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SCIENTIFIC NOTE

NEW RECORDS OF ANT NEST BEETLES (COLEOPTERA: CARABIDAE: PAUSSINAE: PAUSSINI) IN ANGOLA AND AN ANNOTATED LIST OF SPECIES KNOWN FROM THE COUNTRY

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Ant nest beetles (Carabidae: Paussinae: Paussini) are myrmecophilous carabids with a more or less strong deviation from the ordinary ground beetle habitus. A brief historical review on paussine phylogeny, fossil and taxonomic findings, and catalogues were presented by Nagel (2006). An attempt to trace the evolution of myrmecophily in paussines through aspects of the association between paussine beetles and ants, using morphological and potential chemical adaptations, life cycle, host specificity, alimentation, parasitism, and sound production, was done by Geiselhardt *et al.* (2007). Recently, a molecular phylogeny of ant nest beetles by Moore and Robertson (2014) revealed that this symbiosis has produced one of the most stunning examples of rapid adaptive radiation documented to date.

The ant nest beetle fauna of Angola was studied by Luna de Carvalho during more than 20 years, and his expertise on the world paussids culminated in the publication of a monographic work (Luna de Carvalho 1989). Based on this work, that of Nagel (2006), and most recently that of Schüle and Bednářik (2015), 46 species of Paussini came to be known from Angola (Table 1). Most ant nest beetle species found in Angola occur throughout central and southern Africa, namely in neighboring countries (*e.g.*, Democratic Republic of the Congo, Zambia, Zimbabwe, Namibia, and South Africa) (Luna de Carvalho 1987). Eleven taxa of the known Angolan paussines have been reported exclusively from this country ($\pm 22\%$ of the country's paussine fauna, Table 1). Undoubtedly, the most species rich genus in Angola is *Paussus* L.,

1775, with approximately 34 species spread over 10 subgenera (Table 1).

Angola is the seventh largest country in Africa (1,246,700 km²) and is located in the southwestern part of the continent. Some insights on its orography, climate, major vegetation types, and threats to biodiversity can be found in Serrano and Capela (2013). Two trips to Angola during 2014 resulted in the capture by hand of ant nest beetles by means of direct observation (abbreviation “DO” in the text) and light trapping (“LT” in the text). The study of this material resulted in the identification of 10 species of Paussini, two of them representing new subgenera records for Angola and another two new species records, increasing the known Angolan records to 50 species (Table 1).

We follow the classification of ground beetles of Lorenz (2005). Within each subgenus, the species names are organized alphabetically. For each species, the locality(ies), including the geographic coordinate(s), the province of Angola, the number per sex of the specimen(s), and the means of capture are given, followed by a brief geographical and ecological remark. The specimens are deposited in the collection of the first author at the Departamento de Biologia Animal (Faculdade de Ciências da Universidade de Lisboa).

***Carabidomennus* (*Carabidodoxus* Kolbe, 1927) sp.** Barra Cuanza River (9°18'55.35" S, 13°09'58.56" E, 11 m altitude), Luanda, 1♀ LT, A. Serrano leg. This species is similar to *Carabidomennus hargreavesi* Reichenasperger by the scape lacking a large sensorial seta and the possession of eight umbilicate setae on each elytron. However, the

Table 1. List of ant nest beetles of Angola (systematic classification follows Lorenz 2005). **E** = exclusively reported from Angola, * = new record for Angola.

