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A review of *Rhyssemodes* species from China and Mongolia (Coleoptera: Scarabaeidae: Aphodiinae: Psammodiini)

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Abstract. Six species of the genus *Rhyssemodes* Reitter, 1892 occurring in China and/or Mongolia are reviewed and keyed as follows: *Rhyssemodes bouvieri* Clouët des Pesruches, 1901, *Rhyssemodes malyi* Rakovič, 1982, *Rhyssemodes ningxia* sp. nov. from China, the Ningxia Hui Autonomous Region, *Rhyssemodes orientalis* (Mulsant et Godart, 1875), *Rhyssemodes sindicus* Pittino, 1984, and *Rhyssemodes taklamakan* sp. nov. from China, the Taklamakan Desert. The two new species are described and illustrated. Identification key to currently known Chinese *Rhyssemodes* species and new photographs of the four previously described species are also provided.

INTRODUCTION

When examining materials from IRSB, IZAS and ZFMK the authors of the present work encountered interesting specimens of the genus *Rhyssemodes* Reitter, 1892 including those, which belonged to two new species from China. The members of the genus are known from the Palaearctic Region. In addition, the species *Rhyssemodes sindicus* Pittino 1984 is also found throughout the Oriental Region and *Rhyssemodes orientalis* (Mulsant et Godart, 1875) also penetrates into some northern areas of the Afrotropical Region (e.g. Rakovič 1982). Ten species of the genus are listed in the updated Catalogue of Palaearctic Coleoptera (Rakovič et al. 2016a). Four of them, *Rhyssemodes bouvieri* Clouët des Pesruches, 1901; *Rhyssemodes malyi* Rakovič, 1982; *Rhyssemodes orientalis*, and *Rhyssemodes sindicus*, occur in the area considered here (China and/or Mongolia); further two Chinese species are described and illustrated below.

All the six species are keyed, and new distributional data are presented. Detailed photos of previously described species are also provided.

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.

The specimens as mentioned in the section Taxonomy below were examined. Each specimen is equipped with printed labels as mentioned below; the pale green label (if present) specifies a number related to a photo-documentation system by the third author. Individual lines of every label are separated by a slash (/); individual labels are separated by a double slash (//).

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) considering the presence of five transversal ridges, five transversal furrows and an accessory swelling (which can be either present or absent), situated in transversal furrow 4 on each side of the posterior longitudinal furrow (i.e. between transversal ridges 4 and 5). The reasons for this are detailed and explained with the help of a generalized schematic drawing in our quite recent work (Rakovič et al. 2016b).

For morphological terms used in the description of epipharyngeal structures we follow Dellacasa et al. (2001).

In the two most common and widely distributed *Rhyssemodes* species, *Rhyssemodes orientalis* and *Rhyssemodes sindicus*, the synonyms are not presented here, since they were exhaustively discussed formerly by Pitino (1984a, b).

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

DKCP David Král collection, deposited in NMPC;
IRSB Institut Royal des Sciences naturelles de Belgique, Bruxelles, Belgium (Alain Drumont);
IZAS Institute of Zoology, Chinese Academy of Sciences, Beijing, China (Ming Bai, Lu Yuanyuan);
LMCT Ladislav Mencl, private collection, Týnec nad Labem, Czech Republic;
MNHN Muséum National d'Histoire naturelle, Paris, France (Antoine Mantilleri);
MRCD Miloslav Rakovič, private collection, Dobřichovice, Czech Republic;
NMPC National Museum, Praha, Czech Republic (Jiří Hájek);
VMCP Vladislav Malý, private collection, Praha, Czech Republic;
ZFMK Zoologisches Forschungsmuseum Alexander Koenig, Bonn, Germany (Dirk Ahrens).

TAXONOMY

Genus Rhyssemodes Reitter, 1892

Rhyssemodes Reitter, 1892: 156.
Rhyssemodes: Clouët des Pesruches 1901: 16 (revision); Schmidt, 1922: 493 (monograph); Balthasar 1964 (monograph): Rakovič 1982: 1 (revision); Pittino 1984a (refinement of diagnosis); Dellacasa 1987: 421 (catalogue); Rakovič et al. 2016a: 162 (catalogue).

Type species. *Rhyssemodes tenuisculptus* Reitter, 1982: 162 (subsequent designation by Balthasar 1964: 544).

The genus *Rhyssemodes* is not easy to differentiate from *Rhyssemus* Mulsant, 1842. Formerly adopted differences (Reitter 1892, Clouët des Pesruches 1901, Schmidt 1922, Balthasar 1964, Rakovič 1982), based particularly on the width of metatarsomeres, length of metatarsi and length of metatibia terminal spines do not apply to all the species, but Pittino (1984b) analysed these characters, and based on accurate measurements, established the following dichotomy:

Rhyssemodes: Metatarsomeres distinctly, though moderately, widened apically, basal metatarsomere length to basal metatarsomere width being under 2.6 (usually between 1.93 and 2.6); basal metatarsomere apically wider than basal mesotarsite.

Rhyssemus: Metatarsomeres subcylindrical, slightly widened apically, basal metatarsomere length to basal metatarsomere width being under over 2.6 (usually between 2.64 and 4.2); basal metatarsomere of about the same length and width as basal mesotarsite.

In support of the existence of the two separate genera, we would like to suggest that there is a further feature, which concerns the posterior pronotal structure. This concept is explained below in Discussion

Rhyssemodes bouvieri Clouët des Pesruches, 1901
(Figs. 3, 9, 15, 21, 28, 36, 42, 48, 60, 66)

Rhyssemodes bouvieri Clouët des Pesruches, 1901: 22.

Type locality. "Tien Tsin, Nord Pékin".

Type material examined. See Fig. 66 for data on labels situated under the lectotype.

Supplementary redescription based on the lectotype. Total body length: 3.2 mm. Oblong oval, moderately broader behind, broadest behind elytra midlength (Fig. 3), moderately shining, forebody brown, darker than reddish brown elytra (Fig. 3).

Head considerably convex, brown, clypeus anterior and lateral margins lighter, reddish brown. Clypeus (Fig. 21) with upward lifted tooth each side of anteromedian emargination, its lateral margins first moderately emarginate and then moderately arcuate, not quite aligned with anterior margins of genae; genae obtusely angulate, protruding more than eyes, each gena with about five acuminate macrosetae. Head surface evenly, but not very densely covered with distinct transverse granules. Middle protuberance small, consisting of

few larger, longitudinal granules, not differentiated from remaining part of head anteriorly and laterally, but separated by distinct furrow from pair of narrow, distinct oblique ridges posteriorly. Posterior areas (between oblique ridges and eyes) transversally granulate.

Pronotum (Fig. 36) transversal (its length-to-width ratio of 0.61 - width measured in dorsal view, including lateral calli exceeding pronotum circumference at middle), widest behind middle, considerably narrowing toward anterior as well as posterior corners. Lateral margins distinctly crenulate, macrosetaceous (macrosetae rather truncate than acuminate, particularly in posterior half of pronotum (Fig. 48). Macrosetae along pronotum base dilated apically (Fig. 36). Pronotal structure consisting of five transversal ridges, five transversal furrows and posterior longitudinal furrow. Transversal ridge 1 flat, consisting of discrete tubercles, ridges 2-5 partially irregularly tuberculate, but more convex and not broken into discrete tubercles. Transversal furrow 1 narrow, but still distinct, widths of furrows 2-5 comparable to those of respective ridges; furrows 2-5 roughly, slightly transversally punctate.

