

ANNOTATIONES ZOOLOGICAE et BOTANICAE

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COMPLEMENTARY NOTES TO MY REVISION OF OLD WORLD PSAMMODIUS FALLÉN SPECIES (COLEOPTERA, SCARABAEIDAE, APHODIINAE)

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Abstract:

Keys to four subgenera of the genus *Psammodius* Fallén (*Psammodius* s. str., *Leiopsammodius* Rakovič, *Granulopsammodius* Rakovič and *Brindalus* Landin) are presented. For each subgenus, keys to species occurring in Europe, Asia and Africa are given with the aim to include one new species [*Psammodius* (*Granulopsammodius*) *sinicus* sp. n.] and 14 species that were described by different authors after submitting for print the manuscript of a former revision that appeared in 1981 [*Psammodius* (*Leiopsammodius*) *haruspez* Ádám, *P. (L.) belloi* Pierotti, *P. (L.) strumae* Chromý, *P. (s. str.) ovatus* Pittino, *P. (s. str.) bulgaricus* Mencl, *P. (s. str.) sungshinarum* Kim, *P. (s. str.) flavolittoralis* Kim, *P. (s. str.) macnamarae* Pittino, *P. (G.) loebli* Pittino, *P. (G.) plicatuloides* Pittino, *P. (G.) tienshanicus* Pittino, *P. (Brindalus) schatzmayri* Pittino, *P. (B.) granulicollis* Pittino and *P. (B.) maderae* Pittino]. Illustrations concerning the *Psammodius* (*L.*) *endroedii* Rakovič are presented, which are missing in the original description. At the present time, when considering species of the genus *Psammodius* Fallén occurring in Europe, Asia and Africa, 23, 20, 11 and 5 species fall into subgenera *Leiopsammodius* Rakovič, *Psammodius* s. str., *Granulopsammodius* Rakovič and *Brindalus* Landin, respectively — total 59 species.

In my revision of the *Psammodius* Fallén species from Europe, Asia and Afrika (Rakovič, 1981) I established three subgenera of the genus and keyed total 43 species. Many new data were published since the work on the manuscript. Pittino (1980a) proposed a further subgenus, 14 new species were described (Ádám, 1980; Pierotti, 1980; Chromý, 1983; Pittino, 1983a; Mencl, 1982; Pittino, 1983b; Pittino, 1980a; Pittino, 1980b; Pittino, 1984; Kim, 1980) and one species was transferred into the genus *Tesarius* Rakovič (Rakovič, 1984). Recently I had a chance to examine a species new to science (from collections of Institut für Pflanzforschung, Eberswalde. For the above mentioned reasons I considered useful to present new keys to species and to describe one new species. Besides this, illustrations will be presented, concerning the *Psammodius* (*Leiopsammodius*) *endroedii* Rakovič, since the description of this species was included into the former revision (Rakovič, 1981)

in the course of the production when it was already impossible to add further figures.

The four subgenera of the genus *Psammодиус* Fallén may be distinguished from each other as follows:

Key to subgenera

- 1 (2) The pronotal structure consisting only of more or less distinct one or two pairs of lateral impressions and a posterior longitudinal furrow. Large punctures arranged along vestiges of some transverse furrows may occur, however, the complete pronotal structure, consisting of five transverse ridges and five transverse furrows, is never present sbg. *Leiopsammодиус* Rakovič
- 2 (1) The pronotum with five transverse ridges (either continuous or broken into discrete granules) and five transverse furrows. Posterior (fourth and fifth) ridges interrupted medially by a posterior longitudinal furrow.
- 3 (4) Flightless species with coalescent elytra and reduced inner wings. Posterior tibiae slim (rather as with the genus *Diastictus* Mulsant), only apically widened. The furrows between pronotal ridges with extremely coarse, large and deep punctures sbg. *Brindalus* Landin
- 4 (3) Mostly flying species, with normally developed inner wings. In the case of reduced wings [*P.* (s. str.) *nocturnus*, *kobayashii* and *flavolittoralis*] the remaining characters do not adhere to 3 (4) — i. e. posterior tibiae are robust, pronotal furrow either impunctate or with five to medium-sized, not particularly deep punctures.
- 5 (6) Elytral intervals non-granulate sbg. *Psammодиус* s. str.
- 6 (5) Elytral intervals granulate sbg. *Granulopsammодиус* Rakovič

Subgenus *Leiopsammодиус* RAKOVIČ

Sbg. *Leiopsammодиус* Rakovič, 1981: 16.
The type species: *Psammодиус laevicollis* Klug.