Nº	Taxa	
Paussini/Carabidomemnina		
1	<i>Carabidomemnus (Carabidodoxus) acutipennis</i> Luna de Carvalho, 1975	E
2	<i>Carabidomemnus (Carabidodoxus) vilhenai</i> Luna de Carvalho, 1959	E
3	<i>Carabidomemnus (Carabidodoxus) sp.</i>	E
Paussini/Ceraapterina		
4	<i>Ceraapterus (s. str.) benguelanus</i> Kolbe, 1926	-
5	<i>Ceraapterus (s. str.) denoiti</i> Wasmann, 1899	-
6	<i>Ceraapterus (s. str.) lafertei</i> Westwood, 1850	-
7	<i>Ceraapterus (s. str.) myrmidonum</i> Kolbe, 1896	-
8	<i>Ceraapterus (s. str.) smithii</i> Westwood, 1838	-
9	<i>Ceraapterus (s. str.) stuhlmanni</i> Kolbe, 1895	-
Paussini/ Pentaplatarthrina		
10	<i>Pentaplatarthrus (s. str.) vandamii</i> Van de Poll, 1886	-
Paussini/ Heteropaussina		
11	<i>Heteropaussus (s. str.) angolensis</i> Luna de Carvalho, 1959	E
12	<i>Heteropaussus (s. str.) dohrni</i> (Ritsema, 1875)	-
13	<i>Heteropaussus (s. str.) lujae</i> (Wasmann, 1907)	-
14	<i>Heteropaussus (s. str.) passoscarvalhoi</i> Luna de Carvalho, 1971	-
15	<i>Heteropaussus (s. str.) trapezicollis</i> (Wasmann, 1922)	-
Paussini/Paussina		
16	* <i>Paussus (Crenatopaussus) scaliger</i> Reichenasperger, 1926	-
17	<i>Paussus (Bicornipausus) audouini</i> Westwood, 1852	-
18	<i>Paussus (Cochliopaussus) cucullatus</i> Westwood, 1850	-
19	<i>Paussus (Cochliopaussus) huamboensis</i> Schüle and Bednařík, 2015	E
20	<i>Paussus (Cochliopaussus) pseudocucullatus</i> Nagel, 1983	-
21	<i>Paussus (Cochliopaussus) ricardojorgei</i> Luna de Carvalho, 1951	E
22	<i>Paussus (Cochliopaussus) wellmanni</i> Wasmann, 1907	-
23	<i>Paussus (Klugipausus) distinguendus</i> Reichenasperger, 1925	-
24	<i>Paussus (Klugipausus) klugii</i> Westwood, 1838	-
25	* <i>Paussus (Klugipausus) pseudoklugi</i> Luna de Carvalho, 1963	-
26	<i>Paussus (Spinicoxipausus) bohemani</i> Westwood, 1855	-
27	<i>Paussus (Spinicoxipausus) canaliculatus</i> Wasmann, 1919	-
28	<i>Paussus (Spinicoxipausus) cridae</i> Gestro, 1915	-
29	<i>Paussus (Spinicoxipausus) damarinus</i> Westwood, 1874	-
30	<i>Paussus (Spinicoxipausus) massarti</i> Reichenasperger, 1933	-
31	<i>Paussus (Shuckardipausus) curtisii</i> Westwood, 1864	-
32	<i>Paussus (Shuckardipausus) telescopifer</i> Wasmann, 1922	-
33	<i>Paussus (Shuckardipausus) vanrooni</i> Wasmann, 1922	-
34	* <i>Paussus (Squamipausus) signatipennis</i> Péringuey, 1885	-
35	<i>Paussus (Manicanopausus) manicanus</i> Péringuey, 1896	-
36	<i>Paussus (Manicanopausus) vollenhovii</i> Westwood, 1874	-
37	* <i>Paussus (Katapaussus) chappuisi</i> Reichenasperger, 1938	-
38	<i>Paussus (Katapaussus) propinquus</i> Péringuey, 1888	-
39	<i>Paussus (Katapaussus) rusticus</i> Péringuey, 1885	-
40	<i>Paussus (Katapaussus) woerdeni</i> Ritsema, 1875	-
41	<i>Paussus (Lineatopaussus) camaxilensis</i> Luna de Carvalho, 1963	E
42	<i>Paussus (Lineatopaussus) moreirai</i> Luna de Carvalho, 1971	E
43	<i>Paussus (Lineatopaussus) heinrichi</i> Luna de Carvalho, 1959	E
44	<i>Paussus (Lineatopaussus) passosi</i> Luna de Carvalho, 1963	E
45	<i>Paussus (Edaphopaussus) aristotelis</i> Thomson, 1858	-
46	<i>Paussus (Edaphopaussus) avunculus</i> Reichenasperger, 1925	-
47	<i>Paussus (Edaphopaussus) burgeoni</i> Reichenasperger, 1925	-
48	<i>Paussus (Edaphopaussus) cylindricollis</i> Wasmann, 1922	-
49	<i>Paussus (Edaphopaussus) dichrous</i> Janssens, 1950	-
50	<i>Granulopaussus reichenaspergeri</i> (Luna de Carvalho, 1959)	E

general elytral color pattern is similar to that of *C. lunacarvalhoi* Nagel (see figure in Nagel 1983). The adult specimen was captured within a riparian forest.

***Heteropaussus (s. str.) dohrni* (Ritsema, 1875).** Chitembo (13°36'17.43" S, 16°53'59.98" E, 1,538 m altitude), Bié, 30.X.2014, 1♀ LT, A. Serrano leg. This species is widespread throughout western and southwestern Africa and recorded from Angola (Luna de Carvalho 1987). The adult specimen was captured within a secondary open forest.

***Heteropaussus (s. str.) trapezicollis* (Wasmann, 1922).** Chitembo (13°36'17.43" S, 16°53'59.98" E, 1,538 m altitude), Bié, 30.X.2014, 1♂, LT, A. Serrano leg.; Chitembo (13°22'40.78" S, 16°41'58.07" E, 1,666 m altitude), Bié, 1.XI.2014, 1♀ LT, A. Serrano leg. This species occurs from Mozambique to Angola. It was recorded from Bié province by Luna de Carvalho (1989). The adult specimens were captured within a secondary open forest.