Scutellum small, triangular, longer than wide, with moderately rounded apex, moderately alutaceous, darker than elytra, with slight longitudinal impression.

Elytra (Fig. 3) broader behind, broadest behind middle (their length-to-width ratio of 1.44), with ten striae and ten intervals; humeral denticles small. Lateral margins arcuate throughout (from humeri to elytral apex). In dorsal view, elytral intervals seemingly only transversally cut under low magnification (about 20x), but higher magnification reveals quadrangular transversal (wider than long) segments, each of them having larger outside hornlike, obliquely (sideward and backward) directed elevation and smaller inside elevation. Striae narrow, without distinct punctures.

Tarsi lacking in the lectotype specimen.

Ventral surfaces as in Fig. 9. Metaventrum moderately darker than femora, and abdominal ventrites, glabrous with exception of few macrosetae arranged in longitudinal row on each femur. Metaventral plate with anteriorly as well as posteriorly moderately dilated, anteriorly complete and posteriorly moderately reduced midline furrow. Abdominal ventrite 3 smooth with distinct transversal serrate line ("zig-zag line") Fig. 28; ventrite 3 widely fluted posteriorly, ventrites 4 and 5 narrowly fluted anteriorly, ventrite 6 widely and deeply impressed and rugose anteriorly, smooth posteriorly.

Notes. Reliable data on the occurrence in China are only those presented in the original description by Clouët des Pesruches (1901). From Mongolia, the species was reported by Medvedev (1976).

The species can be differentiated from other species occurring in China and/or Mongolia based on the Key to species presented below. Rounded angle each side of the anteromedian clypeus emargination (Fig. 21) is characteristic of *Rhyssemodes bouvieri* compared to dentate angles present in all the other species discussed here (Figs. 19, 20 and 22-24).

Distribution. China ("Tientsin [= Tianjin Province], Nord Pékin [probably north of Beijing]" - type locality); Mongolia ("S. Gobi Aimak, Bayankhongor Aimak") (Medvedev 1976).

Rhyssemodes malyi Rakovič, 1982
(Figs. 1, 7, 13, 19, 25, 34, 40, 46, 58, 64, 65)

Rhyssemodes malyi Rakovič, 1982: 10.

Type locality. "Mongolia, Ulan Batar [nowadays Ulaanbaatar]".

Type material examined. Female holotype (VMCP) and female paratype (MRCD) equipped with labels as shown in Figs. 64 and 65, respectively.

Notes. The photographic documentation of the species is first presented here as follows: dorsal aspect (Fig. 1) ventral aspect (Fig. 7) and details (Figs. 13, 19, 25, 34, 40, 46 and 58). Among the species considered in the present work, strongly dilated macrosetae on lateral margins of the pronotum are the most peculiar character (compare Fig. 46 with Figs. 47-51). Elytral intervals are strongly shagreened (compare Fig. 40 with Figs. 41-45).

Rhyssemodes ningxia sp. nov.
(Figs. 6, 12, 18, 24, 32, 39, 45, 57, 63)

Type locality. China, Ningxia Hui Autonomous Region, About 15 km W of Yinchuan, 30°31'24.3''N 106°03'47.4''E, 1234 m a.s.l.

Type material. CHINA, Ningxia: Holotype, ♂ (ZFMK), "CHINA (Ningxia Aut. Reg.) / ca 15 km W Yinchuan 1234 m / 30°31'24.3''N, 106°03'47.4''E / (waste-water tube, / flood debris sifted / 19. vi. 2011 D. W. Wrase [20] [white printed label] // ZFMK - / Ankauf Wrase via / Schülke, 2013 [white printed label] // 2285 / Dok. L. Mencl, 2016 [pale green printed label, related to the photo-documentation system of the third author] // HOLOTYPUS, ♂ / *Rhyssemodes ningxia* sp. nov. / M. Rakovič, D. Král & L. Mencl / det. 2017" [red printed label]". Allotype, ♀ (ZFMK), same labels and data, but number 2286 instead of 2285 on the pale green label, and ALLOTYPUS, ♀ instead of HOLOTYPUS, ♂ on the red label. Paratypes, 3 specimens (DKCP, LMCT, ZFMK), same white labels and data; same red labels, but the word PARATYPUS instead of HOLOTYPUS, ♂.

Description of holotype. Oblong oval, convex, broader behind, glabrous, body length of 3.3 mm, shining, dark brown (legs and narrow clypeus margin brown). Length-to-width ratio of 2.34, broadest at about 2/3 elytra length (Fig. 6).

Head (Fig. 24) 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. Posteriorly (behind middle protuberance) head 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. 63). 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 20 long, stout, closely spaced spines; area of prophobae well sclerotised, bearing longitudinal row of four short, stout, sparsely spaced spines.

Pronotum (Fig. 39) transversal (length-to-width ratio of 0.76), 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 3-4 granulate laterally, moderately uneven but not granulate on disc; ridge 5 granulate even on disc, but still continuous there; furrows sculptured as shown in Fig. 39, furrows 1-3 narrower than respective ridges. Pronotum lateral margins moderately sinuate posteriorly, otherwise arcuate, crenulate and bearing macrosetae moderately continuously widening from their base toward their apex (Fig. 51); 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. 6) 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 Fig. 45; two rows of granules in each elytral interval considerably distinct, visible in dorsal aspect (Fig. 6) or in dorsolateral aspect (Fig. 18) even under low magnification (about 10x).

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 (Fig. 12) 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. 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, ventrites 4 and 5 finely fluted anteriorly, ventrite 6 widely and deeply impressed and rugosely punctate anteriorly, smooth posteriorly.

Aedeagus as in Figs. 56 and 57.

Sexual dimorphism. The metaventral midline furrow is moderately widened anteriorly and posteriorly in males (Fig. 32), non-widened in females (Fig. 33).

Variability. In the series studied (five specimens), the body length varies from 2.28 to 2.34 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.

Collection circumstances. Sifting debris flooded from a waste-water tube.

Distribution. China (Ningxia Hui Autonomous Region).

Name derivation. Toponymic, noun in apposition, based on the name of an autonomous region in China.

Differential diagnosis. The considerable granulation of elytral intervals, as mentioned in the Key to species below, is a peculiar character of the *Rhyssemodes ningxia* sp. nov. (compare Fig. 45 with Figs. 40-44).

Rhyssemodes orientalis (Mulsant et Godart, 1875)

(Figs. 4, 10, 16, 22, 29, 30, 37, 43, 54, 55, 61)

Rhyssemus orientalis Mulsant et Godart, 1875: 411.
Rhyssemodes orientalis: Clouët des Pesruches, 1901: 23 (new combination, monograph).
For synonyms see Pittino (1984b).

Type locality. "Lebanon, Beirut".

