

***Rhyssmodes yuanyuanae* sp. nov.
(Coleoptera: Scarabaeidae: Aphodiinae: Psammodiini) from Yunnan, China**

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Abstract. A new species of the genus *Rhyssmodes* Reitter, 1892, *Rhyssmodes yuanyuanae* sp. nov. from Yunnan (China), is described, and compared with the species exerting most similar morphological characters, *R. ningxia* Rakovič, Král & Mencl, 2017. External characters (the habitus and details), the epipharynx and aedeagus are illustrated. The differential diagnosis is summarised in a table.

INTRODUCTION

The genus *Rhyssmodes* Reitter, 1892 currently contains 12 species, which are mainly distributed in dry or semidry areas of the Palearctic region, only *R. orientalis* (Mulsant & Godart, 1875) extends into the Afrotropical region and *R. indicus* Pittino, 1984 into the Oriental region (Rakovič 1982, Rakovič et al. 2016a, Schoolmeesters 2023). Rakovič (1982) published the first modern revision of this genus. Six species of the genus occurring in China and/or Mongolia were reviewed by Rakovič et. al. (2017) as follows: *Rhyssmodes bowieri* Clouët des Pesruches, 1901, *R. malyi* Rakovič, 1982, *R. ningxia*, *R. orientalis*, *R. indicus*, and *R. taklamakan* Rakovič, Král & Mencl, 2017. When examining materials stored in the IZAS collections, the authors of the present work encountered interesting Psammodiini specimens, which belonged to the new *Rhyssmodes* species from Yunnan, China.

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, CMEX 5 digital camera and Helicon Focus programme. Measurements of lengths and widths were carried out with the help of an ocular micrometer. It is to note that the elytra length was taken as a distance between a line connecting anterior margin of humeri (or ends of humeral teeth, if present) and elytral apex.

Verbatim label data are cited for the type material, individual lines of every label are

separated by a vertical bar (“|”), individual labels by a double vertical bar (“||”). Information in quotation marks (“”) indicates the original spelling. Our remarks and additional comments are found in brackets (“[]”), [p] - preceding data within quotation marks are printed.

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

IZAS Institute of Zoology, Chinese Academy of Sciences, Beijing, China (Ming Bai, Yuanyuan Lu);

NMPC National Museum, Praha, Czech Republic (Jiří Hájek).

For the explanation of terms concerning structures and sculptures of Psammodiini used in the present work see for example Rakovič et al. (2016b). For morphological terms used in the description of epipharyngeal structures we follow Dellacasa et al. (2010).

DESCRIPTION

Rhysemodes yuanyuanae sp. nov.

(Figs. 1-25)

Type locality. China, Yunnan Province, Yuanmou County, Laocheng Village, Dayuejiu County, Dajianshan.

Type material. CHINA, YUNNAN, ♂ (IZAS), “B64 | 2005.VII.23 36 || B64 Yunnan Province, Yuanmou County | Laocheng Village, Dayuejiu County [sic!], Dajianshan | *Phyllanthus emblica*—*Dodonaea viscosa* | 2005.VII.23 Li Qiao 36 || 2824 / Dok. L. Mencl, 2021 [pale green printed label, related to the photo-documentation system of the third author] || HOLOTYPUS, ♂ | *Rhysemodes yuanyuanae* sp. nov. | M. Rakovič, D. Král & L. Mencl | det. 2023 [red printed label]”. Paratypes. Allotype, ♀ (IZAS), same labels and data, but number 2825 instead of 2824 on the pale green label, and ALLOTYPUS, ♀ instead of HOLOTYPUS, ♂ on the red label. Paratype, 1 ♂ (NMPC), same white labels and data; same red labels, but the word PARATYPUS instead of HOLOTYPUS (see also Fig. 25).