The above mentioned revision (Rakovič, 1981) considers 20 Old World species of this subgenus. Out of them, *Psammодиус caelatus* (LeConte) (an introduced American species) was transferred into the genus *Tesarius* Rakovič (Rakovič, in print). All the remaining 19 species come from Africa and/or Asia. Thus, it was very surprising that the following three new species of this subgenus were described within three years from Europe.

Psammodius (Leiopsammadius) haruspex Á d á m

Psammodius haruspex Á d á m, 1980: 17.

L. c.: Szeged, Algyő, Hungary.

Holotype in Hungarian National Museum, Budapest.

The holotype was collected in a nest of *Riparia riparia*.

Psammodius (Leiopsammadius) belloi Pierotti

Psammodius belloi Pierotti, 1981: 411.

L. c.: Vrontamas, Greece.

Holotype in Museo St. Nat., Verona.

The holotype and paratypes were collected by five Italian entomologists at different localities in Peloponnese.

Psammodius (Leiopsammadius) strumae Chromý

Psammodius (Leiopsammadius) strumae Chromý, 1983: 210.

L. c.: Kresna, Bulgaria.

Holotype in National Museum, Prague.

The holotype and paratype specimens were collected by four Czechoslovak entomologist, at two localities, in the valey of the river Struma, beyond the most frequently flooded areas, most of them near grass tussocks.

Notes

For some taxonomic and zoogeographic notes on several species of this subgenus see Pittino (1982, 1983b). New knowledge on the distribution of *P. (L.) seychellensis* Rakovič is of a particular interest, since I described this species on the basis of material from Seychelles (Rakovič, 1979) and latter I found surprisingly this species among specimens from the Republic of South Africa (Endrődi and Rakovič, 1981). The Pittino's findings from Madagascar and Kenya (1982) help to explain the above mentioned facts — the species has obviously a rather large area of occurrence in the Ethiopian Region.

Key to species of the sbg. *Leiopsammadius* Rakovič

- 1 (2) The head posteriorly with oblique ridges. Reddish brown, 3 mm.
— Egypt *P. (L.) scabrifrons* Walker
- 2 (1) The head posteriorly without oblique ridges.
- 3 (8) The tenth elytral interval only slightly extended beyond one half the elytra length.

- 4 (7) The head remarkably narrowed anteriorly, the head, pronotum and elytra lateral margins richly haired.
- 5 (6) A smaller species (below 2.8 mm). Genae about semicircular, well separated from the clypeus lateral margins. Both terminal spurs of posterior tibiae remarkably bifid apically. Pale, yellow, 2.2 to 2.8 mm. — Nepal, Cambodja, Burma, W. Pakistan, O. Afghanistan
P. (L.) gestroi (Clö uet)
- 6 (5) A larger species (above 3 mm). Anterior margins of genae almost on one line with clypeus lateral margins. Terminal spurs of posterior tibiae simple, at the most slightly sinuate apically. Yellowish brown, 3.3 to 3.7 mm. — Burma, Laos
P. (L.) liviae Pittino
- 7 (4) The head not unusually narrowed anteriorly. Only the pronotum lateral margins haired. Reddish brown, 2.3 mm. — Hungary
P. (L.) haruspex Ádám
- 8 (3) The tenth elytral interval either complete or achieving at least 3/4 elytra length.
- 9 (10) The longitudinal furrow on the pronotum very deeply impressed, extended from the basal margin nearly to the anterior margin. The elytral intervals strongly convex. A small species. Reddish brown, 2.6 to 2.7 mm. — Rhodesia
P. (L.) endroedii Rakovič
- 10 (9) The longitudinal furrow on the pronotum only moderately or slightly impressed, present only posteriorly or marked only by a row of punctures. The elytral intervals moderately convex or flat. Usually larger species.
- 11 (18) Granules on the head, at least those occurring anteriorly, strongly transversal.
- 12 (13) The head granulate behind the clypeofrontal suture. Punctures in elytral striae distinct. Anterior margins of genae quite on one line with the pronotum lateral margins and thus, the genae not protruding. Reddish brown, 2.8 to 3.0 mm. — Congo, Ethiopia
P. (L.) abyssinicus (Müller)
- 13 (12) The head vertex at most with small grains. Punctures in elytral striae indistinct. Anterior margins of the genae not quite on one line with pronotum lateral margins and thus, genae anterior margins protruding, though if weakly.
- 14 (15) Majority of medium-sized or large punctures on the pronotum irregularly distributed; the pronotum disk remarkably punctate. Reddish brown, 3 mm. — Southwest Africa, South Africa, Ost Africa
P. (L.) subciliatus (Harold)
- 15 (14) Majority of the punctures on the pronotum arranged along vestigial furrows; disk at most with few punctures.
- 16 (17) Granules on the head located anteriorly transversal, those located medially rounded. The elytra wider (their length-to-width ra-