Additional material from China. CHINA, Qinghai: 16 specimens (DKCP), 6.6 km NW of Golmud, 36°26.7'N 94°51.2'E, 2805 m, D. Král, J. Hájek & J. Růžička lgt.; Xinjiang: 1 specimen (DKCP), 2 specimens (IZAS), Hetian, 6.iv.1959, light trap; 1 specimen (IZAS), Moyu Sian, 1240 m,16.v.1960, Li Changfa lgt.; 5 specimens (IZAS), Hami, 11.vii.1980; 14 and 97 specimens (MRCD and IRSB, respectively), W. Taklimakan desert, Yarkan He riv. Valley, 39°21.953'N 78°11.639'E, 1140 m, tugay forest, 9.-12.vi.2013, Floriani lgt.

Notes. From China, the species was mentioned by Nikolajev (1987) without further data. We have seen specimens from Qinghai and Xinjiang, but when taking into account the wide distribution of the species in the Palaearctic Region, it can also be reasonably expected in other areas of the country. From Mongolia (S. Gobi Aimak, Bayankhongor Aimak), it was reported by Nikolajev & Puntsagdulam (1984) with references to Medvedev (1972, 1976).

The species can be differentiated from other species occurring in China and/or Mongolia based on the key presented below. The most characteristic feature is given by the fact that not only transversal pronotal ridge 1, but also pronotal ridge 2 is broken into discrete tubercles, ridge 2 being widened at middle; due to this, transversal furrow 1 is distinct laterally and indistinct or absent about middle, ridges 1 and 2 being confluent about middle and separated from each other laterally. This arrangement of pronotal ridges 1 and 2 is also found in the species *Rhyssemodes taklamakan* sp. nov., which can, however, be distinctively differentiated by its posterior structural elements (ridges 3-5 strongly granulate or even broken into discrete tubercles) - see couplets 8 (9) and 9 (8) in the present Key.

It is to remind that in the excellent classic monograph by Clouët des Pesruches (1901), there are drawings representing different forms of the species *Rhyssemodes orientalis*: a drawing of the "forme d'Afrique et d'Asie" (which is broader behind) and two drawings of the "forme des regions du Turkestan et Caucasus" (which is rather subparallel); in agreement with this observation, we have seen hundreds of specimens from North and Northeast Africa, which were really broader behind (the first form); the specimens from China studied here are rather subparallel (Fig. 4), similar to the Clouët des Pesruches's drawings of the second form. For appropriate illustrations of the species see photos of the habitus (Figs. 4, 10 and 16) and details (Figs. 22, 29, 30, 37, 43, 49, 54, 55 and 61).

Distribution. Widely distributed in Europe (Azerbaijan, Armenia, Spain), N. Africa (Algeria, the Canary Islands, Egypt, Libya, Morocco, Tunisia), Asia (Afghanistan, China, Iran, Israel, Kazakhstan, Lebanon, Mongolia, Saudi Arabia, Sinai, Tajikistan, Turkmenistan, Turkey, Uzbekistan, Yemen), and some northern areas of the Afrotropical Region (Mauritania, Ethiopia, Sudan) (see e.g. Rakovič 1982, Rakovič et al. 2016a).

Rhyssemodes sindicus Pittino, 1984
(Figs. 2, 8, 14, 20, 26, 27, 35, 41, 52, 53, 59)

Rhyssemodes sindicus Pittino, 1984a: 22.
For synonyms see Pittino (1984a).

Type locality. "Dhanjuri vill., Bengal [currently in the state of Jharkhand], India".

Type material examined. PAKISTAN, Swat: Paratype, ♀ (MRCD), "NW – PAKISTAN, Prov. Swat / 21°90'L/35°90'B / Madyan, 1400 m am Licht / 19. vi.-4.vii. 1971 / leg. C. Holzschuh [white printed label] // Rhyssemodes / sindicus n. sp. / Det. R. Pittino 84 [red handwriten label] // PARATYPUS [red printed label] // 2280 / Dok. L. Mencl, 2016 [pale green printed label, related to the photo-documentation system of the third author]".

Additional material from China: CHINA, Yunnan: 4 specimens (MRCD), Yongkou, 6.-11.vii.2010, J. Kučera lgt.

Notes. The occurrence in China, as mentioned in the next paragraph and in the Key below, is based on the present data and on those quoted by Pittino (1984a), and is in agreement with information summarized in the Catalogue by Rakovič et al. (2016a) and in supplementary contributions to the Catalogue by Rakovič & Král (2015).

The species can be differentiated from other species of the area studied here based on the Key below. The dorsal habitus (Fig. 2) is also characteristic of the species.

Distribution. Palaearctic Region: China (Beijing, Henan, Taiwan, Yunnan), North India (Uttarakhand), Iran, Nepal, Pakistan; throughout the Oriental Region (see e.g. Pittino 1984a, Rakovič & Král 2015, Rakovič et al. 2016a).

Rhyssemodes taklamakan sp. nov.
(Figs. 5, 11, 17, 23, 31, 38, 44, 56, 62)

Type locality. China, Xinjiang Uyghur Autonomous Region, Terambazar, W. Taklamakan desert (1200 m a.s.l.).

Type material. CHINA, Xinjiang: Holotype, ♀ (IRSB), "Coll. I.R.Sc.N.B. / CHINA : Xinjiang, SW / from Kashi, 1200 m / W. Taklimaklan desert, / Terambazar 2. X. 2013, N39°10.564'-E077°04.039'/ Leg. Floriani, I.G.:32.693 [white printed label] // 2284 / Dok. L. Mencl, 2016 [pale green printed label, related to the photo-documentation system of the third author] // HOLOTYPUS, ♀ / *Rhyssemodes taklamakan* sp. nov. / M. Rakovič, D. Král & L. Mencl / det. 2017 [red printed label]".

Description of holotype. Oblong oval, convex, moderately broader behind, glabrous, body length of 3.5 mm, shining, brown (forebody slightly darker than elytra). Length-to-width ratio of 2.72, broadest at about 2/3 elytra length (Fig. 5).

Head (Fig. 23) convex, clypeus dentate each side of anteromedian emargination, its lateral

sides first moderately sinuate, then arcuate to genae moderately differentiated from clypeus lateral margin and bearing few truncate (neither acuminate nor clavate) macrosetae. Clypeus surface granulate, granules being transversal, decreasing in size from middle protuberance toward anterior margin, tending to semicircular concentric arrangement anteriorly (in front of middle protuberance). Middle protuberance not considerably elevated, consisting of larger granules of variable shapes. Head with two pairs of relatively indistinct oblique ridges posteriorly (rather lost on the background of considerably granulate sculpture present throughout whole area behind middle protuberance).

Epipharynx (Fig. 62). 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.

Pronotum (Fig. 38) transversal (length-to-width ratio of 0.721), with five transversal ridges, five transversal furrows and posterior longitudinal furrow; ridges 1 and 2 widest, broken into discrete round granules, separated from each other only laterally, their middle parts fused together; ridges 3-5 markedly granulate (granules of each ridge arranged in one row); furrows filled with small grains. Pronotum lateral margins sinuate posteriorly, otherwise arcuate, crenulate and bearing tough, truncate macrosetae (Fig. 50); macrosetae along basal margin similar in shape.

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

Elytra (Fig. 5) widest at short distance behind midlength (lateral sides moderately arcuate), without humeral denticles, with ten striae and ten intervals. Elytral sculpture as in Fig. 44; two rows of granules in each elytral interval visible under rather high magnification only (above 30x).