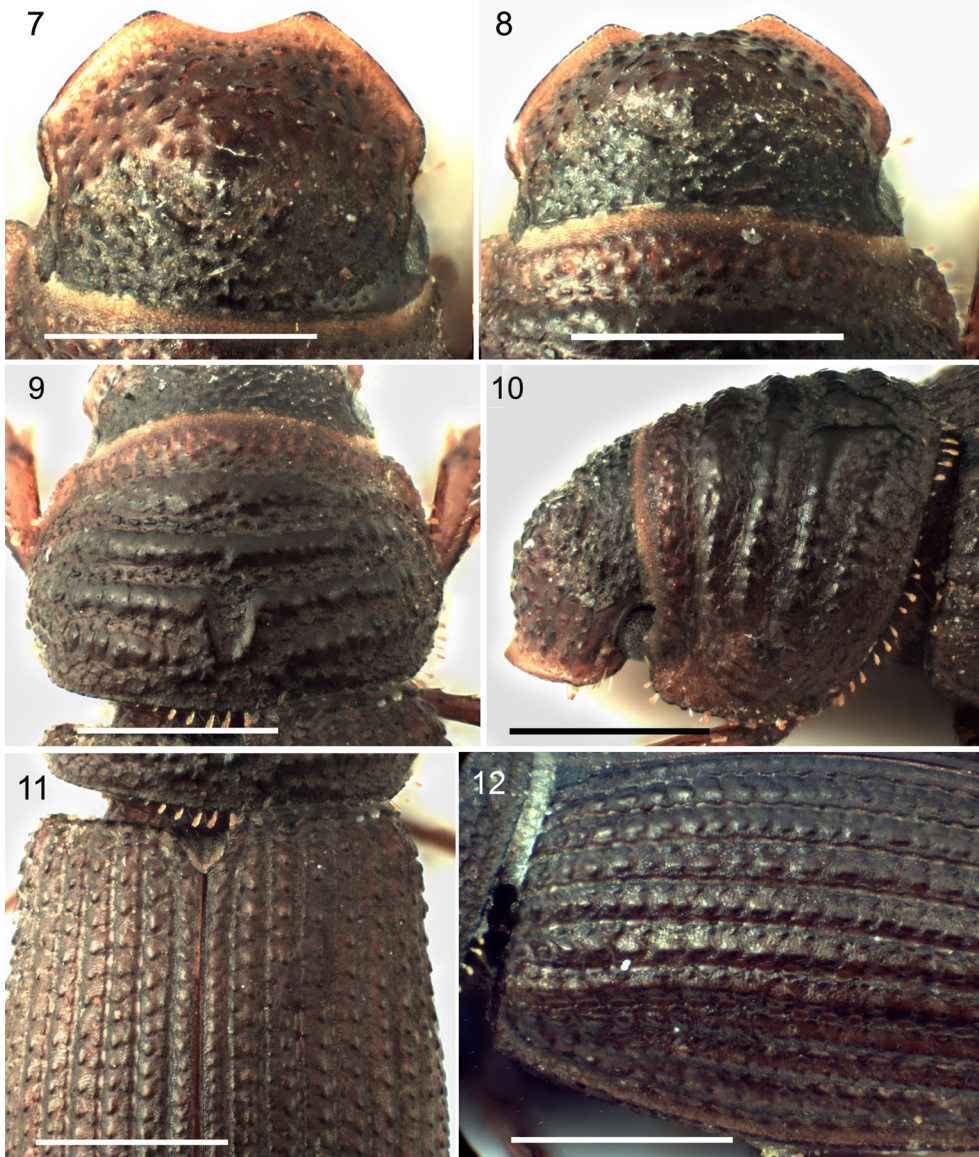
Description of holotype. Oblong oval, convex, broader behind, glabrous, body length of 2.65 mm, shining, dark brown (legs and narrow clypeus margin brown). Length-to-width ratio of 2.35, broadest at about 2/3 elytra length (Fig. 1).

Head (Figs. 7, 8, 13) convex, clypeus dentate each side of anteromedian emargination, its lateral sides moderately sinuate, then arcuate to genae distinctly differentiated from clypeus lateral margin and bearing few short macrosetae. Clypeus surface granulate, granules being moderately transversal, decreasing in size from middle protuberance toward anterior and lateral margins. Head posteriorly (behind middle protuberance) with two pairs of distinct oblique ridges; considerably deep furrows present between middle protuberance and anterior pair of oblique ridges, furrows present between oblique ridges of anterior and posterior pairs as well as those between ridges of anterior pair and ridges of posterior pair granulate.

