

Studies on types in the genus *Rhyssemus*. 1. General considerations and *R. mayeti* Clouët des Pesruches, 1901 (Coleoptera: Scarabaeidae: Aphodiinae: Psammodiini)

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Abstract. General considerations are presented, focused on problems in descriptions of external characters of species in the genus *Rhyssemus* Mulsant, 1842. The lectotype (female) of the species *Rhyssemus mayeti* Clouët des Pesruches, 1901 was studied; appropriate photos and a supplementary redescription are presented to facilitate the species identification. Results of studying additional material and illustrations of a male specimen are also included. The species is reported from Kenya, South Sudan and Sudan for the first time.

INTRODUCTION

In efforts to identify species within the subfamily Aphodiinae, the genus *Rhyssemus* Mulsant, 1842 undoubtedly belongs to most difficult groups. The identification is based to a considerable extent on body surface sculptures and structures, which are frequently misunderstood by readers of particular descriptions or even misinterpreted by their authors (see the part General considerations below).

Specimens studied are frequently dirty due to the development of adults from pupae in the soil (this problem is usually more considerable in the case of loamy soils compared to sandy ones). If so, then the structures and sculptures are hard to recognize.

The first, excellent monographic treatise on the genus was published at the beginning of the 20th century (Clouët des Pesruches 1901). Thereafter, nearly further 150 species have been described (see for example a catalogue by Dellacasa (1988) and subsequent individual works). Last important comprehensive treatises (dealing with more than 50 Old World *Rhyssemus* species) were presented by Pittino (1983, 1984). Since then, there is a gap of over 30 years, which has not yet been bridged. Due to this, there are numerous unidentified and/or new species in private and institutional collections. We feel that this adverse situation could be partially solved by stepwise studies of types supported by appropriate illustrations. The above mentioned problem particularly concerns Old World species. Keys in monographs (Schmidt (1922) - world, Balthasar (1964) - Palearctic and Oriental Regions and Endrödi (1964) - Afrotropical Region) are outdated and suffer from lack of illustrations, which are quite necessary for their use in practice.

MATERIAL AND METHODS

The specimens were observed by using the MBS-10 and SZP 1120-T stereoscopic microscopes. The photos published here were taken by the use of the Meopta laboratory microscope, CMOS 5

digital camera and the Helicon Focus programme.

Prior to the study and taking photos, they were kept in a detergent solution for 30 to 60 min and submitted to mechanical cleaning.

The following acronyms stand for collections, in which the specimens studied here are kept:

- DKCP David Král collection, deposited in NMPC;
LMCT Ladislav Mencl private collection, Týnec nad Labem, Czech Republic;
MRCD Miloslav Rakovič private collection, Dobřichovice, Czech Republic;
MNHN Muséum national d'Histoire naturelle, Paris, France (Antoine Mantilleri);
NMPC National Museum Praha, Czech Republic (Jiří Hájek).

TAXONOMY

General considerations

We would like to emphasize some points associated with characters important for the identification of *Rhyssemus* species, particularly with keeping in mind due avoidance of ambiguous interpretation, misinterpretation and/or misunderstanding. They should be observed when reading the text below, aimed at the species studied here, as well as in the further intended works.

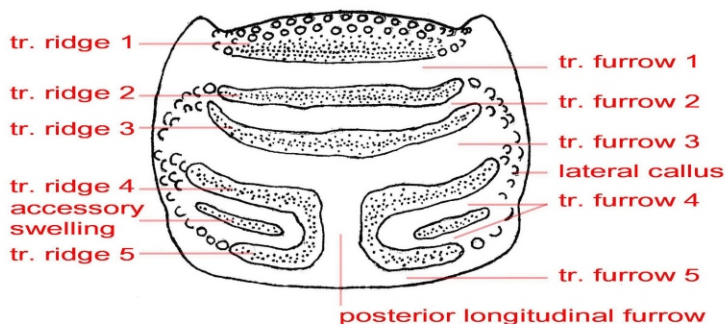
The habitus can be characterized by the body size, shape, colour and appearance (shining or matte). It is necessary to realize that in the same species, clean specimens can be shining, whereas dirty ones seem to be matte or exert only shining elevated structures (ridges and granules), the depressed areas being dirty and thus seemingly matte.