Legs (dorsal aspect). Protibiae with three outer teeth in apical half, not denticulate in basal half, but having outer edge moderately uneven there; apical spur as long as protarsomeres 1 and 2 combined; dorsal face with a longitudinal row of setigerous punctures, otherwise impunctate. Mesotibiae slim, terminal spurs sharp, superior terminal spur reaching about middle of mesotarsomere 2, inferior terminal spur reaching about middle of basal mesotarsomere. Metatibiae moderately widening toward apex; terminal spurs rather spatulate, superior terminal spur reaching about middle of metatarsomere 2, inferior terminal spur reaching less than middle of basal mesotarsomere.

Ventral surfaces (Fig. 11) also brown (abdominal ventrites and metaventrum relatively darker than femora), smooth and glabrous with exception of few macrosetigerous punctures. Metaventral plate smooth, with narrow, complete midline furrow. Abdominal ventrites without transversal serrate lines ("zig-zag lines"); ventrite 3 coarsely fluted posteriorly, ventrites 4-6 finely fluted anteriorly, ventrite 6 moderately impressed anteriorly.

Sexual dimorphism. Not applicable, only female holotype is available.

Variability. Not applicable.

Collection circumstances. At altitude above the sea level of 1200 m, otherwise unknown.

Distribution. China (Xinjiang Uyghur Autonomous Region, Taklamakan Desert).

Name derivation. Toponymic, noun in apposition, the type specimen was found in the Taklamakan Desert.

Differential diagnosis. The anterior pronotal structure (ridges 1 and 2) is similar to that of *Rhyssemodes orientalis,* but the posterior pronotal structure is markedly different: non-granulate ridges 3-5 on the pronotum disc in *Rhyssemodes orientalis* (Fig. 37) and considerably granulate ridges 3-5 on the pronotal disc in *Rhyssemodes taklamakan* sp. nov. (Fig. 38). The shapes of elytra are also quite different in the two species (compare Figs. 4 and 5).

KEY TO CHINESE AND MONGOLIAN *RHYSSEMODES* SPECIES

1(10) Elytral intervals seemingly only transversally cut under low magnification; elevations/granules recognizable in dorsal view under higher magnification only (30x or above) (Figs. 40-44).

2 (7) Transversal pronotal ridge 2 not widened at middle; transversal furrow 1 (separating ridge 1 from ridge 2) is thus quite distinct not only laterally, but also at the middle.

3 (4) Dorsal surfaces strongly shagreened, quite matte. Punctures in pronotal furrows with very large, round (particularly in posterior furrows) or at most slightly transversal punctures (Fig. 34). Lateral margins of pronotum with strongly clavate macrosetae (Fig.46). Reddish brown. 3.6 mm. Mongolia (Ulaanbaatar). .... *Rhyssemodes malyi* Rakovič

4 (3) Dorsal surfaces more or less shining. Punctures in pronotal furrows with medium-sized, quite transversal punctures or wrinkles (Figs. 35, 36). Lateral margins of pronotum with slightly clavate or truncate macrosetae (Figs. 47, 48).

5(6) Dorsal surfaces strongly shining. Clypeus dentate each side of anteromedian emargination (Fig. 20). Posterior angles of pronotum not sinuate. Dark brown to black (seldom reddish brown) 2.4-3.6 mm. Palaearctic Region: China (Beijing, Henan, Taiwan, Yunnan), North India (Uttarakhand), Iran, Nepal, Pakistan; throughout Oriental Region. ..... *Rhyssemodes sindicus* Pittino

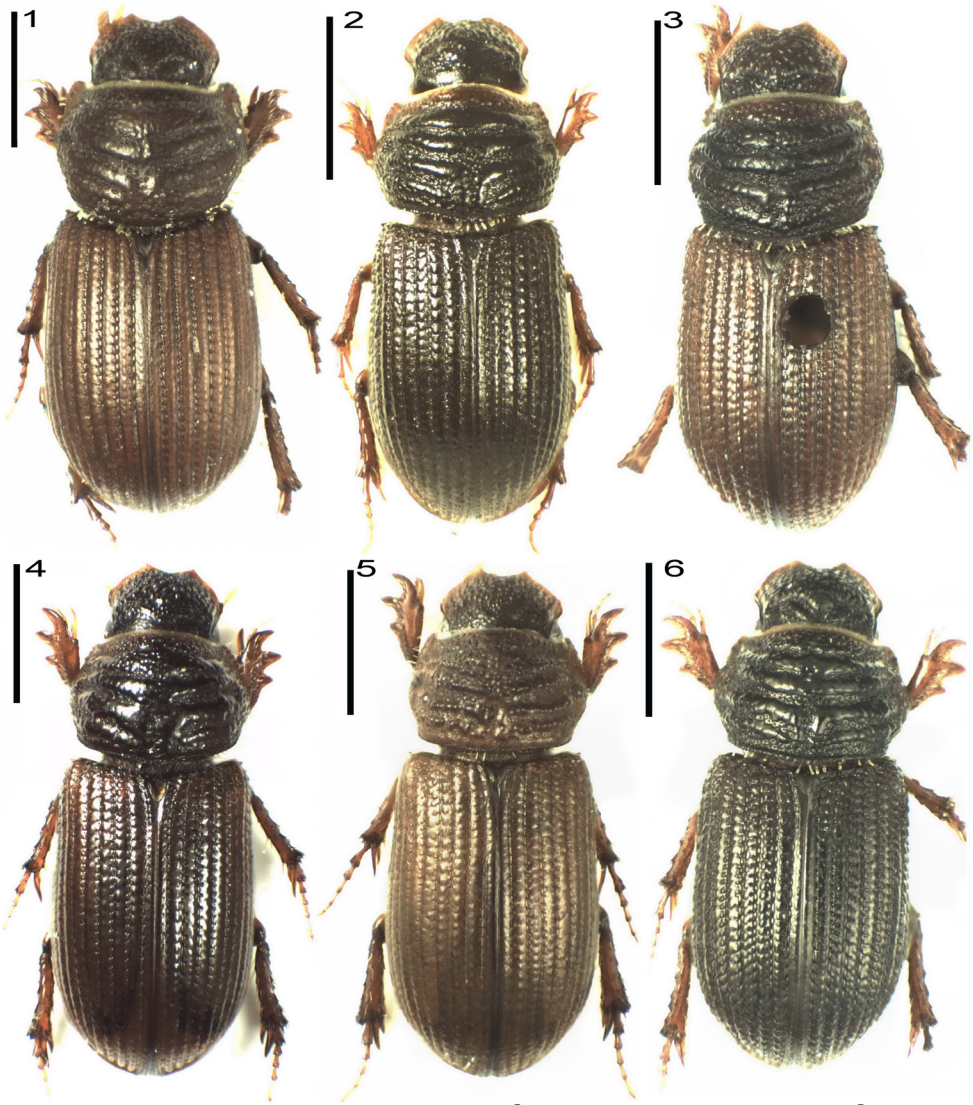
6 (5) Dorsal surfaces only moderately shining. Clypeus rounded each side of anteromedian emargination (Fig. 21). Posterior angles of pronotum sinuate. Reddish brown, head and pronotum moderately darker than elytra. 3.2 mm. China (Tianjin, "Nord Pékin") Mongolia (S. Gobi Aimak; Bayankhongor Aimak). .... *Rhyssemodes bouvieri* Clouët des Pesruches

7 (2) Transversal pronotal ridge 2 widened at middle; due to this, transversal pronotal furrow 1 (separating ridge 2 from ridge 1) is distinct laterally but indistinct or more frequently even absent at middle, middle parts of ridges 1 and 2 being thus fused together.