Epipharynx (Fig. 24). Transversal, anterior outline almost straight, lateral outlines regularly widely rounded; tormae and nesium well sclerotised, approximately symmetrical, apotormae missing; epitorma almost quadrate, weakly sclerotised; helus with group of somewhat irregularly spaced sensilla (including two remarkably large ones medially) and two longitudinal rows of long microtrichia anteriorly; corypha and zygum absent; phobae weakly sclerotised, glabrous; chaetoparia with row of about 18 long, stout, closely spaced spines; area of prophobae well sclerotised, bearing longitudinal row of four short, stout, sparsely spaced spines.

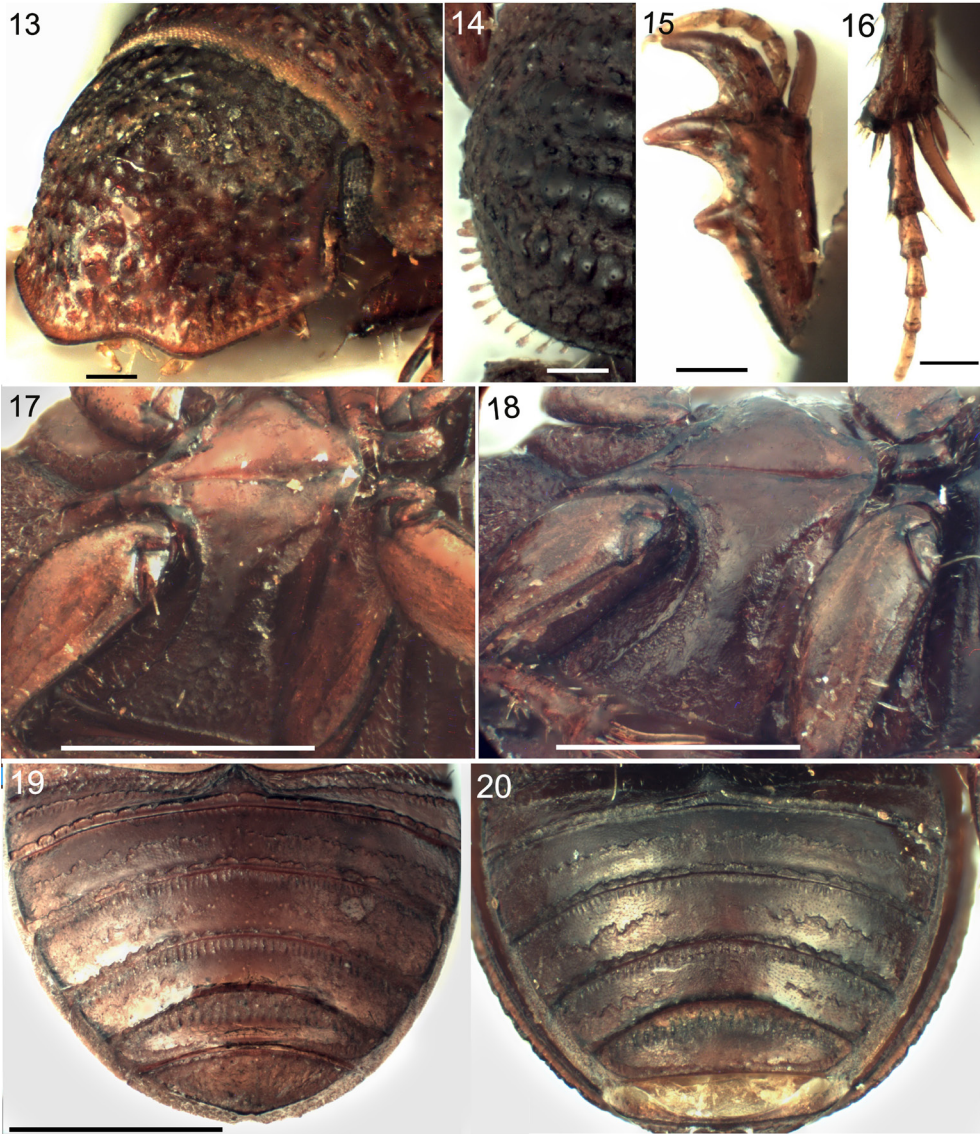


Figs. 1-6. *Rhyssmodes yuanyuanae* sp. nov., habitus. 1-5- holotype (♂); 6- allotype (♀). 1- dorsal view, 2- left dorsolateral view, 3- left lateral view, 4, 6- ventral view, 5- right ventrolateral view. Scale line: 1.0 mm. Photographs by L. Mencl.



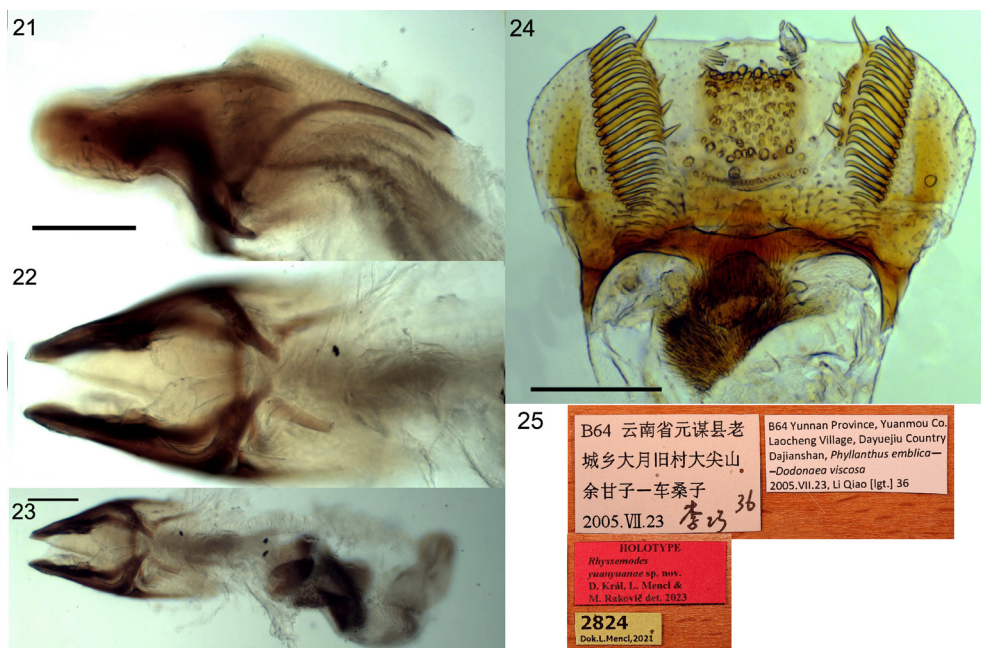
