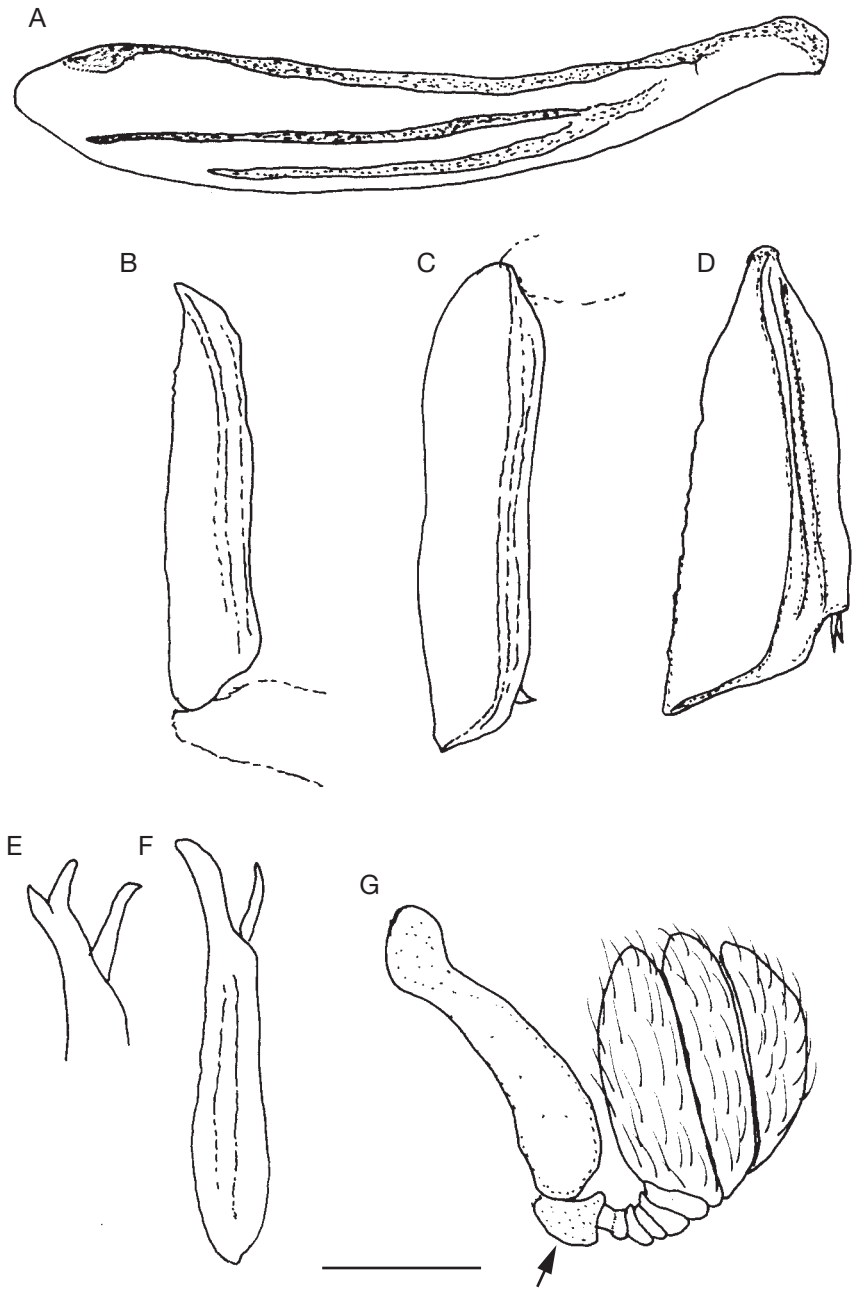

FIG. 3. — *Cryptosphaeroides hystrix* (Paulian, 1991): **A**, wing; **B**, male protibia (chaetotaxy and puncturation omitted); **C**, male mesotibia (chaetotaxy and puncturation omitted); **D**, metatibia (chaetotaxy and puncturation omitted); **E**, apical portion of female protibia showing apical tooth directed downwards (chaetotaxy and puncturation omitted); **F**, female protibia (chaetotaxy and puncturation omitted); **G**, antenna, arrow indicates the pedicellus. Scale bar: A, 0.25 mm; B-F, 0.4 mm; G, 2 mm.

TYPE MATERIAL. — Holotype ♀ (MZUF): "Madagascar: Parc de la Montagne d'Ambre, 23-25/IX/1989 legit L. Bartolozzi & S. Taiti/Holotype/"La Specola" Firenze 77 12/*Pseudopterorthochaetes hystrix* n. sp. R. Paulian det./*Cryptosphaeroides hystrix* Paulian, det. A. Ballerio 2006" [specimen in good condition, distended and glued on a card].

ETYMOLOGY. — Paulian did not explain why he chose this noun in apposition, but undoubtedly he wanted to refer to the erect setae, which give the beetle a thorny appearance, similar to a porcupine.

OTHER MATERIAL EXAMINED. — 40 ♂♂, 49 ♀♀ (CASC), 10 ♂♂, 5 ♀♀ (coll. ABCB), 1 ♂, 1 ♀ (MNHN): "Madagascar: Province d'Antsiranana, Réserve Spéciale d'Ambre, 3.5 km 235° SW Sakaramy, 325 m. 26-31 Jan. 2001/12°28'08" S 49°14'32" E, coll. Fisher, Griswold et al., Calif. Academy of Sciences, sifted litter in tropical dry forest, collection code: BLF2654" [8 ♂♂ and 6 ♀♀ dissected]. — 58 ♂♂, 56 ♀♀ (CASC), 5 ♂♂, 3 ♀♀ (coll. ABCB): "Madagascar: Province d'Antsiranana, Montagne des Français, 7.2 km 142° SE Antsiranana (= Diego Suarez), elev. 180 m., 22-28 Feb 2001/12°19'22" S 49°20'17" E, coll. Fisher, Griswold et al., Calif. Academy of Sciences, sifted litter in tropical dry forest, collection code: BLF3128" [3 ♂♂ dissected]. — 1 ♀ (coll. ABCB): "Madagascar: Province d'Antsiranana, Montagne des Français, 7.2 km 142° SE Antsiranana (= Diego Suarez), elev. 180 m., 22-28 Feb 2001/12°19'22" S 49°20'17" E 29.XII.2005, leg. A. Ballerio & J. E. Randrianirina". — 2 ♂♂ and 1 ♀ (CASC): "Madagascar: Province d'Antsiranana, Foret d'Orangea, 3.6 km 128° SE Ramena, elev. 90 m., 22-28 Feb. 2001/12°15'32"S 49°22'29"E, coll. Fisher, Griswold et al., Calif. Academy of Sciences, sifted litter in littoral forest, collection code: BLF3200" [1 ♂ dissected].

DISTRIBUTION AND HABITAT. — This species seems to occur in the dry tropical forests around Antsiranana (= Diego Suarez) in the northern tip of Madagascar. These forests belong mainly to the Western Domain (Paulian 1961) and can be classified as "deciduous, seasonally dry, western forest" (Du Puy & Moat 1996). While the forest of Montagne des Français is a typical dry, seasonally deciduous forest, the Sakaramy forest, fringing the humid rainforest of Montagne d'Ambre, shows some transitional characteristics with a true tropical rainforest ("evergreen humid rainforest, low altitude", Du Puy & Moat 1996). Finally, the Orangea forest presently is a dry littoral forest ("coastal forest [eastern]", Du Puy & Moat 1996), with very low canopy (average 3 m) and sandy soil, although a few stands of taller trees still exist (the collecting site was in a small taller wood, B. L. Fisher pers. comm.). All known specimens of *C. hystrix* n. comb. have been collected by sifting leaf litter.

DIAGNOSIS. — Besides the unique shape of aedeagus, *C. hystrix* n. comb. can be easily separated from the other known species with the presence of a distinct smooth carina delimitating the pseudoepipleuron and the puncturation of pronotum which is shallower than in all other species.

DESCRIPTION

HL = 0.66-0,77 mm; HW = 1.05-1.16 mm; PL = 0.95-1.00 mm; PW = 1.76-1.91 mm; EL = 1.54-1.63 mm; EW = 1.66-1.83 mm.

Black to dark brown, shiny; underside alutaceous, reddish-brown; head, pronotum and elytra with yellowish/whitish sparse long clavate erect pubescence.

Head: frons with impressed transverse small comma-shaped punctures, the remaining dorsal surface distally and laterally with sparse shallow relatively large horseshoe-shaped punctures and transversal irregular lines, disc almost smooth. Pubescence shorter than on pronotum and elytra.