tio 1 : 0.72). Elytral interval strongly convex. Reddish brown, 2.7 to 3.1 mm. — The Seychelles, Madagascar, Kenya, RSA

P. (L.) seychellensis R a k o v i č

- 17 (16) All the granules on the head transversal. The elytra narrower (their length-to-width ratio 1 : 0.67). Elytral intervals nearly flat. Reddish brown, 2.8 to 3.3 mm. — South Africa

P. (L.) evanidus (P é r i n g u e y)

- 18 (11) Granules on the head rounded, never strongly transversal.
19 (20) A relatively large (4 mm and above) nearly black species from Japan. Dark brown, nearly black, 4 to 5 mm. — Japan

P. (L.) japonicus (H a r o l d)

- 20 (19) Smaller species (below 3.8 mm), yellowish brown to dark brown, from other geographic areas.

- 21 (30) The elytral striae, when observed from above, either indistinct or distinct only near the elytra base. Punctures of the elytral striae replaced by rather large, more or less darkened, quite superficial spots.

- 22 (25) The posterior part of the head (behind the frontal suture) glassy, essentially smooth (at the most with small, microscopic grains). The basal margin line of the pronotum interrupted at the middle. The pronotum glassy, transparent.

- 23 (24) The genae, pronotum lateral margins and legs richly haired. The elytra quite transparent, punctures of elytral striae not visible from above, replaced by slightly darkened, oval, transverse spots occupying the whole width of elytral intervals. Yellowish brown, 3.4 mm. — Algeria

P. (L.) desertorum (F a i r m a i r e)

- 24 (23) The genae, pronotum lateral margins and legs either bare or only sparingly haired. The elytra not transparent, punctures of elytral striae distinct, their diameters equal 1/4 to 1/3 interval width. Yellowish brown, 3.4 mm. — Iran

P. (L.) jelineki R a k o v i č

- 25 (22) The posterior part of the head (behind the frontal suture) with a row of tubercles, with a transverse granulate swelling or with a transverse shagreened swelling. The basal margin line of the pronotum complete.

- 26 (27) The head posteriorly (behind the frontal suture) with either a transverse, tuberculate swelling or a row of discrete tubercles. Reddish brown, 2.5 to 3 mm. — Southwest Africa

P. (L.) substriatus (B a l t h a s a r)

- 27 (26) The head posteriorly (behind the frontal suture) with a non-tuberculate transverse swelling.

- 28 (29) The elytral intervals somewhat convex. The head finely shagreened,

however, yet bright. The elytra base not margined, bare. Reddish brown, 3 mm. — Mali, Benin, Chad, Zair, Ethiopia, Yemen

P. (L.) laevis (Paulian)

- 29 (28) The elytral intervals essentially flat. The head strongly shagreened, quite matt. The elytra base finely margined, haired. Yellowish brown, 2.8 to 3.0 mm. — India, Pakistan

P. (L.) pelluscens (Petrovitz)

- 30 (21) When observed from above, the elytral striae (at least some of them) distinct (not only at the base). Their punctures smaller or larger, more or less distinct, however, never superficial.

- 31 (32) The pronotum with only one pair of lateral impressions (including lateral parts of an anteriorly located premarginal transversal furrow, if present). Reddish brown, 3 mm. — Rep. of S. Africa

P. (L.) modestus (Péringuey)

- 32 (31) The pronotum with two pairs of lateral impressions.