Figs. 7-12. *Rhyssmodes yuanyuanae* sp. nov., details of body parts. 7-11- holotype (♂); 12- allotype (♀). 7- head, dorsofrontal view (looking directly at the head protuberance); 8- head, dorsal view, 9- pronotum, dorsal view; 10- head and pronotum, dorsolateral view; 11- elytra, dorsal view, left elytron, dorsolateral view. Scale lines: 0.5 mm. Photographs by L. Mencl.

Pronotum (Fig. 9) transversal (length-to-width ratio of 0.75), with five transversal ridges, five transversal furrows and posterior longitudinal furrow; ridge 1 widest, broken into discrete round and/or irregularly shaped granules; ridges 2-5 convex; ridge 2 mostly granulate; ridges



Figs. 13-20. *Rhyssmodes yuanyuanae* sp. nov., details of body parts. 13-17, 19- holotype (♂); 18, 20- allotype (♀). 13- head, frontolateral view; 14- lateral setation of pronotum, dorsal view; 15- left protibia and tarsus, dorsal view; 16- distal part of metatibia and tarsus, dorsal view; 17-18- meso-metaventrum, lateroventral view; 19-20- visible abdominal ventrites, ventral view. Scale lines: 0.1 mm for Figs. 13-16, 0.5 mm for Figs. 17-20. Photographs by L. Mencl.