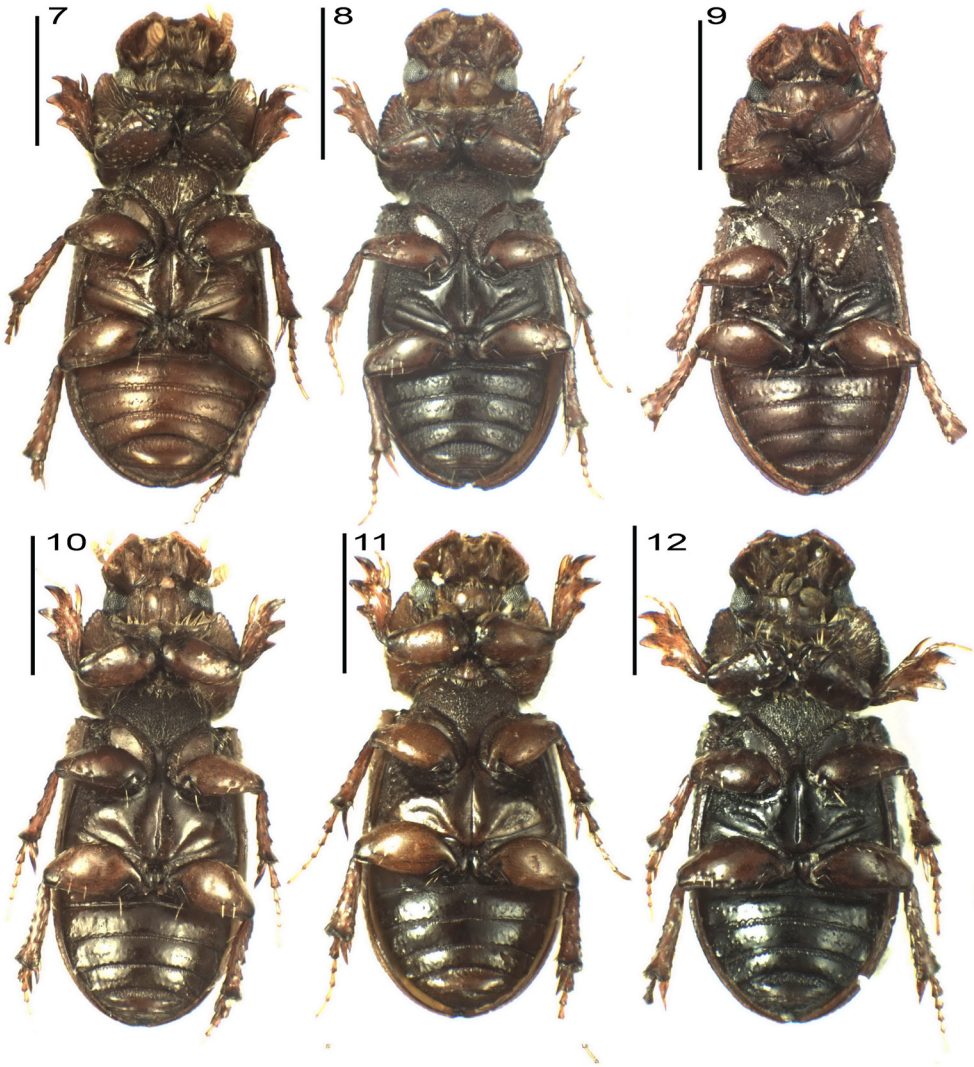
8 (9) Posterior pronotal ridges (ridges 3-5) convex, continuous, moderately granulate or non-granulate, on pronotal disc, wider than respective pronotal furrows (Fig. 37). Reddish brown to dark brown. 2.4-4.0 mm. Widely distributed in W. and E. Palearct including China and Mongolia and in some northern areas of Afrotropical Region (see the paragraph Distribution above), (see the paragraph Notes above). .... *Rhyssemodes orientalis* (Mulsant et Godart)

9 (8) Posterior pronotal ridges (ridges 3-5) considerably granulate or even broken into discrete tubercles on pronotal disc, narrower than respective pronotal furrows (Fig. 38). Reddish brown. 3.5 mm. China (Xinjiang Taklamakan Desert) .....*Rhyssemodes taklamakan* sp. nov.

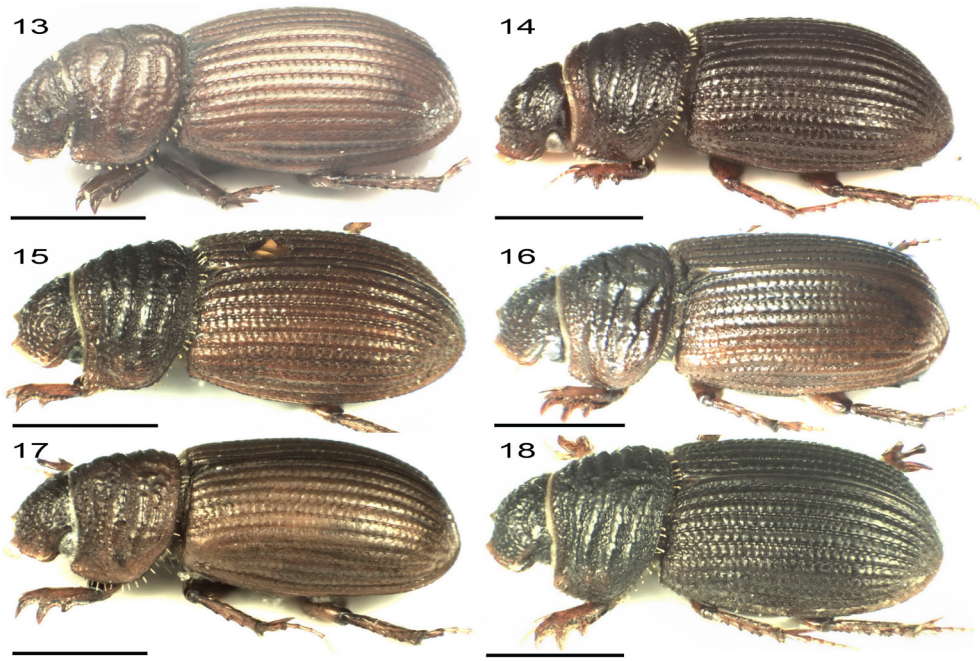
10(1) Individual granules in elytral intervals observable even under low magnification (about 10x) (Fig. 45). Blackish brown species. 2.3-3.0 mm. China (Ningxia ..... *Rhyssemodes ningxia* sp. nov.