- 33 (34) The head posteriorly, behind the clypeofrontal suture, with a granulate transverse swelling or an essentially continuous row of granules. The pronotum lateral margins smooth and haired. Reddish brown, 2.8 to 3 mm. — Algeria, Tunisia, Egypt, Arabic countries, the Sudan, Ethiopia, Somalia, Djibouti, Zair

P. (L.) laevicollis Klug

- 34 (33) The head posteriorly (behind the frontal suture) either with discrete granules or quite smooth.

- 35 (36) The pronotum lateral margins crenulate, with short setae. The elytral striae wide and deep, with large punctures which do not disturb the intervals. Reddish brown, 2.7 mm. — Somalia

P. (L.) somalicus (Petrovitz)

- 36 (35) The pronotum lateral margins smooth. The elytral striae narrow.

- 37 (40) The pronotum lateral margins bare.

- 38 (39) A smaller, paler species. A majority of coarse punctures of the pronotum distributed irregularly. The head relatively wider (the ratio head width: pronotum width 1:1.40). Reddish brown, 3 to 3.5 mm. — Ethiopian and Oriental Region

P. (L.) indicus (Harold)

- 39 (38) A larger, darker species. A majority of medium-sized to coarse punctures of the pronotum arranged along the posterior longitudinal furrow and along lateral vestiges of the first and third transverse furrows. The head narrower (the ratio head width: pronotum width 1:1.65). Dark brown, 3.7 mm. — Kenya

P. (L.) kenyensis Rakovič

- 40 (37) The pronotum lateral margins haired.

- 41 (42) The genae margins nearly on one line with the clypeus lateral margin. Granules on the head rounded. Reddish brown, 2.5 to 3.7 mm. — Greece (Pelopponese)

P. (L.) belloi Pierotti

42 (41) The genae protruding beyond the clypeus lateral margins. Most granules on the head rounded, however, those located close to the clypeus, anterior margin rather transversal. (See the note below the key). Reddish brown, 2.6 mm. — SW Bulgaria

P. (L.) strumae Chromý

NOTE to the key: The species *P. (L.) strumae* Chromý is actually very similar to the *P. (L.) belloi* Pierotti. A study of longer series could possibly confirm their synonymy.

Subgenus *Psammodius* s. str.

Sbg. *Psammodius* s. str. Rakovič, 1981: 42.

The type species: *Psammodius asper* (Fabricius).

In my revision (Rakovič, 1981) 16 species of this subgenus are listed. Out of them, *Psammodius*, (s. str.) *porcicollis* (Illiger) was taken (Pittino, 1980a) as a type of the subgenus *Brindalus* Landin (see below). On the other hand, the five below mentioned species were described recently.

Psammodius (s. str.) *bulgaricus* Mencl

Psammodius (s. str.) *bulgaricus* Mencl, 1982: 310.

L. c.: Kavacite (S. of Sozopol), Bulgaria.

Holotype in National Museum, Prague.

The type and paratypes were collected by the author of the species in sand dunes at the seashore, at the roots of plants.

Psammodius (s. str.) *ovatus* Pittino

Psammodius (s. str.) *ovatus* Pittino, 1983a: 94.

L. c.: Gauhati, India (Assam).

Holotype in Mus. d'hist. nat., Genève.

The holotype (female) species was collected by L. Besuchet and I. Löbl in Nov 1978.

Psammodius (s. str.) *sungshinarum* Kim

Psammodius sungshinarum Kim, 1980: 7.

L. c.: Whajin-Ri, Songra-Myun, Youngil-Kun, Kyoungsang-Bukdo, Korea.

Holotype in Sung-Shin Women's Univ., Seoul.

Not included in the key (see the note below the key).

Psammodius (s. str.) *flavolittoralis* Kim

Psammodius flavolittoralis Kim, 1980: 8.

L. c.: Wooyido isle, Shinan-Kun, Jeonra-Namdo. Korea.
Holotype in Sung-Shin Women's Univ., Seoul.

Not included in the key (see the note below the key).

Psammодиус (s. str.) *macnamarae* Pittino

Psammодиус (s. str.) *macnamarae* Pittino, 1984: 15.
L. c.: nr. Birganj, Lothar 450 ft., Nepal.
Holotype in Biosystematic Res. Inst., Ottawa.