Pronotum: surface with relatively dense shallow puncturation made of large transverse horseshoe-shaped punctures (with horseshoe very opened, always centrifugally), each one bearing an erect seta internally, punctures irregularly spaced out. Scutellum: punctures as on pronotum, although shorter, more impressed and opened backwards. Elytra: surface covered by medium sized sparse (their distance being usually slightly larger than their width) shallow horseshoe-shaped punctures opened backwards and outwards, each one bearing a long erect clavate seta internally; border between dorsal elytral surface and pseudoepipleuron marked by a longitudinal weakly raised carina starting near humeral area and reaching elytral suture near the apex. Pseudoepipleuron with a few longitudinal shallow comma-shaped punctures.

Parameres: Fig. 4A, B. Genital segment: Fig. 4C.

Cryptosphaeroides hippocrepis n. sp.
(Figs 4E-I; 5)

TYPE MATERIAL. — Holotype ♂ (CASC): "Madagascar: Antsiranana Province, Réserve Spéciale de l'Ankarana, 13.6 km 192° SSW Anivorano Nord, Elev. 210 m. 16-20 Feb. 2001/12°51'49" S 49°13'33" E, coll. Fisher, Griswold et al., Calif. Academy of Sciences, sifted litter tropical dry forest, collection code: BLF3012" [specimen in good condition, distended and glued on a card, the dissected

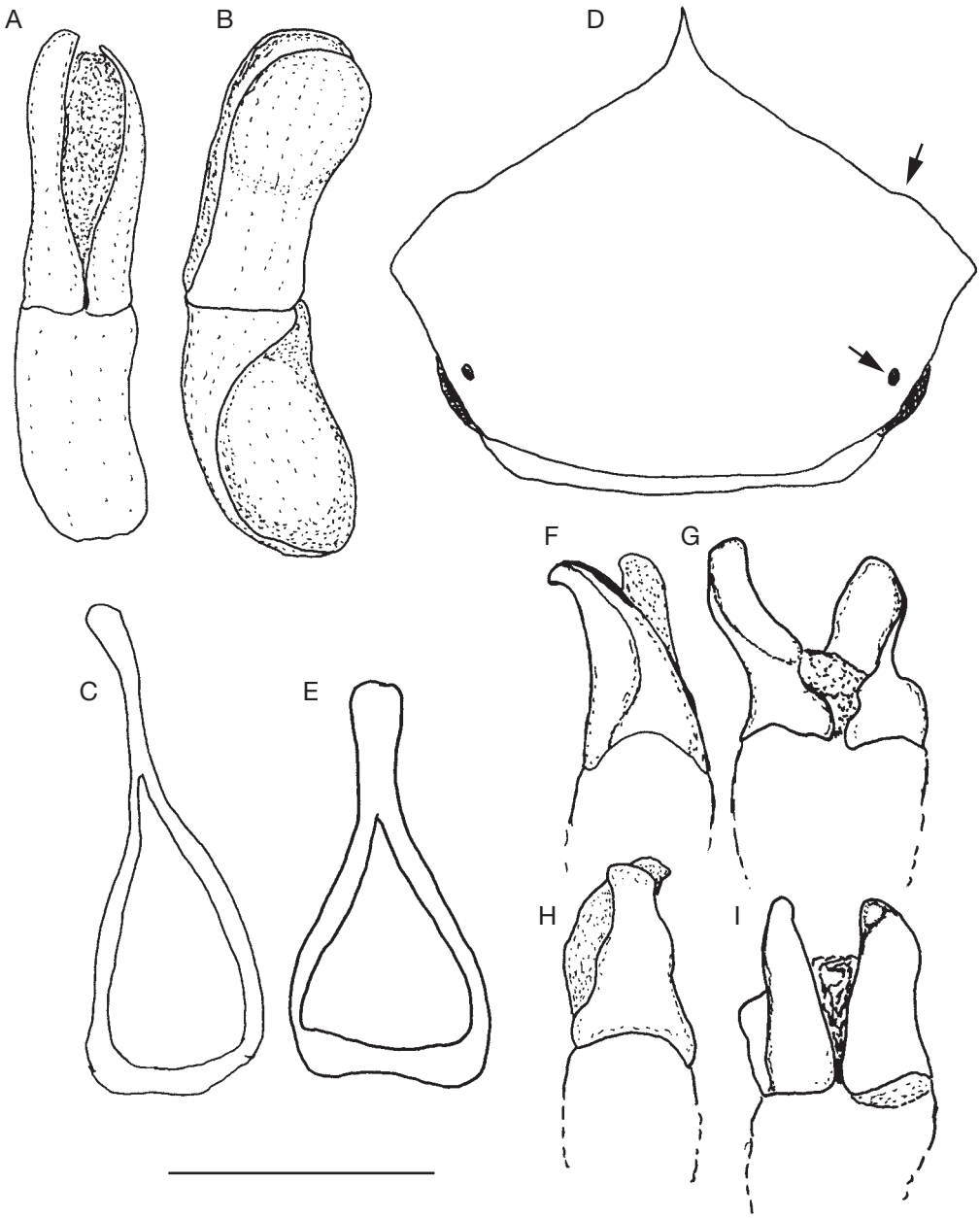

FIG. 4. — **A**-**D**, *Cryptosphaeroides hystrix* (Paulian, 1991); **A**, **B**, aedeagus; **C**, outline of genital segment; **D**, outline of female head, arrows indicate small dorsal ocular area and starting point of gena; **E**-**I**, *Cryptosphaeroides hippocrepis* n. sp.; **E**, outline of genital segment; **F**-**I**, aedeagus. Scale bar: A-C, 0.4 mm; D, 0.25 mm; E-I, 0.4 mm.

aedeagus, abdomen and genital segment are mounted in DMHF resin on a separate card on the same pin].
Paratypes: 3 ♂♂, 14 ♀♀ (CASC), 3 ♂♂, 2 ♀♀ (coll. ABCB), 1 ♀ (MNHN): same data as holotype [5 ♂♂ and 2 ♀♀ dissected].

ETYMOLOGY. — From ancient Greek ιππος (horse) and κρηπίς (shoe), in order to highlight the presence

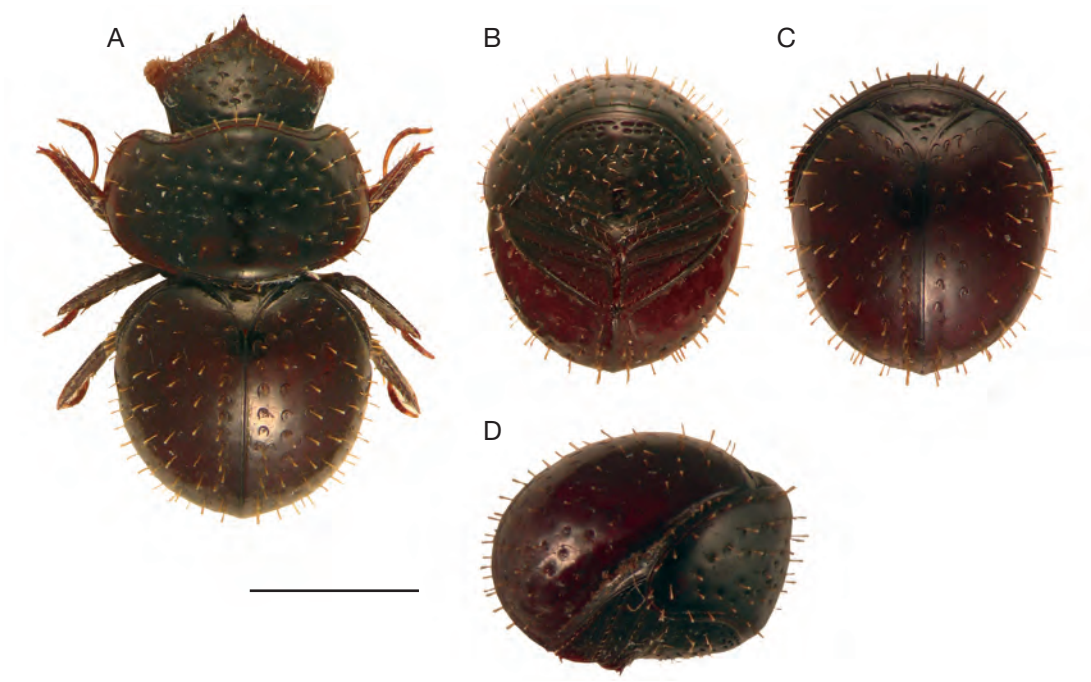

FIG. 5. — *Cryptosphaeroides hippocrepis* n. sp.: **A**, female dorsal view; **B**-**D**, rolled up female specimen; **B**, ventral view; **C**, dorsal view; **D**, lateral view. Scale bar: 1 mm.

of large horseshoe-shaped punctures on elytra. Noun in apposition.