In the head, characteristic features can be found, concerning the shape, structure or sculpture. First of all, there is an anteromedian emargination of the clypeus and the specimen has its clypeus sharp (dentate), angulate (obtusely angulate), moderately rounded, distinctly rounded or even broadly rounded each side of the emargination. It is to emphasize that the direction of the observation is of principal importance. When looking at a specimen to observe its whole habitus in the dorsal aspect, then the clypeus can look for example angulate or even dentate each side of the emargination, since the specimen mounted on the card in an usual manner has usually its head declined downward, though if moderately; on the other hand, when observing the head in direction perpendicular to the plane of the head circumference (or in other words perpendicular to the prevalent area of the head), then the clypeus appears to be more or less rounded each side of the emargination. Differences in the observation direction between the reader and author will then unavoidably bring misunderstanding. The shape of the clypeus lateral margin from the anterior angle to the genae or of individual parts of the margin (sinuate, straight or arcuate) is less problematic, but the appropriate direction of observation (perpendicular to the head) is also advisable. Relevant figures are very helpful in these cases. The structures of the head include granules on the clypeus surface and two pairs of oblique ridges arranged in chevron on the head vertex; the ridges of the anterior pair are usually more distinct, those of the posterior pair are sometimes less distinct or even missing; between the anterior granulate area of the clypeus and head vertex, there is a more or less elevated structure, referred to as the middle protuberance in the present work.

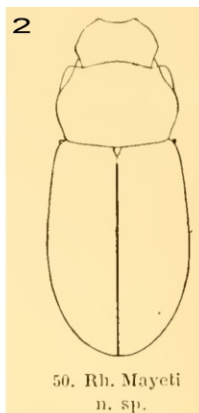
The pronotum exerts many features useful for the identification to species.

As to the terms describing the pronotal structure in Psammodiini (numbering of pronotal ridges), in the present work, we adhered to the terminology formerly proposed by the first author (Rakovič 1987). The reasons for this are as follows. In Psammodiini, there are genera characterized by

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Figs. 1-2. *Rhyssemus*: 1- generalized scheme of structural elements usually present on pronotum; 2- original drawing of *Rhyssemus mayeti* from Clouët des Pesruches (1901).

a complete pronotal structure, i.e. five transversal ridges, five transversal furrows and a posterior longitudinal furrow (as is the case for example in the genera *Psammmodius* Fallén, 1807, *Neopsammmodius* Rakovič, 1986, *Rhyssemodes* Reitter, 1982, etc.), or by a reduced pronotal structure, i.e. a posterior longitudinal furrow and some vestigial, incomplete furrows or at least lateral impressions corresponding to ends of the first and third transversal furrows (which is encountered for example in *Leiopsammmodius* Rakovič, 1981 *Pleurophorus* Mulsant, 1842, etc.). In *Rhyssemus*, between ridges 4 and 5, which are interrupted by the posterior longitudinal furrow, there is usually an additional transversal swelling on each side. Due to this, many authors consider that members of the genus *Rhyssemus* have six transversal ridges. This consideration itself does not pose any problem, but the problem arises when numbering the ridges, since in this case, the "5th" ridge sensu auct. in *Rhyssemus* is by no means homologous with the 5th ridge in other Psammodiini having the complete pronotal structure. It is thus better to consider five transversal ridges with right and left accessory transversal swellings present between the 4th and 5th ones (see Fig. 1). We prefer this approach for the following two reasons. The first reason is principal, given by the homology among all the Psammodiini with the complete pronotal structure exerted by the presence of five transversal ridges - when disregarding the accessory swelling, then the structure shown schematically in Fig. 1 applies to any genus with the complete pronotal structure (for example *Psammmodius*). The second reason is practical: in certain *Rhyssemus* species, some of the posterior transversal structures is very weak, indistinct or even missing, and in this case, the authors, who usually write about six ridges in most *Rhyssemus* species, unexpectedly simply write about five ridges without any specification which of the "six ridges" sensu auct. is missing; within the concept employed here, it is easy to identify the missing posterior structure (ridge 4, accessory swelling or ridge 5) based on the position of the present structures and this identification can be helpful in the description as well as determination to species. The lateral callus can be more or less developed; it can sometimes overlap a middle part of the pronotum lateral margin (if so, then the middle part of the pronotum lateral margin is concealed under the callus in the dorsal view of the pronotum).