This species was recognized by its author in a series of specimens from a Canadian Nepal Expedition, which I formerly missinterpreted as *P.* (s. str.) *tesari* Rakovič (Rakovič, 1981).

Notes

Baraud and Branco (1980–81) reported the occurrence of *P.* (s. str.) *plicicollis* (Erichson) in Portugal.

P. (s. str.) *sefrensis* (Petrovitz) formerly known only from Algeria, was reported by Ádám (1979) from Tunisia (Skanés).

Key to species of the sbg. *Psammодиус* s. str.

20

- 1 (16) The tenth elytral interval achieving the apex or at least exceeding beyond 3/4 elytra length.
- 2 (9) Pronotum lateral margins always crenulate anteriorly with distinctly clavate setae.
- 3 (4) A slender, relatively larger species from Formosa, with coarsely punctate elytral striae (see also Note below the key). Piceous. 3.6 mm. — Taiwan

P. (s. str.) *subopacus* Nomura

- 4 (3) Smaller species from different areas, more widened behind, with smaller punctures of elytral striae.
- 5 (6) The first (anterior) transverse ridge on the pronotum consisting of a row of discrete tubercles, widened at the middle. The head posteriorly (around the oblique ridges) very remarkably coarsely punctate. The elytral striae nearly as wide as the intervals. Reddish brown, the pronotum slightly darker, 2.8 mm. — Thailand

P. (s. str.) *thailandicus* (Balthasar)

- 6 (5) All the five pronotal ridges continuous. The head posteriorly (in the area of oblique ridges) impunctate. The elytral striae much narrower.
- 7 (8) Posterior tibiae very robust, continuously widened from the base to the apex. Reddish brown, 2.9 to 3.4 mm. — Bulgaria

P. (s. str.) *bulgaricus* Mencl

- 8 (7) Posterior tibiae slimmer, widened only at the apex.
- 9 (10) The genae haired. Dark brown to black. 2.6 to 3.6 mm. — Italy, Spain, Algeria, Caucasus, Iran, the U. S. A. (introduced)
P. (s. str.) pierottii Pittino
- 10 (9) The genae bare.
- 11 (12) The elytral intervals more convex. The anterior margins of the genae more prominent and thus the genae asymmetrical about their transversal axes; a darker species. Dark brown to black (immature specimens reddish brown). 2.6 to 4 mm. — Europe, Caucasus, Transcaucasia, the U. S. A. (introduced)
P. (s. str.) asper (Fabricius)
- 12 (11) The elytral intervals less convex, the genae essentially symmetrical about their transversal axes; a less dark species. Reddish brown to dark brown. 2.6 to 3.6 mm. — Japan
P. (s. str.) convexus Waterhouse
- 13 (2) The lateral margins of the pronotum either crenulate or smooth, with fine, hairlike, sometimes abruptly truncate and slightly dilatate, however, never clavate setae.
- 14 (17) The elytra nearly parallel.
- 15 (16) Hairlike setae on the pronotum lateral margins acute apically. Dark brown, 3.0 to 4.3 mm. — The whole South Europe (Northward up to Panonia and South Slovakia), N. Africa, Syria, Transcaucasia
P. (s. str.) laevipennis Costa
- 16 (15) Setae on the pronotum lateral margins abruptly truncate and often dilatate apically. Dark brown, 3.7 to 4.9 mm. — Sardinia, Corsica, Liguria, S. France, Portugal
P. (s. str.) plicicollis Erichson
- 17 (14) Species remarkably broader behind.
- 18 (19) A larger species with shining elytra. The clypeus lateral margins continuously curved up to the anterior margins of the genae. The elytra without humeral teeth. The elytral intervals only moderately convex, the striae fine, dark brown, 3.5 to 4.5 mm. — Spain, S. France, Italy, Balcan, Caucasus (Eastward up to Krym)
P. (s. str.) basalis Mulsant et Rey
- 19 (18) A smaller species, with shagreened elytra. The clypeus lateral margins bent inwardly before the genae. The elytral intervals strongly convex, the striae deep and wide. The elytra with small humeral teeth. Reddish brown to dark brown, 3.3. to 3.8 mm. — Algeria, Tunisia, Libya
P. (s. str.) besucheti (Petrovitz)
- 20 (1) The tenth elytral interval achieving only about 1/2 to 3/4 elytra length.
- 21 (26) The pronotum lateral margins with clavate setae.