DISTRIBUTION AND HABITAT. — Known only from the type locality, the Réserve spéciale de l'Ankarana (Antisiranana Province), in northern Madagascar. The forest grows in a limestone formation ("Tsingy") and falls within the Western Domain (Paulian 1961) and can be classified as "deciduous, seasonally dry, western forest" (Du Puy & Moat 1996), although characterized by a moister climate compared to other similar forests (Cardiff & Befourouack 2003). All specimens have been collected by sifting litter.

DIAGNOSIS. — Besides the distinctive shape of parameres, the combination of strongly impressed sparse pronotal punctures and large shallow horseshoe-shaped elytral punctures allow to identify this species very easily.

DESCRIPTION

HL = 0.66 mm; HW = 1.03 mm; PL = 0.91 mm; PW = 1.56 mm; EL = 1.53 mm; EW = 1.50 mm.

Black to dark brown, shiny; underside alutaceous, yellowish/reddish-brown; head, pronotum, margins of pronotum and elytra with yellowish/whitish sparse long clavate erect pubescence.

Head: surface with sparse (their distance being usually larger than their width) impressed transverse comma-shaped punctures and transversal irregular lines. Pubescence shorter than on pronotum and elytra.

Pronotum: surface with sparse puncturation made of large transverse irregularly spaced out punctures, very deeply impressed, bearing an erect long clavate seta. Scutellum: a few transverse irregular impressed punctures. Elytra: surface covered by large weakly impressed horseshoe-shaped punctures, relatively dense (their distance being about equal to their width) and oriented backwards, punctures shorter near elytral base. Pseudoepipleuron indistinct, sides of elytra regularly rounded, lacking any carina or furrow.

Parameres: Fig. 4F-I. Genital segment: Fig. 4E.

FIG. 6. — *Cryptosphaeroides ankaranensis* n. sp.: **A**, male dorsal view; **B**-**D**, rolled up male specimen; **B**, ventral view; **C**, dorsal view; **D**, lateral view. Scale bar: 1 mm.

Cryptosphaeroides ankaranensis n. sp.
(Figs 6; 8F-I)

TYPE MATERIAL. — Holotype ♂ (CASC): "Madagascar: Antsiranana Province, Réserve Spéciale de l'Ankarana, 22.9 km 224° SW Anivorano Nord, 10-16 Feb. 2001/12°54'32" S 49°06'35" E, coll. Fisher, Griswold et al., Calif. Academy of Sciences, sifted litter tropical dry forest, 80 m, collection code: BLF2858" [specimen in good condition, distended and glued on a card, the dissected aedeagus, abdomen and genital segment are mounted in DMHF resin on a separate card on the same pin].
Paratypes: 4 ♂♂, 2 ♀♀ (CASC), 1 ♂, 1 ♀ (coll. ABCB): same data as holotype [3 ♂♂ dissected].

ETYMOLOGY. — From the type locality, the Tsingy formation of Ankarana.

DISTRIBUTION AND HABITAT. — See under *C. hippocrepis* n. sp.

DIAGNOSIS. — This species can be easily identified on the basis of parameres and puncturation of head (uniformly transversely comma-shaped) and, above all, of elytra (made of very sparse comma-shaped punctures).

DESCRIPTION

HL = 0.60 mm; HW = 1.15 mm; PL = 1 mm; PW = 1.70 mm; EL = 1.60 mm; EW = 1.58 mm.

Black to dark brown, shiny; underside alutaceous, yellowish/reddish-brown; head, pronotum and elytra with yellowish/whitish sparse long clavate pubescence.

Head: surface almost uniformly covered by deeply impressed large transverse very short comma-shaped punctures, regularly spaced out (their distance being usually shorter than their width). Pubescence shorter and finer than on pronotum and elytra.

Pronotum: surface with relatively sparse puncturation (their distance being larger than their width) made of large deeply impressed punctures bearing an erect long clavate seta. Scutellum: punctures

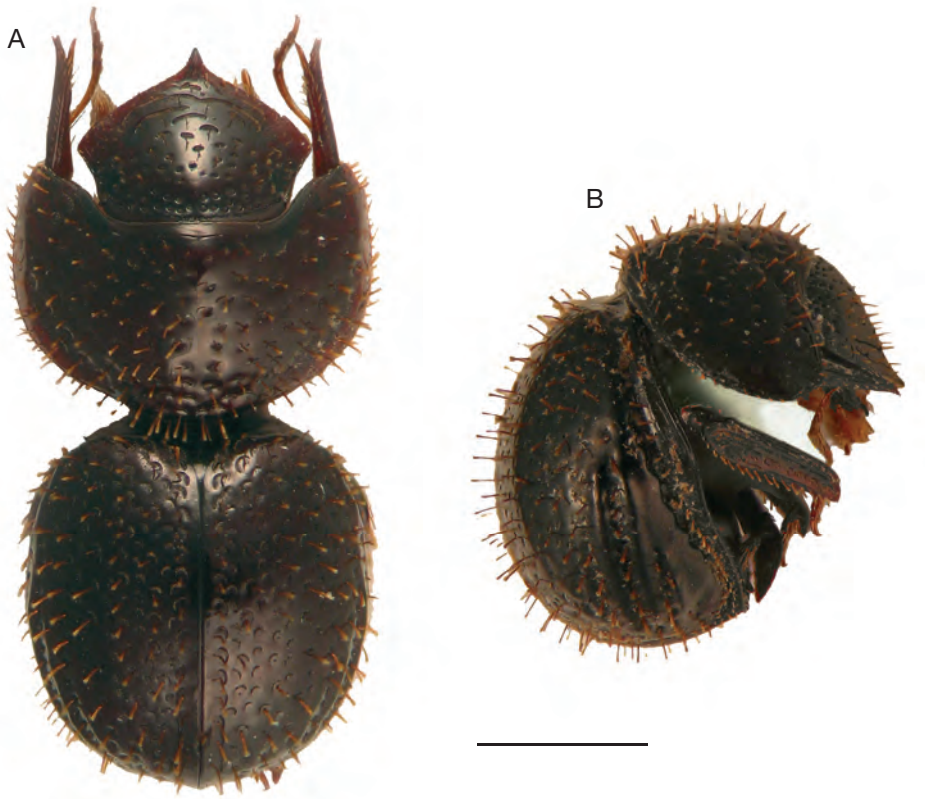

FIG. 7. — *Cryptosphaeroides tenrec* n. sp.: **A**, female dorsal view; **B**, male lateral view. Scale bar: 1 mm.

transversely comma-shaped and impressed. Elytra: surface with very sparse puncturation made of extremely short longitudinal and transversal comma-shaped punctures of variable size, although always small, often having a setigerous pore next to them, punctures very spaced out from each other. Pseudo-epipleuron indistinct. A hint of 2 or 3 longitudinal broad weakly raised carinae at each side of elytra, starting at distal third.

Parameres: Fig. 8G-I. Genital segment: Fig. 8F.

Cryptosphaeroides tenrec n. sp.
(Figs 7; 8A-E)

TYPE MATERIAL. — Holotype, ♂ (CASC): "Madagascar: Province d'Antsiranana, Ampasindava, Foret d'Ambilanivy, 3.9 km 181° S. Ambaliha, elev. 600m, 4-9 March 2001/13°47'55" S 48°09'42" E, coll. Fisher, Griswold et al., Calif. Academy of Sciences, sifted litter in rainforest, collection code: BLF3252" [specimen in good condition, distended and glued on a card, the dissected aedeagus, abdomen and genital segment are mounted in DMHF resin on a separate card on the same pin].
Paratypes: 4 ♂♂, 7 ♀♀ (CASC), 2 ♂♂, 1 ♀ (coll. ABCB), 1 ♀ (MNHN): same data as holotype [6 ♂♂ and 2 ♀♀ dissected].

ETYMOLOGY. — From the Tenrec (Mammalia Tenrecidae): a Malagasy hedgehog-like mammal. Once again because of the thorny appearance of the beetle. Noun in apposition.

DISTRIBUTION AND HABITAT. — Known only from the type locality, the forest of Ambilanivy in northern Madagascar (Antisranana Province). This forest belongs to the Western Domain (Paulian 1961) and can be classified as "deciduous, seasonally dry, western forest" (Du Puy & Moat 1996). All specimens have been collected by sifting leaf litter.