Difficulties can also be encountered in descriptions of the sculpture and structure of elytral intervals. Numerous species have more or less granulate elytral intervals, each interval with two rows of granules: an outside row of large granules and an inside row of smaller ones (small

grains). In some of them, the large granules are distinctly delimited even when observed under a low magnification, but in some others, the observation in different directions (dorsal view, lateral view and oblique dorsolateral view) under a high magnification is necessary to make a decision about the granule shape. In certain species, the elytral intervals observed under a low magnification seem to be only transversally incised in dorsal aspect, but their detailed examination as mentioned above actually reveals the presence of the two rows of granules, where each large granule has a small, backward directed elevation at its posterior margin. In descriptions, it is then quite necessary to exactly characterize the shape of the granule, sometimes with specification of observation conditions. In some species, the intervals are strongly carinate (costate), either without differences in height of odd and even intervals on the elytral disc or with higher odd intervals and lower even intervals (the sutural interval being counted as interval). However, in some other species, there are intervals bearing two rows of granules, as considered above, but the large granules are considerably longitudinal, thus producing chains reminding of the carinate (costate) structure of the elytra; if so, it is necessary to detail the situation in descriptions, since the allegedly carinate structure of elytral intervals can sometimes otherwise occur in keys in this case, thus making the use of the keys impracticable. Exact descriptions of the interval heights on the elytral apex are also of importance; some authors write about lower even intervals on the apex, but in some species, the actual apical arrangement of intervals can be rather expressed by the statement that some even intervals (for example interval 4 and/or 6) are reduced in length (i.e. do not achieve the apical margin) compared to respective neighbouring odd intervals.

***Rhyssemus mayeti* Clouët des Pesruches, 1901**

(Figs. 2-19)

Rhyssemus mayeti Clouët des Pesruches, 1901: 110.

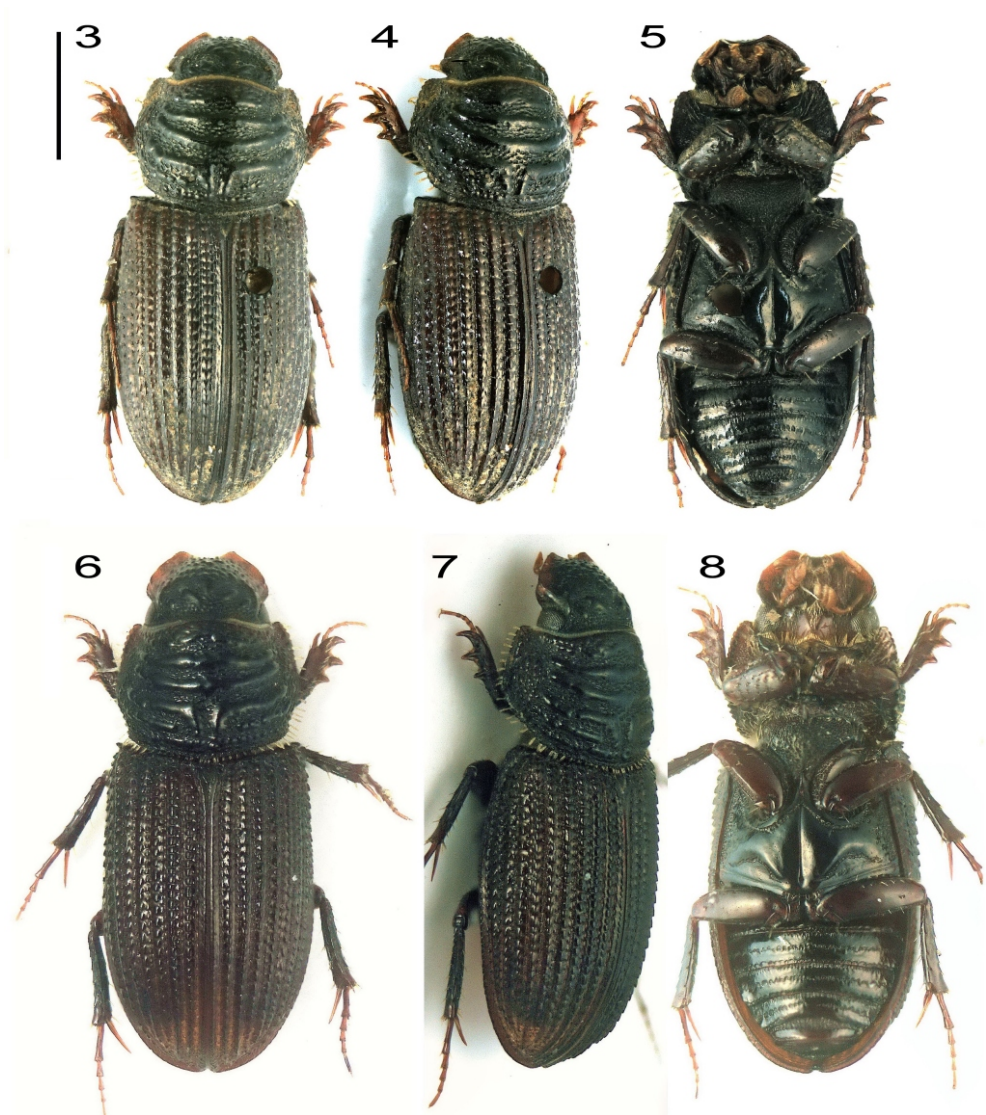
Type locality. "Égypte".