- 22 (23) The elytra without humeral teeth. Dark reddish brown, 2.6 mm. Taiwan
P. (s. str.) kobayashii Nomura
- 23 (22) The elytra with humeral teeth.
- 24 (24) The elytral margins equipped with rather dense, short hairs. Reddish brown, 2.8 to 3.3 mm. — Pakistan, Ceylon, Nepal, India
P. (s. str.) tesari Rakovič
- 25 (24) The elytral margins bare. Reddish brown, 2.1 to 2.7 mm. — Nepal
P. (s. str.) macnamarae Pittino
- 26 (21) The pronotum lateral margins either bare, or with fine, apically acuminate hairs.
- 27 (28) The pronotum lateral margins bare. Dark brown to black, 2.8 to 3.0 mm. Nepal
P. (s. str.) nepalensis Balthasar
- 28 (27) The pronotum lateral margins with fine hairs.
- 29 (30) The first pronotal ridge partially broken into discrete tubercles. Reddish brown, 2.3 mm. — India
P. (s. str.) ovatus Pittino
- 30 (29) The first pronotal ridge quite continuous.
- 31 (32) The pronotum basis without hairs, the tenth elytral interval achieving only 1/2 elytra length. Yellow to reddish brown, 2.8 to 3.3 mm. — Transcaucasia
P. (s. str.) generosus Reitter
- 32 (31) The pronotum basis haired, the tenth elytral intervals terminating before 3/4 elytra length.
- 33 (34) A dark species with small, however, distinct humeral teeth. The eyes well visible from above. The elytra, length-to-width ratio 1 : 0.75. Reddish brown, 3.5 to 4 mm. — Algeria (Ain Sefra), Tunisia
P. (s. str.) sefrensis (Petrovitz)
- 34 (33) A paler species without humeral teeth. The two eyes hardly visible simultaneously from above. The elytra length-to-width ratio above 0.80. Yellowish brown, 2.6 to 3.4 mm. — Israel, Lebanon, Tunisia, Italy, Sicily
P. (s. str.) nocturnus Reitter

Note to the key: I had no chance to examine the following two Korean species:

P. (s. str.) sungshinarum Kim

P. (s. str.) flavolittoralis Kim

Thus, they are not included in the key. According to relevant descriptions, they are very similar to *P. (s. str.) convexus* (Waterhouse) and *P. (s. str.) kobayashii* Nomura, respectively.

Subgenus *Granulopsammadius* RAKOVIČ

Sbg. *Granulopsammadius* Rakovič, 1981: 63.

The type species: *Psammadius plicatulus* (Fairmaire)

Seven species of this subgenus are included in my revision of Old World *Psammadius* Fallén species. Out of them, the *Psammadius rotundipennis* Reitter was transferred into the subgenus *Brindalus* Landin (Pittino, 1980a). Three new species were recently described by Pittino, 1980a – see below.

Psammadius (Granulopsammadius) loebli Pittino

Psammadius loebli Pittino, 1980b: 77.

L. c.: Tunisi, Tunisia.

Holotype in Mus. d'hist. nat., Genève.

The species was described on the basis of material from the Petrovitz collection kept in Mus. d'hist. nat., Genève. I studied 2 specimens with locality Nafzaoua, Tunisia.

Psammadius (Granulopsammadius) plicatuloides Pittino

Psammadius (Granulopsammadius) plicatuloides Pittino, 1984: 18.

L. c.: Central Asia, Chinese Turkestan (Sinkiang): Maralbashi (= Pachu).

Holotype in Muséum national d'histoire naturelle, Paris.

This species was described on the basis of two specimens from the Bedel's collection kept in Mus. nat. d'hist. nat., Paris. As reported by its author, it resembles *Rhyssmodes* Mulsant species in external appearance, however, robust posterior tibiae indicate that it belongs to the genus *Psammadius* Fallén.

Psammadius (Granulopsammadius) tienshanicus Pittino

Psammadius (Granulopsammadius) tienshanicus Pittino, 1984: 20.

L. c.: Tien-Chan ou Monts Celestes.

Holotype in Muséum national d'histoire naturelle, Paris.