DIAGNOSIS. — This is the largest of all known species of *Cryptosphaeroides*. Besides the distinctive shape of

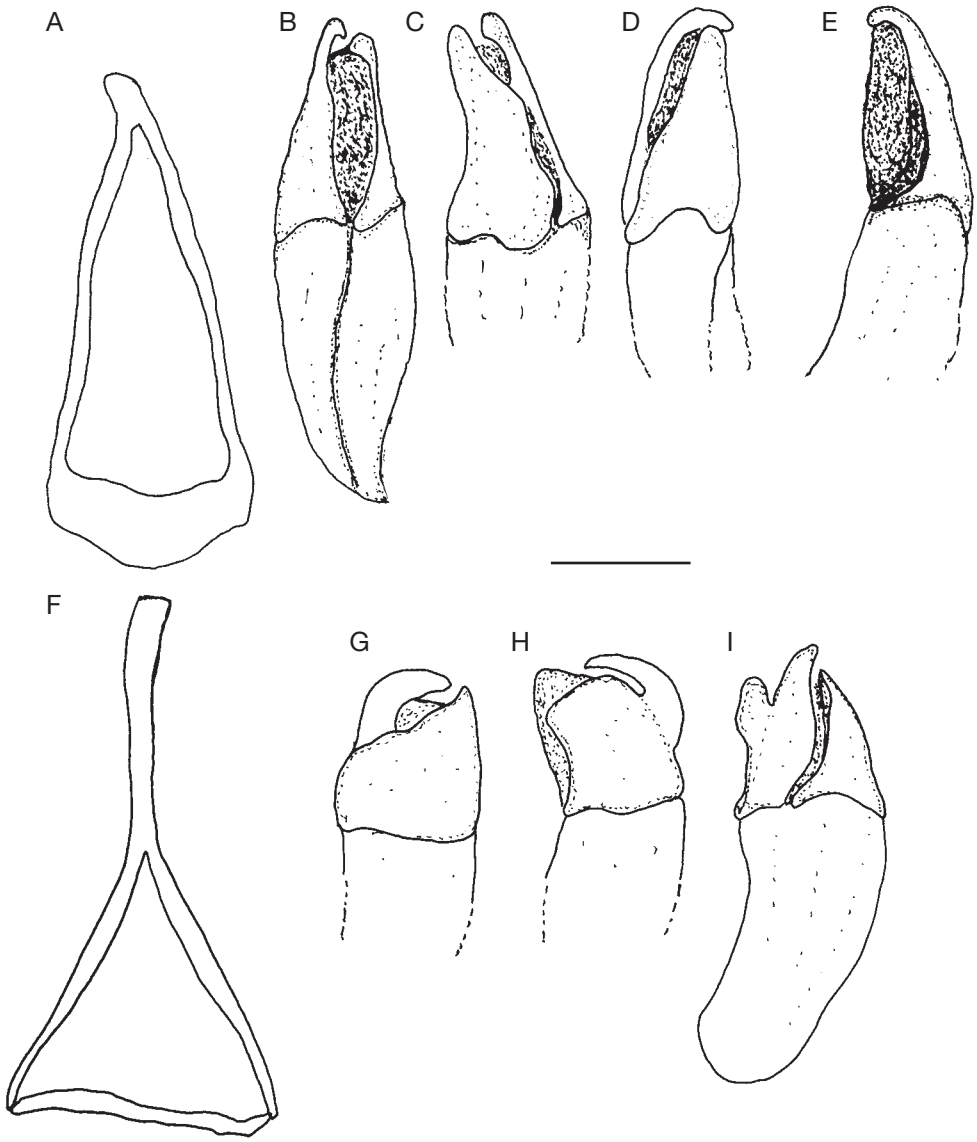

FIG. 8. — **A**-**E**, *Cryptosphaeroides tenrec* n. sp.; **A**, outline of genital segment; **B**-**E**, aedeagus; **F**-**I**, *Cryptosphaeroides ankaranensis* n. sp.; **F**, genital segment; **G**-**I**, aedeagus. Scale bar: 4 mm.

aedeagus and genital segment, this species can be easily identified by the combination of elytral puncturation and sculpturing of elytral sides as well as by the pronotal margins with a row of short clavate dense setae.

DESCRIPTION

HL = 0.76 mm; HW = 1.30 mm; PL = 1.03 mm; PW = 1.91 mm; EL = 2.00 mm; EW = 1.83 mm.

Black to dark brown, shiny; underside alutaceous, yellowish/reddish-brown; head, pronotum, margins of pronotum and elytra with yellowish/whitish sparse long clavate erect pubescence.

Head: frons with impressed transverse small comma-shaped punctures, the remaining dorsal surface with sparse transverse short comma-shaped

punctures and, only distally, transversal irregular long lines. Pubescence shorter than on pronotum and elytra.

Pronotum: surface with relatively sparse puncturation made of large transverse irregularly spaced out punctures, deeply impressed, bearing an erect long clavate seta. Lateral margins of pronotum with a row of shorter clavate setae. Scutellum: covered by irregular deeply impressed transverse punctures. Elytra: surface covered by medium sized relatively dense (their distance being often shorter than their width) impressed mostly comma-shaped punctures, longitudinally oriented and opened outwards, each one bearing an erect clavate seta internally, occasionally punctures transversely oriented and forming a short horseshoe-shaped puncture; pseudoepipleuron indistinct, each side of elytra distally with up to five smooth longitudinal broad and poorly raised carinae reaching apex of elytra.

Parameres: Fig. 8B-E. Genital segment: Fig. 8A.

Cryptosphaeroides sp.

MATERIAL EXAMINED. — 1 ♀ (CASC): "Madagascar: Mahajanga Prov: Parc national Tsingy de Bemaraha, 2.5 km 62° ENE Bekopaka, Ankidrodroa River, elev. 100 m, 11-15 Nov. 2001/19°7'56" S 44°48'53" E, coll. Fisher, Griswold et al., Calif. Academy of Sciences, sifted litter tropical dry forest on Tsingy, collection code: BLF4340" [specimen in good condition, distended and glued on a card].

REMARKS

This single female specimen probably represents a new species, very close to *C. ankaranensis* n. sp. (which occurs about 800 km north of the Tsingy de Bemaraha), however I prefer not to describe it formally until more material becomes available.

Genus *Pseudosynarmostes* n. gen.

TYPE SPECIES. — *Pseudosynarmostes mitsinjo* n. sp.

ETYMOLOGY. — From Ancient Greek ψευδος (false) and *Synarmostes*, because the appearance of the beetle when rolled up is very similar to that of *Synarmostes*. The gender is masculine.

DISTRIBUTION AND HABITAT. — Madagascar, see under individual species for more details.

DIAGNOSIS. — *Pseudosynarmostes* n. gen. can easily be distinguished from all other known genera of Ceratocanthinae by the following combination of characters: 1) head with a deep furrow between the tip of fore margin and the vertical part of clypeus, which bears a distinct sexually dimorphic process; 2) antennae with first segment of club unusually expanded basally and oriented longitudinally (Fig. 13F); 3) female protibiae sharp and S-shaped (Fig. 13B); 4) female protibiae, when the beetle is rolled up, are not completely visible, but only a small portion is visible at sides (Fig. 12B); 5) mesotibiae having only one apical spur; and 6) a likely hint of genal suture visible on head.

DESCRIPTION

Small Ceratocanthinae, body dorsally shiny, ventrally alutaceous; setose; "rolling up" coaptations perfect; winged but possibly flightless.

Head wide (W/L ratio = 1.75), subrectangular, fore margin forming a very obtuse angle (about 145°, excluding apical acute process) in the middle, scarcely protruding forward and with apex slightly protruding in a small acute setose process sexually dimorphic (Fig. 10A, B), both sides of the process smooth and very slightly curved, not reflexed upward; genae aligned with fore margin, protruding outwards, forming a rounded right angle with genal canthus; genal canthus relatively narrow, straight and complete, touching the occipital area; dorsal ocular area small, dorsal interocular area about 10-11 times the maximum width of the dorsal ocular area, ventral ocular area large; head surface plane, with variable punctures, transversal striae and pubescence, a transverse line just before the gena (genal suture?).

Pronotum distinctly wider than long (W/L ratio = 2), slightly wider than elytra; fore margin finely beaded at middle and feebly bisinuate; fore angles slightly but distinctly protrudent forward, subtruncate; sides not beaded, obtusely rounded; base very finely beaded at middle; pronotal surface regularly convex, uniformly sculptured and setose.