Type material studied. Lectotype, designated by Pittino (1984), a female specimen from MNHN, equipped with labels as shown in Fig. 19.

Additional material studied. **Egypt:** 1 specimen (DKCP): Luxor, vi.1967, coll. K. Hůrka; 1 specimen (MRCD): Luxor. **Kenya:** 2 specimens (LMCT): Kenya bor., Lodwar, 18.-20.xii.1995, lgt. Smrž; 2 specimens (LMCT): Kenya mer., Voi, 23.xi.1997, lgt. M. Snížek. **South Sudan:** 1 specimen (MRCD): Upper Nile State, Malakal, lgt. R. Linnavuori. **Sudan:** 296 specimens (MRCD): Khartoum, ix.-x.1974, light trap, lgt. Dr. V. Seichert; 1 specimen (MRCD): Khartoum 30. iv.-3. v.1961, lgt. R. Linnavuori; 2 specimens (MRCD): Khartoum, Ed Damar, 5.-10.vii.1961, lgt. R. Linnavuori; 1 specimen (MRCD): Khartoum, Sunt Forest 23.vii.1971, ad lucem, lgt. H.J. Bremer; 1 specimen (MRCD): Kassala State, Erkowit, 5.-10.vii.1961, lgt. R. Linnavuori. 1 specimen (MRCD): Atbara, Blue Nile State, 14.iii.1978, sub lapidi, lgt. H. J. Bremer.

Female lectotype redescription. Elongate, subparallel (slightly broader behind: broadest slightly behind elytra midlength, total body length - 3.8 mm, length-to-width ratio of 2.44), shining (Figs. 2, 3)