This species was described on the basis of 9 specimens, collected by Dr. L. Vaillant in 1909, and kept in Mus. nat. d'hist. nat., Paris. Similarly as *Psammadius (G.) mesopotamicus* (Petrovitz) and *P. (G.) plicatuloides* Pittino, it resembles *Rhyssmodes* species in external appearance.

Psammadius (Granulopsammadius) sinicus sp. n.

L. c.: China.

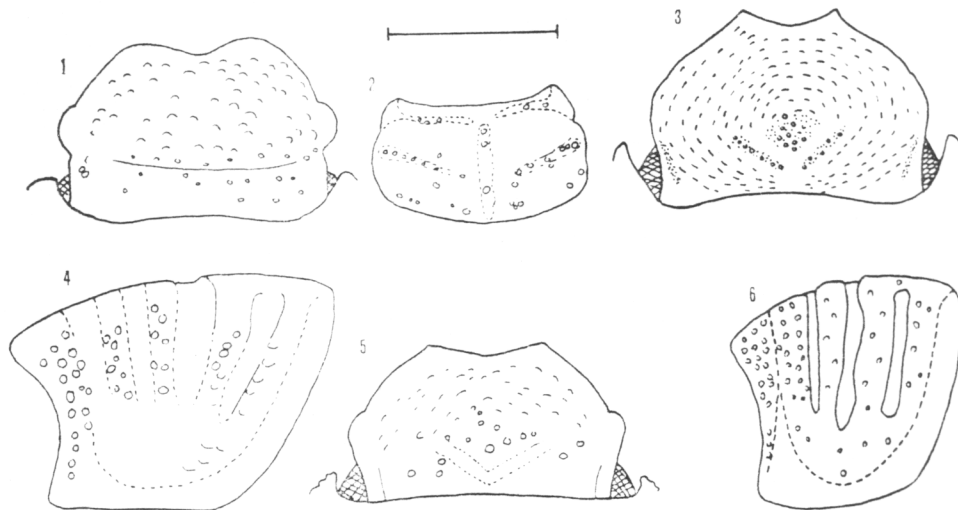
Holotype in Institute für Pflanzforschung, Eberswalde.

Oblong oval, only slightly broader behind, 3.5 mm, the length-to-width ratio 1 : 0.406. Shining, yellowish to reddish brown, the pronotum basal margin line somewhat darker.

The whole head surface (Fig. 3) very uniformly granulate, the granules rather transversal. On the vertex some granules arranged in a pair of weak, however, distinct oblique ridges. An only slightly elevated area before these ridges, granulate swellings along eyes. The clypeus roundly emarginate anteriorly, with a lifted, acute angle each side of the emargination. The clypeus lateral margins first distinctly concave, then, before the genae, convex. The genae rounded, their anterior margins nearly on one line with the clypeus lateral margins. The head margins, the genae inclusive, bare (of course, a possibility cannot be precluded that the hairs were rubbed off).

The pronotum transversal, the length-to-width ratio 1 : 1.24. Widest behind the middle, narrowed posteriorly much more strongly than anteriorly. Lateral margins crenulate anteriorly, with a few fine hairs (most hairs were probably rubbed off). With five transverse ridges. The first ridge consisting of discrete tubercles, widened medially (about three tubercles in its width). The second ridge continuous laterally, widened and consisting of discrete tubercles medially (about four tubercles in its width). The third to fifth ridges continuous, tuberculate, the third and fourth ridges of about the same width, the fifth ridge narrower.

The scutellum small, narrow, subparallel at the base, shagreened.



Figs. 1—6. Heads and pronota of three *Psammodius* Fallén species. 1—*P. (L.) endroedii* Rakovič, head, 2—*P. (L.) endroedii* Rakovič, pronotum — top view. 3—*P. (G.) sinicus* sp. n., head, 4—*P. (G.) sinicus* sp. n., pronotum — side view. 5—*P. (G.) loebli* Pittino — head, 6—*P. (G.) loebli* Pittino, pronotum — side view. Scale line: 0.5 mm for heads, 1.0 mm for pronota.

The elytra with margined base and distinct humeral teeth, subparallel. the length-to-width ratio 1 : 0.604. With 10 striae and 10 intervals. The striae distinct, their punctures very small, indistinct. not disturbing the intervals. The intervals convex, granulate, the tenth interval fused with the ninth one close to the elytra apex.