Scutellum large, wider than long (W/L ratio = 1.5), sides proximally subparallel and notched by elytral articular process, then convergent to form a triangle with acute apex and sides slightly curved inward. Apical portion of mesepisterna hardly

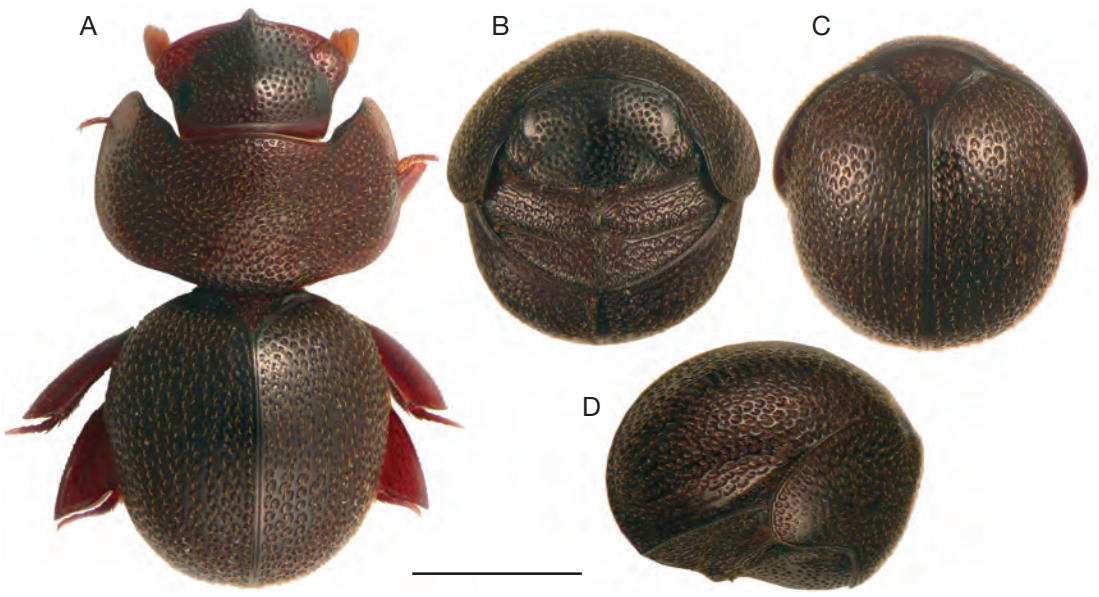

FIG. 9. — *Pseudosynarmostes mitsinjo* n. sp., Réserve spéciale d'Analamazaotra: **A**, dorsal view of male; **B**-**D**, rolled up female specimen; **B**, ventral view; **C**, dorsal view; **D**, lateral view. Scale bar: 1 mm.

visible from above, distinctly smaller than elytral articular process.

Elytra slightly longer than wide (W/L ratio = 0.91), apical 4th regularly rounded (dorsal view), apex slightly re-entering inward (lateral view); elytra regularly convex without forming a distinct pseudo-epipleuron; elytral suture very feebly raised, sutural stria extremely narrow and approaching to suture; inferior sutural stria present, although very finely impressed, delimiting a small marginal elytral area, with irregular surface sculpturing; striated articular area narrow, visible in lateral view, made of 5 or 6 striae; humeral area rounded, lacking a distinct humeral callus; elytral articular process normally developed, smooth and shiny.

Apical vertical extremity of clypeus short and transversely deeply grooved in a sexually dimorphic way, medially the groove is setose and notched upwards by the acute process of apex of head and downwards by a setose sexually dimorphic process (Fig. 10A, B). Labrum relatively narrow and short, bearing several long setae. Distal epipharynx (Fig. 11H) subrectangular, longitudinally divided by a sharp strong anterior median process; pariae distinctly raised with respect to the haptolachus; median brush and corypha absent; apical fringe made of long fine setae, absent in the middle. Labium (Fig. 11E) ventrally flat, deeply emarginated in the middle, emargination regularly narrow-U-shaped; labial palpi (including palpiger) 4-jointed, 1st joint short and very transverse, joint 2 very short and weakly sclerotized, joint 3 longer than preceding one and slightly curved, joint 4 subconical, all joints, apart from the last one, fringed with long setae. Maxillae (Fig. 11F) with an elongate single membranous lacinia, covered with fine long setae, monolobed galea proximally sclerotized and distally clothed with very coarse medium sized thick spatulate setae (galeal brush; Fig. 11G)), maxillary palpi (including palpiger) 4-jointed, palpiger very small, joint 2 wide and relatively short, joint 3 about as wide as long, joint 4 long and subconical, distinctly longer than the preceding 2 together, apically bearing some short sensilla. Mandibles (Fig. 11A-D) relatively long, slightly asymmetrical, outer margin regularly convex, apiculus preceded by a short vertical tooth, apiculus relatively long and acutely pointed, exceeding the mesal brush by

one third of the length, mesal brush narrow and well-developed, molar lobe very strong. Antennae 10-segmented (Fig. 13F), scape long (about half the total length of antenna), distally slightly clavate/securiform, distally bearing some setae, funicle short with pedicellus plump and rounded, the remaining articles very short, distinctly wider than long, antennal club made of 3 articles, the first one expanded basally, oriented almost longitudinally following the longitudinal axis of the last article of funicle, articles of club hairy, relatively small.

Ventral areas of prothorax, apart from the sides, setigerously punctured, setae long and recumbent. Hypomeron smooth, very 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, fore edge distinctly concave, surface smooth with few recumbent setae; protibiae sexually dimorphic (Fig. 13A, B), apical spur relatively long, sharp, distally curved downward, protarsi with 1st article slightly longer than the following articles together, articles 2 and 3 slightly dilated, article 5 slightly longer than the 4th article, bearing 2 short curved claws, each tarsomere, with the exception of the last one, ventrally bearing a tuft of coarse fine setae. 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, surface smooth, with hind edge emarginated at distal 3rd, emargination preceded by a small distinct tooth; mesotibiae (Fig. 13C, D) relatively short, sexually dimorphic, inner angle of apex with one straight apical spurs in both sexes, mesotarsi inserted near the inner angle of apical edge, slightly longer than apical edge of tibia, with first 3 articles subequal, 4th shorter, 5th almost as long as the preceding 2, bearing 2 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, surface hairy, hind edge distally with a small emargination, metatibiae (Fig. 13E) triangular, very wide, flat, ending with 2 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 3 together, 5th 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 longitudinal striae along inner margin and a variable sculpturing and setation along outer margin.

Wings (Fig. 12A) (L wing/L elytron ratio = 2.1): with reduced and poorly sclerotized venation, MP_{1+2}-RP loop absent, RP2 relatively long (although weakly sclerotized), apical field with a small vertical secondary sclerification near the radial cell.

Sexual dimorphism: females have the acute process of apex of head more protruding forwards and bent upwards (Figs 10B; 14), grooves of vertical part of clypeus deeper and setose process of vertical part of clypeus larger and more setose than in males, female protibiae (Fig. 13B) sharpened and S-shaped, ending with 2 small short teeth, apical spur of protibiae plumper with tip more dramatically bent downwards, mesotibiae more narrowed apically (Fig. 13C) ending with a short process bent outwards marked by a tuft of short setae, whereas males have the protibiae normally shaped, with a broad distal part and ending with a single small outer tooth (Fig. 13A), apical spur of protibiae slender and more gently bent downwards, and mesotibiae almost straight, without any tuft of setae apically (Fig. 11D). While in the rolled up posture the female conceals the protibia, which in turn is normally visible in the male (Fig. 12B).

Male genitalia: genital segment fairly sclerotized. Aedeagus dorsally flattened with basal piece very slightly twisted, longer than parameres; internal sac relatively small, usually extroflected forwards; temones present; parameres dorsally flattened.

Female genitalia: no bursal sclerites and spermatheca weakly sclerotized; genital palpi weakly sclerotized, relatively small and short.