3-4 granulate laterally, moderately uneven but not granulate on disc; ridge 5 granulate even on disc, but still continuous there; last two furrows matt, slightly granulate (Fig. 10), furrows 1-3 narrower than respective ridges. Pronotum lateral margins moderately sinuate posteriorly,



Figs. 21-25. *Rhyssmodes yuanyuanae* sp. nov. 21-23- aedeagus; 24- epipharynx, allotype (♀); 25- etiquettes of holotype. 21- right lateral view, 22-23- ventral view, 24- ventral view. Scale lines: 0.1 mm. Photographs by L. Mencl.

otherwise arcuate, crenulate and bearing macrosetae moderately continuously widening from their base toward their apex (Fig. 14); macrosetae along basal margin similar in shape.

Scutellum small, narrowly ogival (isosceles triangular with moderately arcuate sides and moderately rounded apex).

Elytra relatively wide (Fig. 1) but only quite indistinctly broader behind midlength (lateral sides only slightly arcuate), without humeral denticles, with ten striae and ten intervals. Elytral sculpture as in Figs. 11-12; two rows of granules in each elytral interval considerably distinct, visible in dorsal aspect (Fig. 11) or in dorsolateral aspect (Fig. 12) even under low magnification (about 10×).

Legs (dorsal aspect). Protibiae with three outer teeth in apical half, not denticulate in basal half; apical spur nearly as long as protarsomeres 1 and 2 combined; dorsal face with a longitudinal row of setigerous punctures, otherwise impunctate. Mesotibiae slim, only moderately widening toward apex; superior terminal spur nearly as long as mesotarsomeres 1-3 combined; inferior terminal spur slightly longer than basal mesotarsomere. Metatibiae moderately widening toward apex; superior spur about as long as metatarsomeres 1 and 2 combined; inferior terminal spur about as long as basal metatarsomere.

Ventral surfaces (Figs. 4-6) also dark brown (abdominal ventrites and metaventrum relatively darker than femora), glabrous with exception of few macrosetae arranged in longitudinal row on each meso- and metafemur. Profemora vaguely punctate, meso- and metafemora impunctate except rows of setigerous punctures. Meso-metaventral plate smooth, with anteriorly complete and posteriorly reduced midline furrow. Abdominal ventrites 3-5 smooth

with exception of transverse row of rather vague punctures forming vestigial serrate line (“zig-zag line”) on each of them; ventrite 3 coarsely fluted posteriorly, abdominal ventrites 4 and 5 finely fluted anteriorly, abdominal ventrite 6 widely and deeply impressed and rugosely punctate anteriorly, smooth posteriorly.

Aedeagus as in Figs. 21-23.

Sexual dimorphism. The metaventral midline furrow is moderately widened anteriorly and posteriorly in males (Fig. 17), non-widened in females (Fig. 18).

Variability. In the series studied (three specimens), the body length varies from 2.6 to 2.7 mm. Transversal ridge 5 of the pronotum can sometimes be less developed, but there are actually no important differences in the structures and sculptures of the head, pronotum or elytra.

Differential diagnosis. The new species is classified within the subtribe Rhysemina in the genus *Rhysemodes* mainly by possessing the following set of synapomorphies: body oblong oval, subparallel; dorsal surface glabrous; pronotal structure complete, formed by five transverse ridges, each side of posterior longitudinal furrow; absence of the accessory swelling between pronotal ridges 4 and 5; elytral intervals either granulate or transversally wrinkled; metatarsomeres distinctly, though moderately, widened apically, basal metatarsomere length to basal metatarsomere width being under 2.60 (usually between 1.93 and 2.60); basal metatarsomere wider than basal mesotarsomere apically (see Rakovič & Král (1997) and Rakovič et al. (2017), for details). The key presented by Rakovič et al. (2017: 484) leads the present new species to the same branch as *R. ningxia*. For the differentiation from this species see the complex of diagnostic characters in Table 1.