***Paussus (Crenatopaussus) scaliger* Reichenasperger, 1926.** Mumbué (13°53'55.86" S, 17°23'12.68" E, 1,622 m altitude), Bié, 1♀ DO, A. Serrano leg. This species was previously known only from South Africa (Luna de Carvalho 1987). Angola is a **new country record** for the subgenus and species. The specimen was captured under bark with Formicidae and Zygentoma (not identified) within a secondary open forest.

***Paussus (Klugipaussus) pseudoklugi* Luna de Carvalho, 1963.** Satchijamba (13°43'38.76" S, 17°12'17.74" E, 1,601 m altitude), Bié, 7.IV.2014, 1♂, DO, A. Serrano leg. This species is known from central-southern and eastern Africa (Luna de Carvalho 1987). The specimen fits very well with the description and measurements of the antennal club. It is a **new country record** for Angola. Like *P. scaliger*, it was found under bark with Formicidae and Zygentoma (not identified) within a secondary open forest.

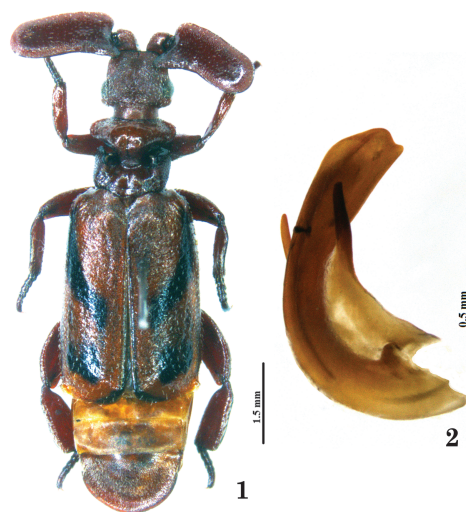
***Paussus (Spinicoxipaussus) cridae* Gestro, 1915.** Chitembo (13°36'17.43" S, 16°53'59.98" E, 1,538 m altitude), Bié, 30.X.2014, 1♂, LT, A. Serrano leg.; Chitembo (13°22'40.78" S, 16°41'58.07" E, 1,666 m altitude), Bié, 1.XI.2014, 9♂, LT, A. Serrano & R. Capela leg. This species is widespread throughout central and southwestern Africa (Luna de Carvalho 1989). It is a very common species in Angola from the littoral to inland territories (Luna de Carvalho 1989).

***Paussus (Shuckardipaussus) vanrooni* Wasmann, 1922.** Satchijamba (13°22'40.78" S, 16°41'58.07" E, 1,666 m altitude), Bié, 2.XI.2014, 1♂, 1♀ LT, A. Serrano leg. A species widespread throughout eastern, central, and southwestern Africa, it is already known from Angola (Luna de Carvalho 1989). The adult specimens were captured within a secondary open forest.

***Paussus (Squamipaussus) signatipennis* Péringuey, 1885.** Kakande (12°42'50.57" S, 16°45'33.13" E, 1,716 m altitude), Bié, 31.III.2014, 1♂, 1♀ DO, A. Serrano leg. This species was known only from South Africa (Transvaal) (Reichensperger 1958; Luna de Carvalho 1989). The specimens fit very well with the original description of Péringuey (1885). Angola is a **new country record** for the subgenus and species. The specimens were captured in a trail of probably a species of *Pheidole* Westwood on the soil, walking among worker and soldier ants. We illustrate the male habitus and aedeagus of the species in Figs. 1 and 2, respectively. We point out the fact that the apex of the middle lobe is different from that of most other African *Paussus* types (see figs. 164 to 171 in Darlington 1950).

***Paussus (Katapaussus) chappuisi* Reichenasperger, 1938.** Satchijamba (13°22'40.78" S, 16°41'58.07" E, 1,666 m altitude), Bié, 2.XI.2014, 2♂, LT, A. Serrano & R. Capela leg. Based on previous records (e.g., Luna de Carvalho 1989), *P. chappuisi* and *Paussus rusticus* Péringuey, 1885 seem to be sister species with vicariant (allopatric) distribution. The former species was known until now only from eastern Africa while the latter is known from southwestern Africa (Luna de Carvalho 1989). However, our specimens fit very well with the description for *P. chappuisi* given by Nagel (1977). The species is a **new country record** for Angola, expanding its distribution to southwestern Africa. The adult specimens were captured within a secondary open forest.

***Paussus (Edaphopaussus) burgeoni* Reichenasperger, 1925.** Cachingue-Chipica



Figs. 1–2. *Paussus signatipennis*. 1) Dorsal habitus of adult male collected in Kakande, Angola; 2) Aedeagus, lateral view.

(13°10'15.14" S, 16°45'33.52" E, 1,668 m altitude), Bié, 2.IV.2014, 1♂, LT, A. Serrano leg. This species is known from the Democratic Republic of the Congo, Congo (Brazzaville) (see Nagel 1986, p.167: "Zaire, Kongo, NE-Angola", and map no. 5), Rwanda, and Angola (Luna de Carvalho 1989). The adult specimen was captured within a secondary open forest.

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