Remarks

Both Fairmaire (1900) and Paulian (1979) stressed the unusual morphology of the habitus of *Philharmostes perrieri*, but, having only a single specimen at hand, they did not go further. Dissection of the holotype of *P. perrieri* and the collection of a long

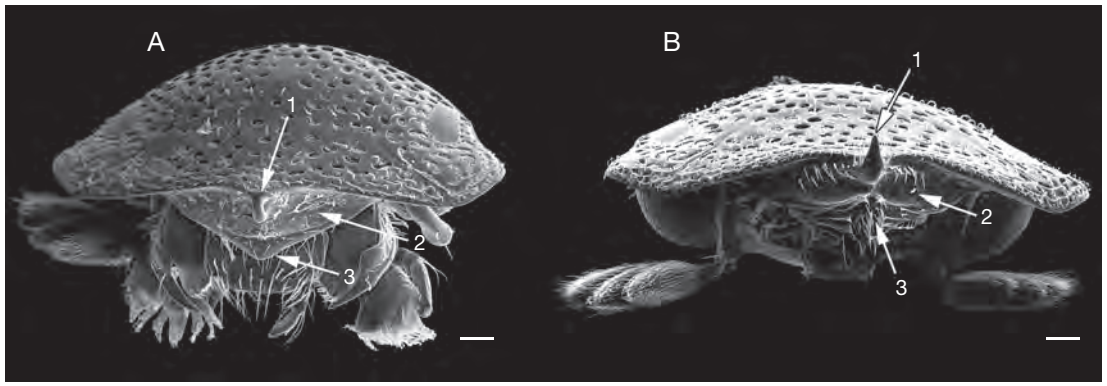

FIG. 10. — *Pseudosynarmostes mitsinjo* n. sp.: **A**, head of male; **B**, head of female (mouthparts removed). Arrows indicate: **1**, apex of head; **2**, groove between apex of head and setose process; **3**, setose process. Scale bars: 100 µm.

series of a new species in January 2006 allowed me to discover the unique antennal and head morphology as well as the unusual sexual dimorphism and therefore to find many autoapomorphies warranting the establishment of a new genus. The nearest affinities of *Pseudosynarmostes* n. gen. are unknown and the set of unique characters distinguishing this genus is truly amazing. No other Ceratocanthinae possess such a modified vertical part of clypeus with a groove so deeply excavated and the "setose process". The secondary sexual dimorphism is particularly interesting and unique within the family (Ballerio 2006). The female protibiae have a shape not found in any other known genus, being sharpened and S-shaped, this perhaps could be related to digging capabilities for egg laying. It is interesting to notice another unusual feature related to the shape of female protibiae: once rolled up the female of *Pseudosynarmostes* n. gen. does not show the outer face of protibiae (Fig. 12B), which in turn are regularly visible in the male. Possibly the morphology of aedeagus, head and mouthparts could suggest some similarities with *Synarmostes* and the continental African genera *Melanophilharmostes* Paulian, 1968 and *Pseudopterorthochaetes* Paulian, 1977 but the phylogenetic position of this new genus will be discussed in another paper. The metathoracic wings of *Pseudosynarmostes* n. gen. are relatively long, although they show a weak and reduced wing venation, so it is not possible to state whether the species in this genus are able to fly or not. It must also be observed that the humeral area is rounded and lacks a humeral callus, a typical feature related to flightlessness (Scholtz 2000).

Pseudosynarmostes mitsinjo n. sp.
(Figs 9-13)

TYPE MATERIAL. — Holotype ♂ (CASC): "Madagascar Est, Andasibe (= Perinet) (Toamasina prov.), Station Forestière (= Forêt Mitsinjo), 1135 m. a.s.l. 18°55'05"S 48°24'29"E, 5.I.2006 leg. A. Ballerio, J. E. Randrianirina & R. K. Zafinasolo in nest of *Nasutitermes* sp." [specimen in good condition, distended and glued on a card, the dissected aedeagus, abdomen and genital segment are mounted in DMHF resin on a separate card on the same pin].
Paratypes: 1 ♂, 2 ♀♀ (CASC), 3 ♂♂, 6 ♀♀ (coll. ABCB): same data as holotype [3 ♂♂ and 2 ♀♀ dissected]. — 6 ♂♂, 10 ♀♀ (coll. ABCB), 1 ♂, 1 ♀ (MNHN): "Madagascar Est, Andasibe (= Perinet) (Toamasina prov.), Réserve Spéciale de Analamazaotra, 947 mt. a.s.l. 18°56'44"S 48°25'06"E, 7.I.2006 leg. A. Ballerio, J. E. Randrianirina & R. K. Zafinasolo in nest of *Nasutitermes* sp." [2 ♂♂ and 2 ♀♀ dissected].

ETYMOLOGY. — Named after the Association Mitsinjo (Malagasy word meaning "caring for the future"), a local environmental organization which runs the Station forestière bordering the Réserve spéciale d'Analamazaotra, where the first specimens of the new species have been collected. Noun in apposition.

DISTRIBUTION AND HABITAT. — Known only from the two localities listed above, both in the Perinet area (about 30 km E of Moramanga, Toamasina province), belonging to the Eastern Domain (Paulian 1961). The whole type

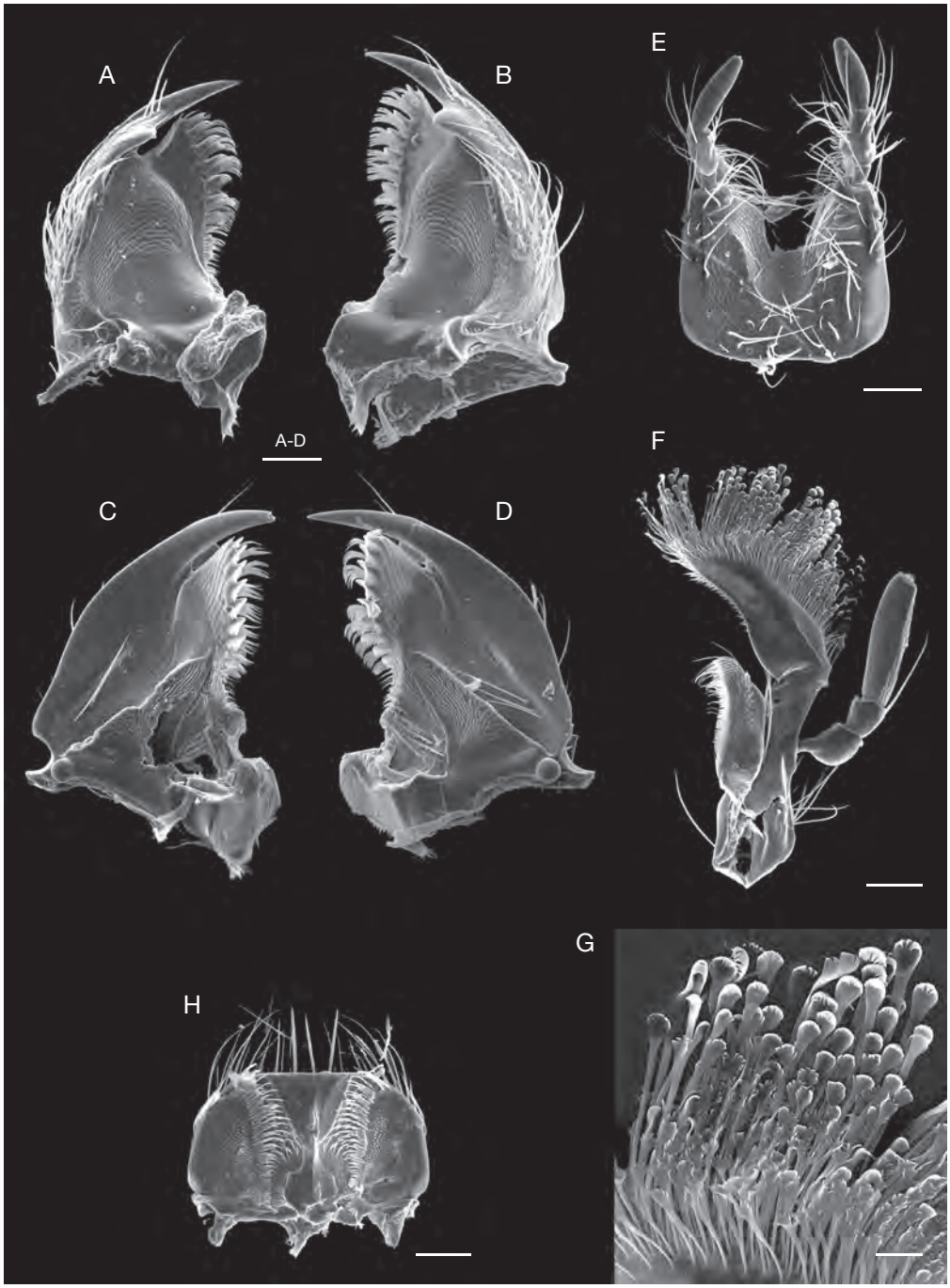

FIG. 11. — *Pseudosynarmostes mitsinjo* n. sp. mouthparts: **A**, **B**, mandibles in dorsal view; **C**, **D**, mandibles in ventral view; **E**, labium and labial palpi; **F**, maxilla and maxillary palpus; **G**, detail of galeal brush; **H**, distal epipharynx. Scale bars: A-F, H, 80 µm; G, 20 µm.