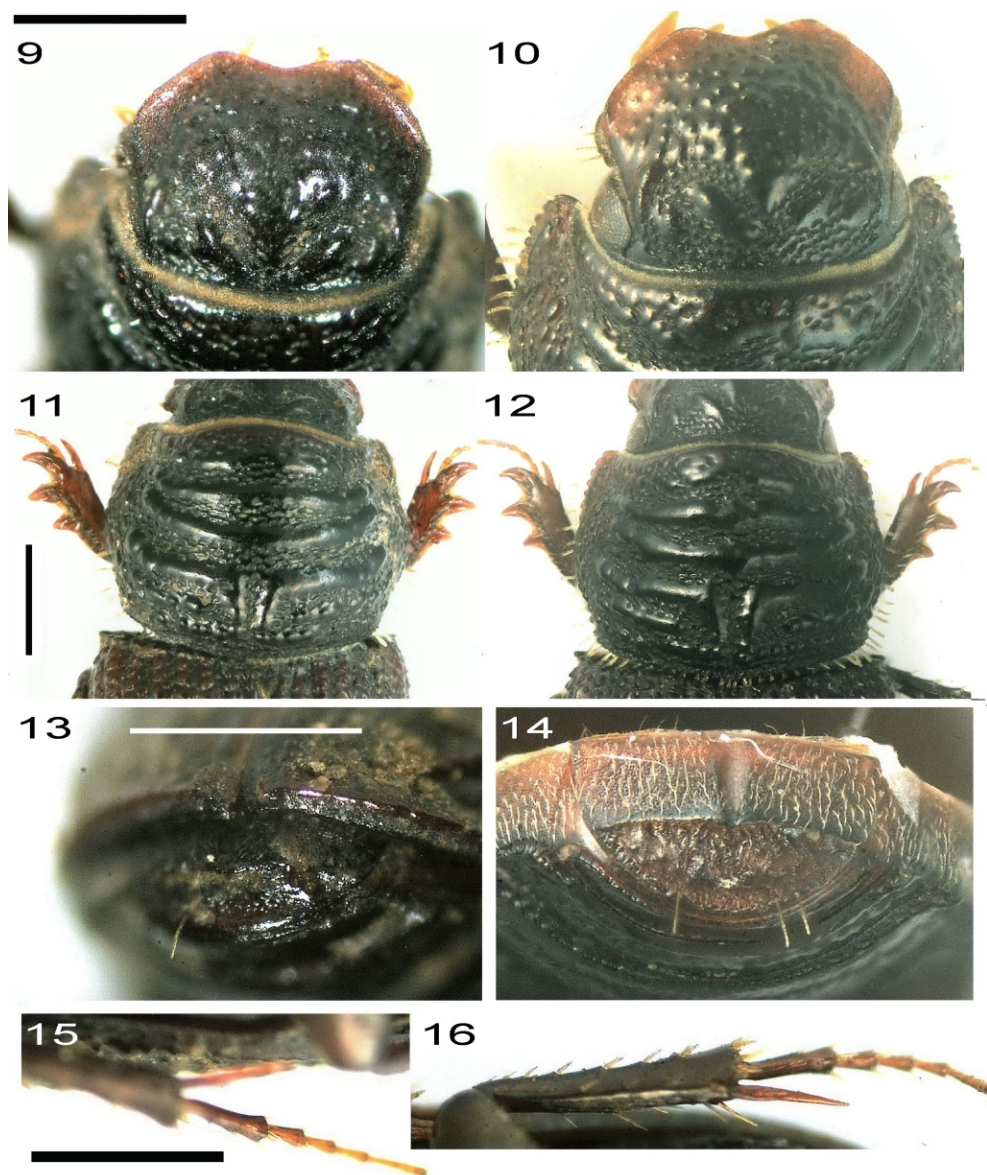
Head (Fig. 9). Clypeus obtusely roundly angulate each side of anteromedian emargination, its sides not sinuate anteriorly - rather straight behind anterior angles, then their short part just before genae arcuate, separated by slight notches from, but essentially aligned with anterior margins of genae protruding more than eyes and bearing few tough, acuminate macrosetae. Clypeus surface with not very dense, low, rather transversal granules; middle protuberance above the granulate clypeus area distinctly elevated, its small posterior part smooth or at most moderately granulate but forward merging into discrete granules. Head vertex with two pairs of



Figs. 3-8. *Rhyssesus mayeti*, habitus: 3- lectotype, ♀, dorsal aspect; 4- lectotype, ♀, dorsolateral aspect; 5- lectotype, ♀, ventral aspect; 6- specimen from Egypt (DKCP), ♂, dorsal aspect; 7- specimen from Egypt (DKCP), ♂, dorsolateral aspect; 8- specimen from Egypt (DKCP), ♂, ventral aspect. Scale line 1 mm. Photographs by L. Mencl.

oblique ridges; ridges of anterior pair larger, convex, having smooth or only slightly uneven (but not granulate) surface, separated by deep, V-shaped furrow from middle protuberance; ridges of posterior pair smaller, but still distinct.