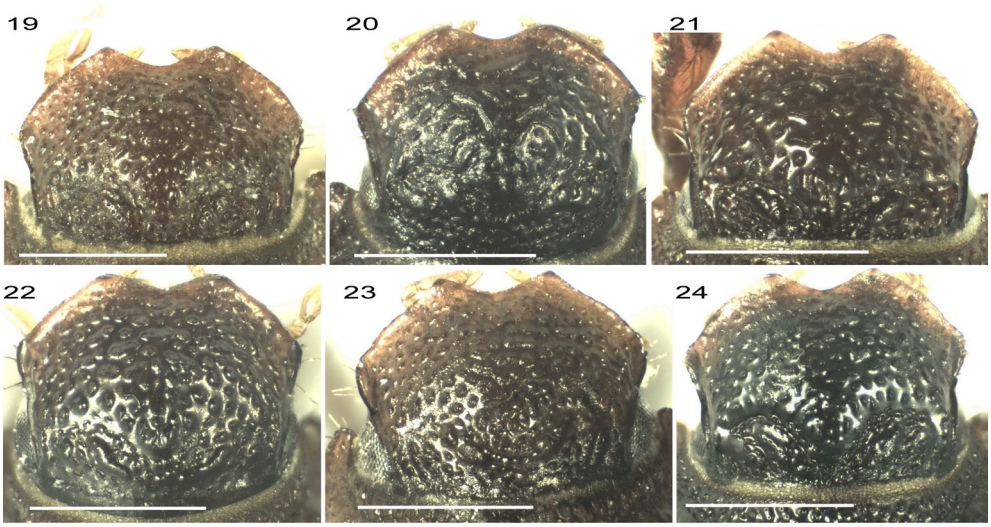
Figs. 1-6. Habitus, dorsal aspects: 1- *Rhyssemodes malyi*, ♀, holotype; 2- *Rhyssemodes sindicus*, ♀, paratype; 3- *Rhyssemodes bouvieri*, ♀, lectotype; 4- *Rhyssemodes orientalis*, ♀, specimen from Taklamakan Desert, China; 5- *Rhyssemodes taklamakan*, ♀, holotype ; 6- *Rhyssemodes ningxia*, ♂, holotype. Scale line 1 mm. Photographs by L. Mencl.



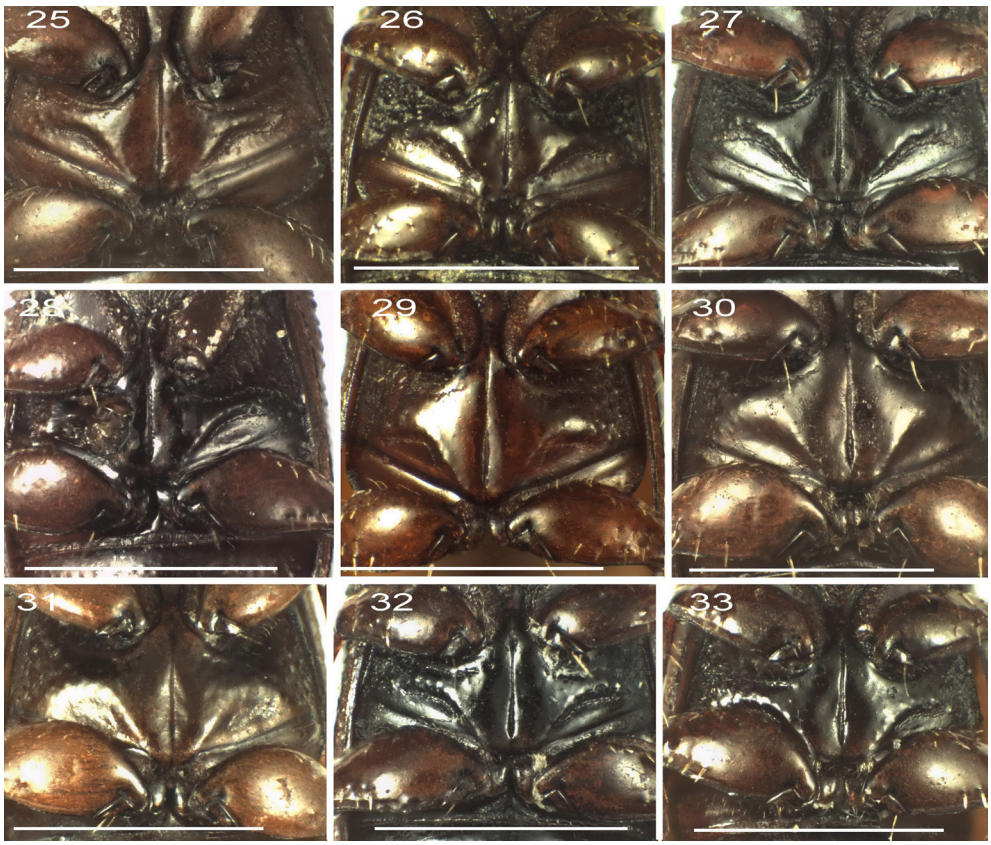
Figs. 7-12. Habitus, ventral aspects: 7- *Rhyssemodes malyi*, ♀, paratype; 8- *Rhyssemodes sindicus*, ♀, paratype; 9- *Rhyssemodes bouvieri*, ♀, lectotype; 10- *Rhyssemodes orientalis*, ♀, specimen from Taklamakan Desert, China; 11- *Rhyssemodes taklamakan*, ♀, holotype ; 12- *Rhyssemodes ningxia*, ♂, holotype. Scale line 1 mm. Photographs by L. Mencl.



Figs. 13-18. Habitus, laterodorsal aspects: 13- *Rhyssemodes malyi*, ♀, holotype; 14- *Rhyssemodes sindicus*, ♀, paratype; 15- *Rhyssemodes bouvieri,* ♀, lectotype; 16- *Rhyssemodes orientalis*, ♀, specimen from Taklamakan Desert, China; 17- *Rhyssemodes taklamakan*, ♀, holotype ; 18- *Rhyssemodes ningxia*, ♂, holotype. Scale line 1 mm. Photographs by L. Mencl.



Figs. 19-24. Head, dorsal aspects: 19- *Rhyssemodes malyi*, ♀, holotype; 20- *Rhyssemodes sindicus*, ♀, paratype; 21- *Rhyssemodes bouvieri*, ♀, lectotype; 22- *Rhyssemodes orientalis*, ♀, specimen from Taklamakan Desert, China; 23- *Rhyssemodes taklamakan*, ♀, holotype ; 24- *Rhyssemodes ningxia*, ♂, holotype. Scale line 0.5 mm. Photographs by L. Mencl.