Table 1. Character matrix for separation of *Rhysemodes ningxia* Rakovič, Král & Mencl, 2018, from *R. yuanyuanae* sp. nov.

character	<i>R. ningxia</i> Rakovič, Král & Mencl, 2017	<i>R. yuanyuanae</i> sp. nov
colour and gloss of dorsal surface	dark brown, shiny (see Rakovič et al. 2017, figs. 6)	light brown, less shiny (Fig. 3)
gloss and sculpture of pronotal transverse furrows	shiny, last three furrows as a rule distinctly roundly punctate (see Rakovič et al. 2017, fig. 39)	entirely matt, at least last two furrows as a rule slightly granulate (Figs. 9-10)
granulation of elytral intervals	less pronounced (see Rakovič et al. 2017, figs. 6, 18, 45)	more pronounced (Figs. 11-12)
body length	2.80-2.85 mm	2.65-2.70 mm
distribution	Ningxia	Yunnan

Collection circumstances. The material of the new species was collected in a stand of plants of *Dodonea viscosa* Jacq. and *Phyllanthus emblica* L.

Name derivation. Patronymic; the new species is named in honor of our colleague Yuanyuan Lu, an expert in the subfamily Rutelinae.

Distribution. China, Yunnan.

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REFERENCES

- DELLACASA G., DELLACASA M. & MANN D. J. 2010: The morphology of the labrum (epipharynx, ikrioma and aboral surface) of adult Aphodiini (Coleoptera: Scarabaeidae: Aphodiinae), and its implications for systematics. *Insecta Mundi* 132: 1-21.
- RAKOVIČ M. 1982: A revision of the genus *Rhyssmodes* Reitter (Coleoptera, Scarabaeidae, Aphodiinae). *Annotationes Zoologicae et Botanicae* 147: 1-20.
- RAKOVIČ M. & KRÁL D. 1997: New taxa, new combinations and current taxonomic status of tribes and genera of Psammodiinae (Coleoptera: Scarabaeoidea: Aphodiidae). *Acta Societatis Zoologicae Bohemicae* 61: 233-247.
- RAKOVIČ M., KRÁL D. & BEZDĚK A. 2016a: Tribe Psammodiini. Pp. 158-165. In: LÖBL I. & LÖBL D. (eds.): *Catalogue of Palaearctic Coleoptera Vol. 3, Revised and Updated Edition. Scarabaeoidea - Scirtoidea - Dasciloidea - Buprestoidea - Byrrhoidea*. Leiden: E. J. Brill, 983 pp.
- RAKOVIČ M., KRÁL D. & MENCL L. 2016b: Studies on types in the genus *Rhyssmus*. 1. General considerations and *R. mayeti* Clouët des Pesruches, 1901 (Coleoptera: Scarabaeidae: Aphodiinae: Psammodiini). *Folia Heyrovskyana, Series A* 24(1): 86-94.
- RAKOVIČ M., KRÁL D. & MENCL L. 2017: A review of *Rhyssmodes* species from China and Mongolia (Coleoptera: Scarabaeidae: Aphodiinae: Psammodiini). *Studies and Reports, Taxonomical Series* 13(2): 455-473.
- SCHOOLMEESTERS P. 2023: World Scarabaeidae Database. In: BÁNKI O., ROSKOV Y., DÖRING M., OWER G., VANDEPITTE L., HOBERN D., REMSEN D., SCHALK P., DEWALT R. E., KEPING M., MILLER J., ORRELL T., AALBU R., ABBOTT J., ADLARD R., ADRIAENSSENS E. M., AEDO C., AESCHT E. & AKKARI N. (eds.): *Catalogue of Life Checklist* (Version 2023-05-15). <https://doi.org/10.48580/dfrq-38g>

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