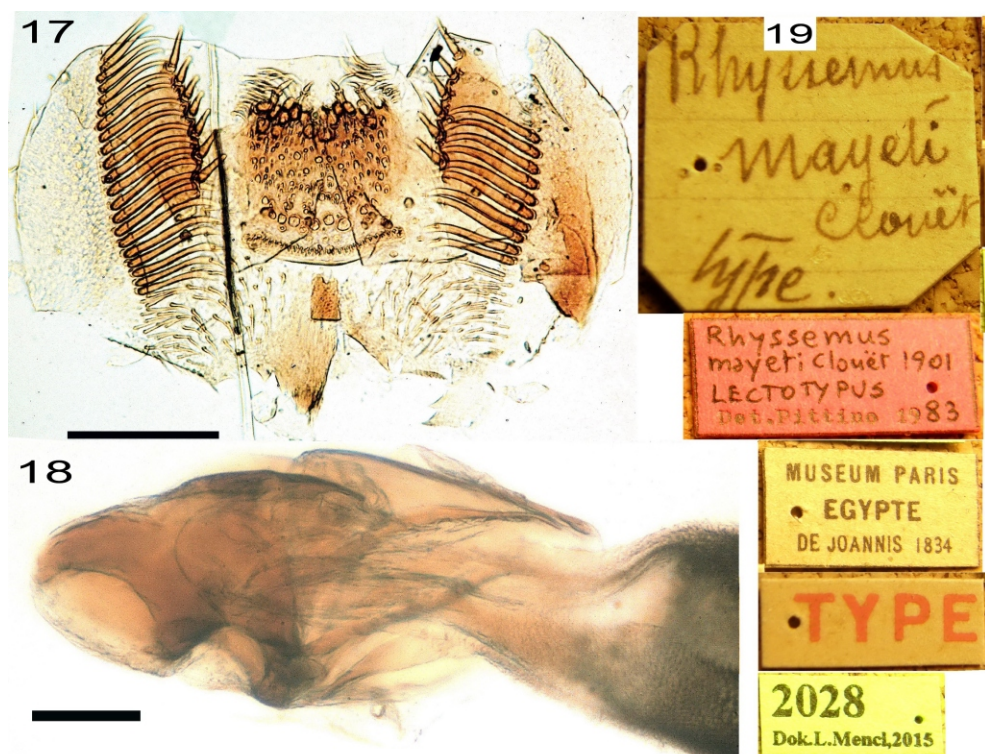
Epipharynx (Fig. 17) transversal, anterior outline very shallowly emarginate, lateral outlines regularly widely rounded; epitorma subquadrate, well sclerotised; helus with group of somewhat irregularly spaced sensilla (including four remarkably large ones medially) and two longitudinal



Figs. 9-16. *Rhysssemus mayeti*, details: 9-lectotype, ♀, head, dorsal view; 10- specimen from Egypt (DKCP), ♂; 11-lectotype, ♀, pronotum, dorsal view; 12- specimen from Egypt (DKCP), ♂, pronotum, dorsal view; 13- lectotype, ♀, pygidium, caudal view; 14- specimen from Egypt (DKCP), ♂, pygidium, caudal view; 15-lectotype, ♀, mesotibia and mesotarsus, dorsal view; 16-lectotype, ♀, metatibia and metatarsus, dorsal view. Scale lines 1 mm. Photographs by L. Mencl.

rows of long microtrichia anteriorly; corypha and zygum absent; phobae weakly sclerotised, glabrous; right chaetoparia with row of 21 long, stout, closely spaced spines (left chaetoparia partially damaged); area of prophobae well sclerotised, bearing longitudinal row of six short, stout, densely spaced spines.