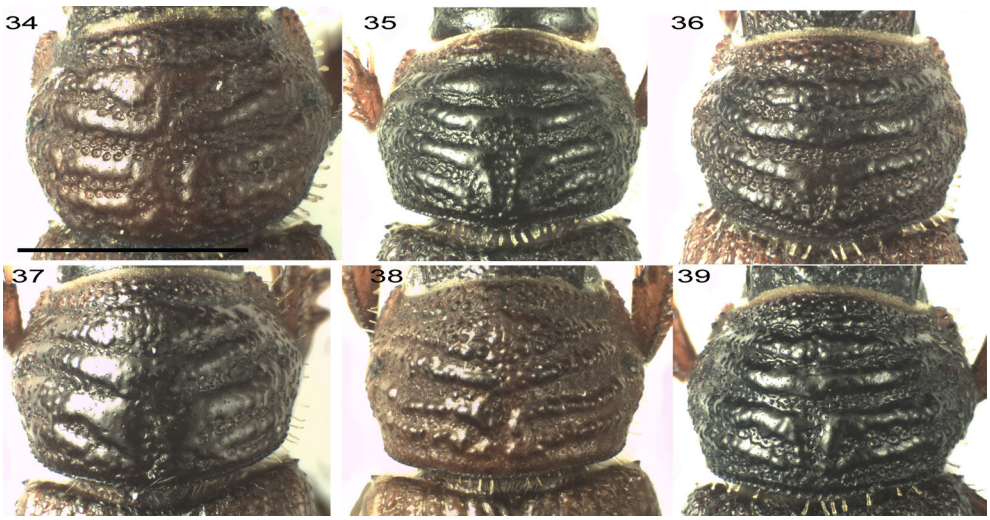


Figs. 25-33. Metaventrum, ventral aspects: 25- *Rhyssemodes malyi*, ♀, paratype; 26- *Rhyssemodes sindicus*, ♂; 27- *Rhyssemodes sindicus*, ♀, paratype; 28- *Rhyssemodes bouvieri*, ♀, lectotype; 29- *Rhyssemodes orientalis*, ♂, specimen from Taklamakan Desert, China; 30- *Rhyssemodes orientalis*, ♀, specimen from Taklamakan Desert, China; 31- *Rhyssemodes taklamakan*, ♀, allotype ; 32- *Rhyssemodes ningxia*, ♂, holotype; 33- *Rhyssemodes ningxia*, ♀, allotype. Scale line 0.5 mm. Photographs by L. Mencl.

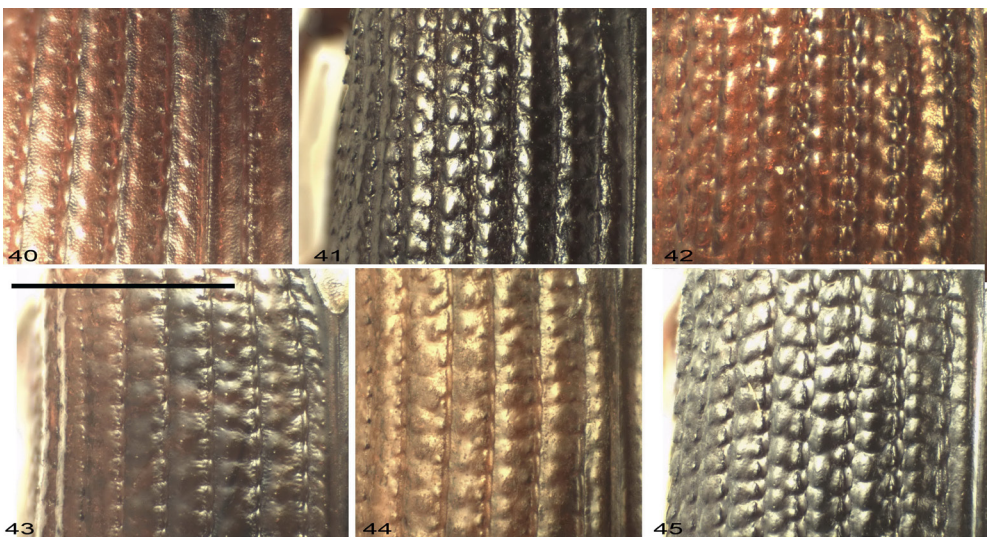
DISCUSSION

As already mentioned in the part Taxonomy, there are problems with the differentiation of the genus *Rhyssemodes* from the genus *Rhyssemus*. The differences were most exactly analysed by Pittino (1984b) based on quantitative relationships between lengths and widths of meso- and metatarsomeres.

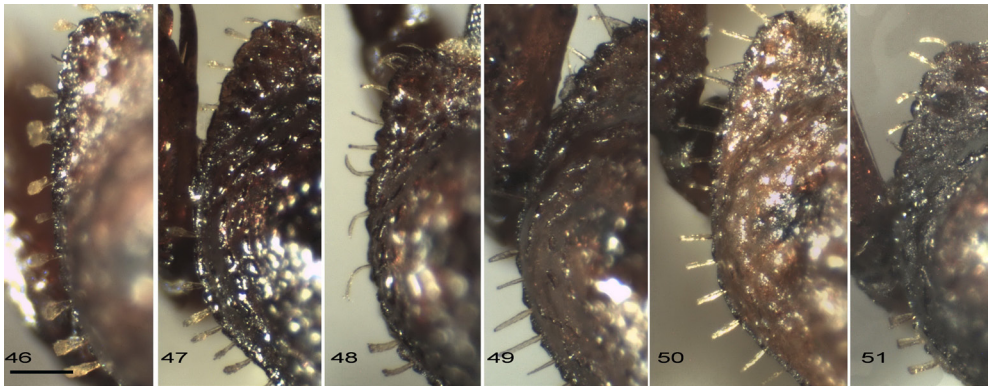
We offer the following auxiliary (assisting and supporting) criterion concerning the posterior pronotal structure (the arrangement of transversal ridges 4 and 5 and presence or absence of the accessory swelling). In the present consideration, it is to realize that *Rhyssemodes* inhabits only the Old World (Palaearctic Region, Oriental Region and some countries in the Afrotropical Region such as Sudan, Mauritania or Ethiopia). It is thus useless to consider for example Nearctic or Neotropical species of *Rhyssemus* here. Members of the



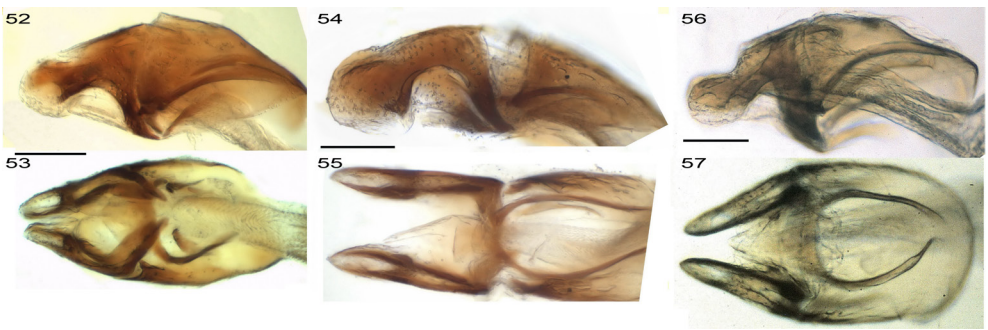
Figs. 34-39. Pronotum, dorsal aspects: 34- *Rhyssemodes malyi*, ♀, holotype; 35- *Rhyssemodes sindicus*, ♀, paratype; 36- *Rhyssemodes bouvieri,* ♀, lectotype; 37- *Rhyssemodes orientalis,* ♀, specimen from Taklamakan Desert, China; 38- *Rhyssemodes taklamakan*, ♀, holotype; 39- *Rhyssemodes ningxia*, ♂, holotype. Scale line 1 mm. Photographs by L. Mencl.



Figs. 40-45. Sculpture of elytra, dorsal aspects: 40- *Rhyssemodes malyi*, ♀, paratype; 41- *Rhyssemodes sindicus*, ♀, paratype; 42- *Rhyssemodes bouvieri*, ♀, lectotype; 43- *Rhyssemodes orientalis*, ♀, specimen from Taklamakan Desert, China; 44- *Rhyssemodes taklamakan*, ♀, holotype ; 45- *Rhyssemodes ningxia*, ♂, holotype. Scale line 0.5 mm. Photographs by L. Mencl.