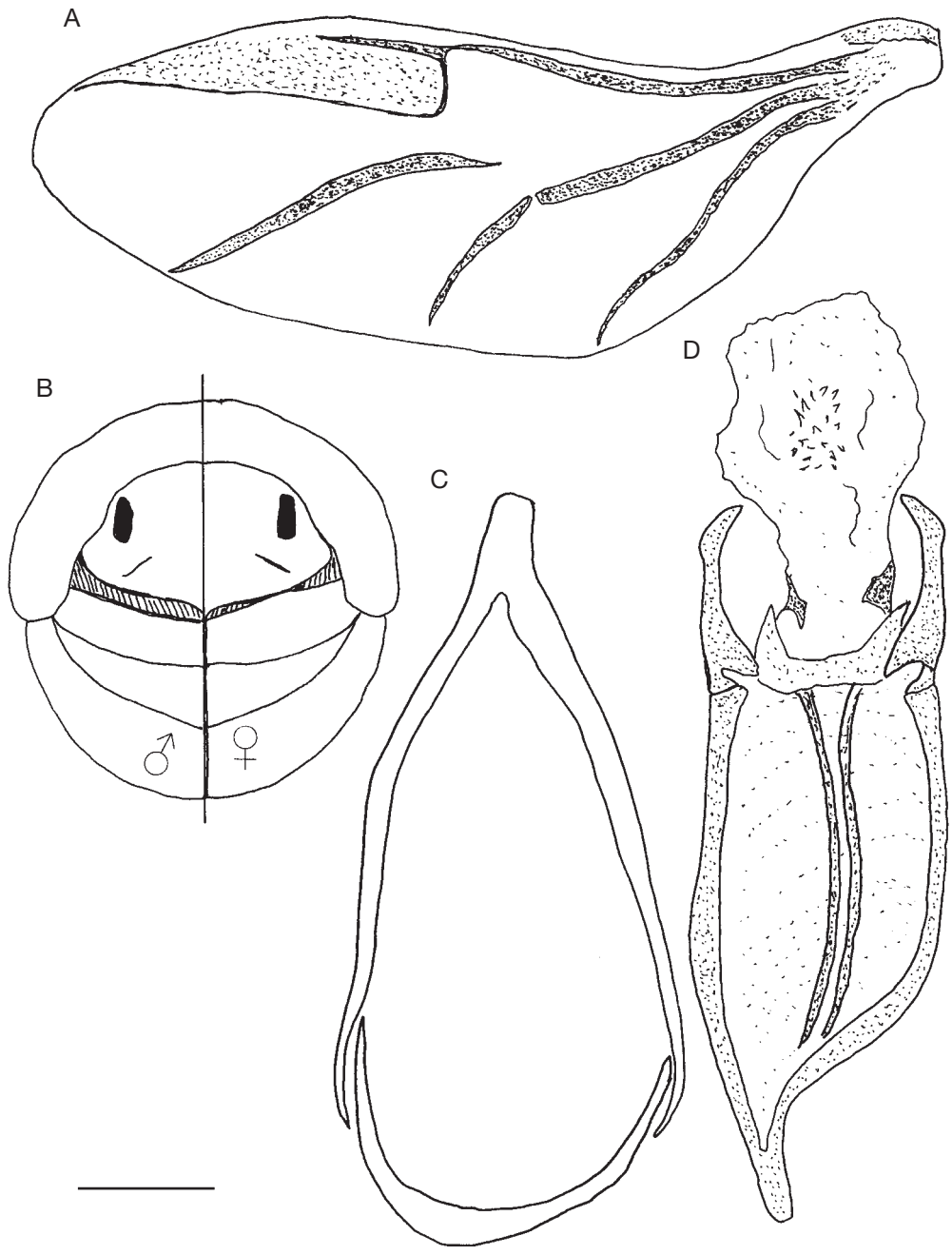

FIG. 12. — *Pseudosynarmostes mitsinjo* n. sp.: **A**, wing; **B**, outline of specimen once rolled up, left male and right female, hatched areas indicate the protibiae; **C**, outline of genital segment; **D**, aedeagus. Scale bar: A, B, 0.7 µm; C, D, 0.5 µm.

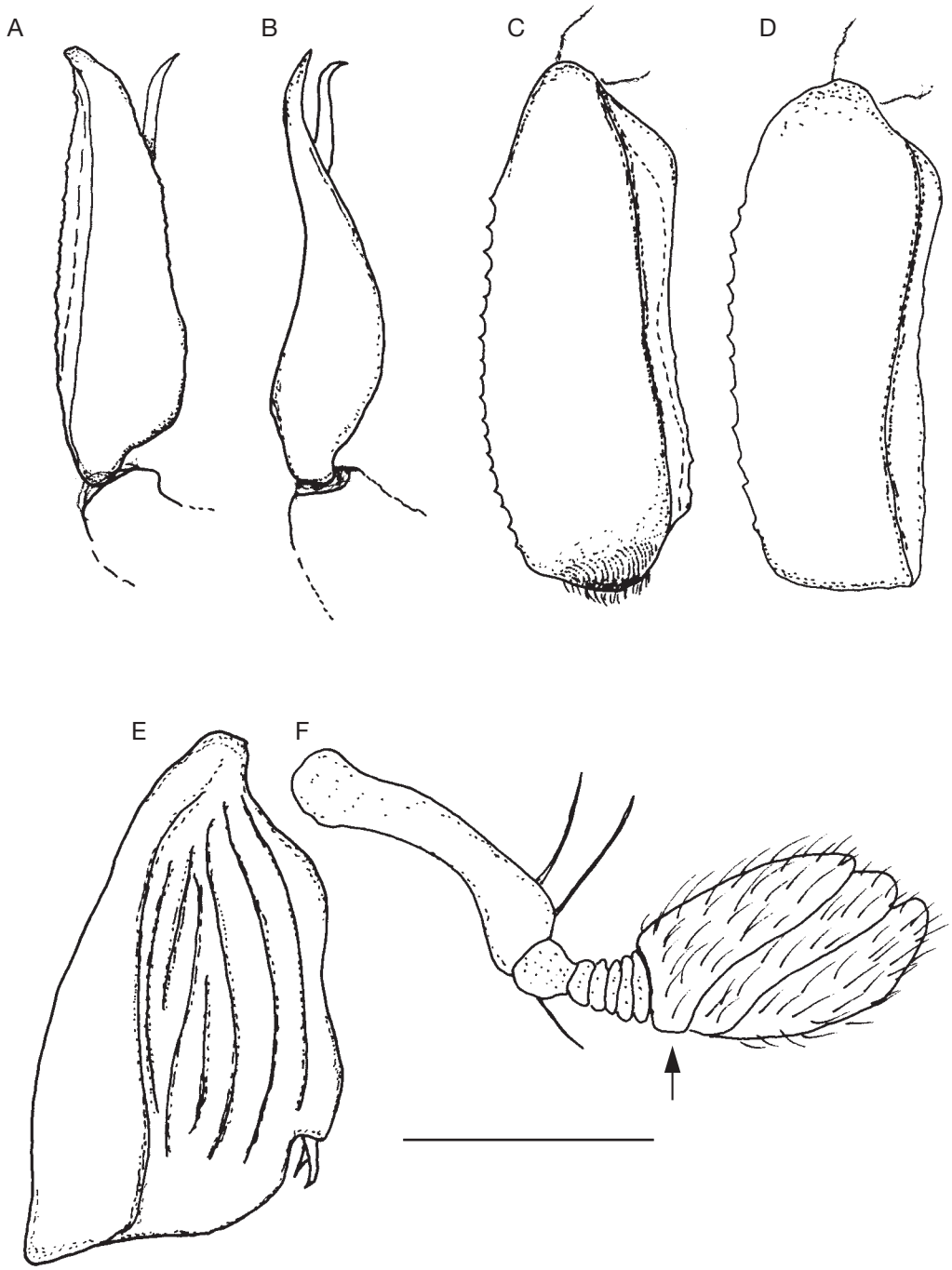

FIG. 13. — *Pseudosynarmostes mitsinjo* n. sp.: **A**, male protibia (chaetotaxy and puncturation omitted); **B**, female protibia (chaetotaxy and puncturation omitted); **C**, female mesotibia (chaetotaxy and puncturation omitted); **D**, male mesotibia (chaetotaxy and puncturation omitted); **E**, metatibia (chaetotaxy and puncturation omitted); **F**, antenna, arrow indicates the basal development of first segment of antennal club. Scale bar: A-E, 0.4 mm; F, 0.2 mm.

series has been collected in tropical rainforest ("mid altitude evergreen humid forest", Du Puy & Moat 1996) inside the nests of *Nasutitermes* sp. (Isoptera). Samples taken from the top, the sides and the base of the mound as well as samples of litter adjacent to the base all yielded specimens of *P. mitsinjo* n. sp. No larvae have been found. I inspected five termite nests, all still inhabited by termites, located inside and just outside the rainforest, and only two yielded specimens of *Pseudosynarmostes* n. gen. In both cases the nests were inside the rainforest. No other Ceratocanthinae have been collected in the nests apart from the elytra of a single specimen of *Synarmostes* cf. *tibialis* Klug, 1832, found in the litter around a nest in the Réserve spéciale d'Analamazaotra.