Pronotum (Fig. 11) transversal (its length-to-width ratio of 0.722), widest at middle, arcuately narrowed anteriorly, obliquely straight (at most very slightly sinuate) narrowed toward round posterior angles, lateral margins crenulate, with macrosetae slightly dilated before apex; macrosetae along basal margin similar. Pronotal structure consisting of five transversal ridges, five transversal furrows, posterior longitudinal furrow and accessory swelling present in furrow 4 on each side of the longitudinal furrow arranged as follows: transversal ridges convex, mostly continuous, sparsely microscopically punctate, ridge 1 wide and rather uneven due to presence of sparse coarse punctures throughout, ridges 2-4 smooth (with sparse coarse punctures only quite anteriorly), continuous, accessory swelling granulate, ridge 5 very narrow, consisting of discrete granules; transversal pronotal furrows 1-3 transversally wrinkled; few transversal to round punctures also present in transversal furrow 4 and posterior longitudinal furrow in addition to transversal wrinkles.



Figs. 17-19. *Rhyssemus mayeti*: 17- lectotype, ♀, epipharynx; 18- specimen from Egypt, ♂, lateral view; 19- labels attached to lectotype. Scale lines 0.1 mm. Photographs by L. Mencl.

Elytra (Figs. 3, 4) moderately broader behind (their length-to-width ratio of 1.53), with ten striae and ten intervals; humeral denticles not large, but well distinct, directed sideward. Striae narrow, with indistinct elongate punctures. Granules in discal elytral intervals of shape not easy to recognize under low magnification, arranged in two rows: outside row - elongate large granules, each having a backward directed elevation posteriorly, and inside row - small elongate grains. Elytral intervals narrowing toward apex, thus making elytra subcarinate apically; some even

intervals reduced in length posteriorly (intervals 4 and 6 shorter than interval 5).

Pygidium (Fig. 13) rugosely punctate.

Legs. Superior terminal spurs of meso- and metatibia longer than basal meso- and metatarsomere, respectively. Basal meso- and metatarsomere nearly as long as meso- and metatarsomeres 2-4 combined, respectively Figs. 15, 16.

Ventral surface (Fig. 5) finely alutaceous and thus only moderately shining, mostly glabrous and smooth, but femora with medium-sized (profemora) or fine (meso- and metafemora) macrosetigerous punctures. Metaventral plate with narrow longitudinal furrow, which is complete anteriorly, moderately dilated and reduced posteriorly; area around furrow distinctly concave. Abdominal ventrites 3-5 with quite distinct serrate lines ("zig-zag lines"), ventrite 3 distinctly fluted posteriorly, ventrite 4 distinctly fluted anteriorly as well as posteriorly, ventrite 5 fluted anteriorly, ventrite 6 very strongly, scabrously fluted anteriorly.

A male specimen from Egypt, Luxor (DKCP). Figs. 6-8, 10, 12 and 14 demonstrate no distinct differences, which could be attributed to the sexual dimorphism. The shape of the aedeagus (right lateral view) is shown in Fig. 18.

Variability. A comparison of the lectotype with the specimens mentioned in the preceding paragraph, there is no considerable difference in shapes, structures and sculptures. The body size of specimens studied here ranges between 3.1 and 4.2 mm. Endrödi (1984) and Pittino (1984) reported similar dimensions: 3-4 mm and 3.4-4.3 mm, respectively.

Distribution. Democratic Republic of the Congo, Egypt, Ethiopia, Kenya, South Sudan and Sudan (new to Kenya, South Sudan and Sudan; see also the Discussion below). Only data based on the material studied in the present work and data by Pittino (1984) are considered as reliable and presented here.

DISCUSSION

Rhyssemus mayeti certainly does not belong to those Afrotropical species that are easy to identify, which is also likely to be associated with some erroneous data about its distribution. Pittino (1984) also suggested that "*R. mayeti* does not exist in West Africa ...". Materials of *Rhyssemus* attainable to the present authors are in support of this opinion.

The identification of *R. mayeti* can be particularly based on the clypeus shape, pronotum shape (particularly nearly straight posterior half of pronotum lateral margin), structure of particular pronotal ridges, transversally wrinkled/transversally granulate pronotal furrows and elytral intervals sculpture (shape of granules in elytral intervals); these characters were found to be fairly constant within the lectotype and the additional material studied.

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