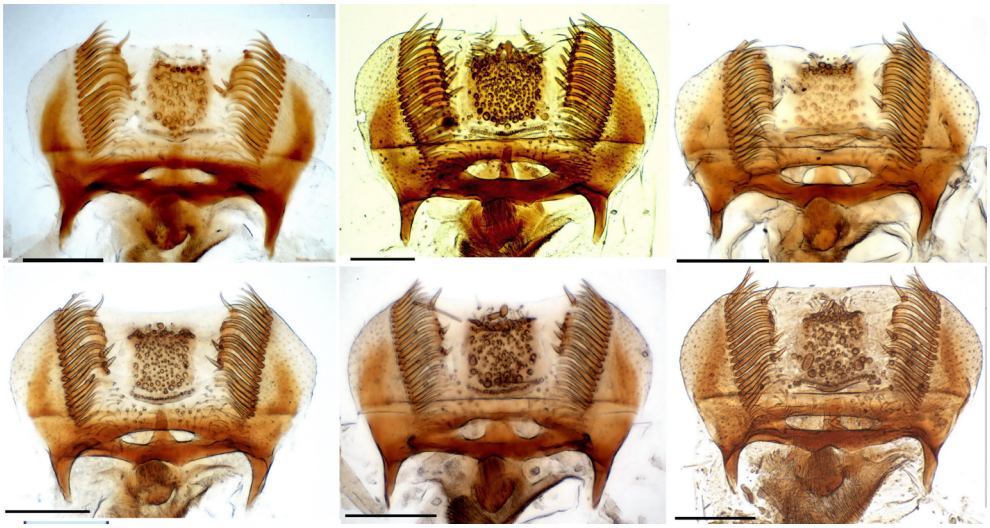
Figs. 46-51. Macrosetae on pronotum lateral margin, dorsal aspects: 46- *Rhyssemodes malyi*, ♀, holotype; 47- *Rhyssemodes sindicus*, ♀, paratype; 48- *Rhyssemodes bouvieri*, ♀, lectotype; 49- *Rhyssemodes orientalis*, ♀, specimen from Taklamakan Desert, China; 50- *Rhyssemodes taklamakan*, ♀, holotype ; 51- *Rhyssemodes ningxia*, ♂, holotype. Scale line 0.5 mm. Photographs by L. Mencl.



Figs. 52-57. Aedeagus: 52- *Rhyssemodes sindicus*, ♂, lateral view; 53- *Rhyssemodes sindicus,* ♂, ventral view 54- *Rhyssemodes orientalis*, ♂, specimen from Taklamakan Desert, China, lateral view; 55- *Rhyssemodes orientalis*, ♂, specimen from Taklamakan Desert, China, ventral view; 56- *Rhyssemodes ningxia*, ♂, holotype, lateral view; 57- *Rhyssemodes ningxia*, ♂, holotype, ventral view. Scale line 0.1 mm. Photographs by L. Mencl.

genus *Rhyssemodes* have two rows of granules in each elytral interval (an outside row of larger granules and inside row of smaller ones); it is thus necessary to consider comparison of *Rhyssemodes* species just with those species of *Rhyssemus*, which also exert this sculpture of elytral intervals (the most numerous group of the genus *Rhyssemus*).

It is to remind that in two subtribes of Psammodiini (Psammodiina and Rhyssemina), there are genera including species with the complete pronotal structure (five transversal ridges, five transversal furrows and a posterior longitudinal furrow), as well as those having a reduced pronotal structure (lateral impressions corresponding to posterior ends of transversal furrows 1 and 3 and/or vestiges of some transversal furrows or of the posterior longitudinal furrow, frequently only indicated by punctures arranged in rows. *Rhyssemodes* belongs to genera of the subtribe Rhyssemina having the complete pronotal structure. When having in mind the above mentioned facts, one can consider the following types of the complete pronotal

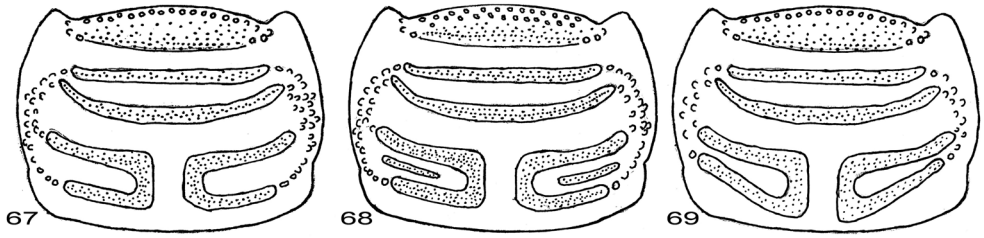


Figs. 58-63. Epipharynx: 58- *Rhyssemodes malyi*, ♀, paratype; 59- *Rhyssemodes sindicus,* ♀; 60- *Rhyssemodes bouvieri*, ♀, lectotype; 61- *Rhyssemodes orientalis*, ♀, specimen from Taklamakan Desert, China; 62- *Rhyssemodes taklamakan*, ♀, holotype ; 63- *Rhyssemodes ningxia*, ♂, holotype. Scale line 0.1 mm. Photographs by L. Mencl.

Figs. 64-66. Labels situated under type specimens: 64- *Rhyssemodes malyi*, ♀, holotype; 65- *Rhyssemodes malyi*, ♀, paratype; 66- *Rhyssemodes bouvieri*, ♀, lectotype. Photographs by L. Mencl.

structure within the tribe Psammodiini with putting emphasize on the posterior structural elements. They are schematically represented by three drawings (Figs. 67-69) in which the ridges are depicted as continuous elements, but of course, they can also consist of discrete granules and/or can be low or short (sometimes strongly reduced laterally).

Figure 67 shows the situation in genera of the tribe Psammodiina having complete pronotal structure (for example in *Psammodius* Fallén, 1807, *Brindalus* Landin, 1960, *Granulopsamodius* Rakovič, 1981 or *Rakovicius* Pittino, 2006).



Figs. 67-69. Simplified schemes of situation of pronotal ridges: 67- in genera of Psammodiina having complete pronotal structure (for example in *Psammodius* Fallén, *Brindalus* Landin, *Granulopsamodius* Rakovič or *Rakovicius* Pittino); 68- in largest group of *Rhyssemus* Mulsant species, in *Trichiorhyssemus* Clouët des Pesruches or in *Neotrichiorhyssemus* Rakovič et Král; 69- in most species of *Rhyssemodes* Clouët des Pesruches.

Figure 68 shows the situation in largest group of *Rhyssemus* species (species having two rows of granules in elytral intervals and being thus comparable with *Rhyssemodes*), in *Trichiorhyssemus* Clouët des Pesruches, 1901 or in *Neotrichiorhyssemus* Rakovič et Král, 1997.

Figure 69 shows the situation present to smaller or larger extent in species of *Rhyssemodes* Clouët characterized by ridge 5 having middle parts close to pronotum base and lateral parts approaching ridge 4.

The absence of the accessory swelling in *Rhyssemodes* species and its presence in those *Rhyssemus* species, which can be (due to their elytral sculpture) compared with *Rhyssemodes*, can be thus helpful in the consideration of differences between the two genera.

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