DIAGNOSIS. — *Pseudosynarmostes mitsinjo* n. sp. and *P. perrieri* n. comb. are very similar to each other. I was unable to find relevant differences in the shape of parameres and genital segment: the only available male of *P. perrieri* n. comb. and the slight variability in the shape of the tip of paramers shown by *P. mitsinjo* n. sp. do not allow to draw any conclusion about this problem. The main morphological distinguishing characters are the puncturation and pubescence of head, pronotum and elytra. *Pseudosynarmostes perrieri* n. comb. has much shallower puncturation and recumbent setae, while *P. mitsinjo* n. sp. has much deeper punctures and erect, semi-curled setae. The horseshoe-shaped punctures of elytra in *P. perrieri* n. comb. are narrower and longer, head punctures are shallower and narrower than in *P. mitsinjo* n. sp. and finally the dorsal ocular area is slightly narrower than in *P. mitsinjo* n. sp. The whole type series of *P. mitsinjo* n. sp. displays a remarkable uniformity in size, shape and surface sculpturing.

DESCRIPTION

HL = 0.90 mm; HW = 1.40 mm; PL = 1.19 mm; PW = 2.24 mm; EL = 2.17 mm; EW = 2.1 mm.

Dark brown to light brown; underside alutaceous, reddish-brown; head, pronotum and elytra with yellowish/whitish very short curled erect pubescence.

Head: Surface covered by deeply impressed dense (their distance being usually about as big as their width) rounded or transverse-comma-shaped punctures. A very small smooth area on disc. A few large irregularly shaped lines at sides and near fore margin. Pubescence shorter and finer than on pronotum and elytra.

Pronotum: surface with dense (their distance being distinctly shorter than their width) puncturation made of impressed relatively small horseshoe-shaped punctures, each one bearing a short curled fine seta at middle, horseshoes opening inwards basally and outwards laterally. Scutellum: punctures as on pronotum, opened backwards. Elytra: surface completely covered by dense impressed horseshoe-shaped punctures, relatively larger than on pronotum, each one bearing a short curled seta at middle, with openings of horseshoe relatively short (horseshoe almost closing completely to form an ocellate puncture) and oriented backwards. Pseudoepipleuron indistinct, sides of elytra regularly rounded, lacking any carina or furrow.

Aedeagus: Fig. 12D. Genital segment: Fig. 12C.

FIG. 14. — *Pseudosynarmostes perrieri* (Fairmaire, 1898) n. comb., dorsal view of female (Tsimembo forest). Scale bar: 1 mm

Pseudosynarmostes perrieri (Fairmaire, 1898) n. comb. (Fig. 14)

Synarmostes perrieri Fairmaire, 1898: 471 (description). — Marie & Lesne 1917: 117 (catalogue).

Philharmostes perrieri Fairmaire, 1900: 473. — Alluaud 1900: 245 (catalogue). — Arrow 1911: 46 (catalogue). — Paulian 1937: 132 (key); 1979: 71 (key, description,

distribution). — Boucomont 1937: 280 (listing). — Ocampo & Ballerio 2006: 189 (catalogue).

TYPE MATERIAL. — Holotype ♂ (MNHN): "Madag. Perrier/*Synarmostes perrieri* Fairm. Madag./Museum Paris, Madagascar, Perrier de la Bâthie, Coll. Léon Fairmaire 1906/Type/*Pseudosynarmostes perrieri* Fairmaire 1898 det. A. Ballerio 2006" [specimen in good condition, partly distended and glued on a card; the dissected aedeagus, genital segment, abdomen and left protibia are mounted in DMHF resin on separate cards on the same pin].

ETYMOLOGY. — Named after its collector, the French botanist Henri Perrier de la Bâthie (1873-1958).

OTHER MATERIAL EXAMINED. — 2 ♀♀ (CASC) [all dissected]: "Madagascar: Mahajanga Prov. Foret de Tsimembo, 11.0 km 346° NNW Sostana, elev. 50 m, 21-25 Nov. 2001, 18°59'43"S 44°26'37"E/coll: Fisher, Griswold et al., California Acad. of Sciences, sifted litter (leaf mold, rotten wood) in tropical dry forest, coll. code: BLF4508".

DISTRIBUTION AND HABITAT. — Probably restricted to the tropical dry forests of western Madagascar. The holotype bears only a generic locality label "Madagascar", but Fairmaire, while describing it, quoted "Suberbieville" (Maevatanana, Mahajanga Province) as the type locality. Despite the fact that the holotype bears a label dated 1906, this should have been added later, since the description by Fairmaire is from 1898. Perrier de la Bâthie came to Madagascar in 1897 (Lacroix 1998) and therefore *Pseudosynarmostes perrieri* n. comb. should have been one of the very first beetles collected by him. The other two specimens examined come from another locality in western Madagascar, belonging to the same ecological region, but some 400 km southwards from the forests around Maevatanana: the Tsimembo forest, near Antsalova. There seems to be a big gap between the two localities, however the shortage of available material does not allow to find appreciable differences for separating these two females from the male holotype from Maevatanana.

DIAGNOSIS. — See under *P. mitsinjo* n. sp.

DESCRIPTION

HL = 0.60 mm; HW = 1.25 mm; PL = 1.05 mm; PW = 1.90 mm; EL = 1.80 mm; EW = 1.81 mm.

Dark brown to light brown; underside alutaceous, reddish-brown; head, pronotum and elytra with yellowish/whitish very short recumbent pubescence.

Head: Surface covered by relatively shallow dense (their distance being usually about as big as or slightly smaller than their width) punctures, transversely comma-shaped. A few large irregularly shaped lines at sides and near fore margin. Pubescence shorter and finer than on pronotum and elytra.

Pronotum: surface with dense (their distance being distinctly shorter than their width) puncturation made of shallow ocellate or rarely horseshoe-shaped punctures, each one bearing a short recumbent seta at middle, horseshoes opening inwards basally and outwards laterally. Scutellum: punctures as on pronotum, opened backwards. Elytra: surface completely covered by dense shallow longitudinally narrowed horseshoe-shaped punctures, relatively larger than on pronotum, each one bearing a short recumbent seta at middle, with openings and oriented backwards. Pseudoepipleuron indistinct, sides of elytra regularly rounded, lacking any carina or furrow.

KEY TO MALAGASY CERATOCANTHINAE GENERA AND TO THE SPECIES OF *CRYPTOSPHAEROIDES* N. GEN. AND *PSEUDOSYNARMOSTES* N. GEN.

1. Dorsal ocular area always present and normally developed (Fig. 9A), antennal pedicellus straight or slightly curved 2
— Dorsal ocular area very reduced (Fig. 4D) or absent, antennal pedicellus strongly curved backwards (Fig. 3G) 5

2. Fore tibiae regularly broadly curved inwards ..... *Philharmostes*
— Fore tibiae straight or S-shaped 3

3. Apical portion of elytra with several carinae ..... *Synarmostes*
— Apical portion of elytra with the same sculpturing of the remaining elytral surface, lacking any carinae (Fig. 9A-D) ..... *Pseudosynarmostes* n. gen., 4

4. Puncturation of head, pronotum and elytra deeply impressed with erect semi-curled setation ..... *P. mitsinjo* n. sp.

— Puncturation of head, pronotum and elytra shallow with recumbent setation .... *P. perrieri* n. comb.

5. Surface sculpturing made only of sparse horseshoe-shaped or comma-shaped punctures, setate (45 ×), posterior margin of pronotum not raised..... *Cryptosphaeroides* n. gen., 6
— Surface sculpturing made of tubercles and carinae and strong fine punctures, glabrous (45 ×), posterior margin of pronotum raised ..... *Goudotostes*

6. Elytra with distinct pseudoepipleura ..... *C. hystrix* n. comb.
— Elytra lacking any distinct pseudoepipleura, at most with some longitudinal carinae near sides 7

7. Pronotal lateral margins with a row of dense short clavate setation ..... *C. tenrec* n. sp.
— Pronotal lateral margins without any distinct setation or with very sparse long clavate setae 8

8. Puncturation of elytra made of shallow large horseshoe-shaped punctures .... *C. hippocrepis* n. sp.
— Puncturation of elytra made of deep small comma-shaped punctures .... *C. ankaranensis* n. sp.

Dedication
This work is dedicated to the memory of Renaud Paulian (1913-2003)

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