The posterior tibiae widened apically, of the same length as the intermediate ones. The first to fourth tarsal segments moderately triangularly widened, the fifth segment long. The sharp upper terminal spur of the posterior tibia achieving the middle of the second tarsal segment.

The ventral surface also yellowish brown, the trochanters and apices of femora and tibiae darker. The prosternum and mesosternum coriaceous. rows of longitudinal wrinkles along anterior margins of the 5th and 6th abdominal sternites, otherwise the ventral surface smooth, shining. The metasternal plate moderately elevated, with an oval impressed area around the longitudinal furrow. The posterior femur length-to-width ratio 1 : 0.468. The ratio of the intermediate femur width to the posterior femur width 1 : 1.22.

Type material: Holotype — China, coll. Kraatz, Institut für Pflanzforschung, Eberswalde. (Unfortunately, the specimen is not equipped with more detailed locality data.)

Notes

The *P. (G.) loebli* Pittino, described on the basis of type material from Tunisia was latter collected by H. Pierotti in Algeria (Ain-Sefra) (Pittino, 1982).

The data on the distribution of the *P. (G.) plicatulus* (Fairmaire) (see the key) were completed according to Pittino (1980b); I have seen 1 specimen from Somaliland (Berbera).

Key to species of the sbg. *Granulopsammodius* Rakovič

- 1 (4) The upper terminal spur of the posterior tibia about as long as the first tarsal segment.
- 2 (3) The elytra with distinct humeral teeth. A larger animal from the Ethiopian Region. Dark brown, 3.9 mm. — Somalia
P. (G.) petrovitzi Rakovič
- 3 (2) Humeral teeth missing. A smaller animal from the North Africa. Reddish brown, 2.9 to 3.3 mm. — Tunisia, Algeria
P. (G.) loebli Pittino
- 4 (1) The upper terminal spur of the posterior tibia remarkably longer than the first tarsal segment.
- 5 (8) The genae laying on one line with the clypeus lateral margins (see e. g. Fig. 3).
- 6 (7) The clypeus with a very acute tooth each side of its anterior emargination (Fig. 3). The pronotum narrowed posteriorly much

more than anteriorly, with essentially bare basal and lateral margins. Yellowish to reddish brown, 3.5 mm. — China

P. (G.) sinicus sp. n.

- 7 (6) The clypeus with a rather rounded tooth each side of its emargination. The pronotum narrowed posteriorly similarly as anteriorly, its lateral and basal margins richly haired. The animal resembling in external appearance the *Rhyssemodes orientalis* Mulsant et Godart. Reddish brown, 3.8 mm — Iraq, Iran

P. (G.) mesopotamicus (Petrovitz)

- 8 (5) The genae protruding beyond the clypeus lateral margins.
9 (10) The second transverse ridge of the pronotum medially continuous, though if tuberculate. Reddish brown, 2.5 to 3.0 mm. — the USSR (Transcaspia, Kizilkum)

P. (G.) transcaspicus (Petrovitz)

- 10 (9) The second transverse ridge of the pronotum medially consisting of discrete tubercles.
11 (12) The genae truncate. The ventral surface richly haired. Reddish brown, 3.7 mm. — Mongolia

P. (G.) mongol (Endrődi)

- 12 (11) The genae rounded. The ventral surface at most sparsely haired.
13 (16) The 10th elytral interval shortened posteriorly.
14 (15) The oblique ridges on the head vertex quite lost in the granulate structure. Reddish brown, 3.4 to 3.9 mm. — the USSR (Turkmenistan, Uzbekistan)

P. (G.) centralasiae Rakovič

- 15 (14) The head vertex with a pair of granulate oblique ridges. Reddish brown, 3.2 to 3.6 mm. — W. China (Sinkiang)

P. (G.) plicatuloides Pittino

- 16 (13) The 10th elytral interval complete.
17 (18) The clypeus lateral margins bare. Oblique ridges on the head vertex almost continuous. Reddish brown, 3.0 to 3.9 mm. — China (Tien Shan)

P. (G.) tienshanicus Pittino

- 18 (17) The clypeus lateral margins bare. The oblique ridges on the head vertex broken into discrete tubercles.
19 (20) The genae strongly protruding. Oblique ridges on the head vertex consisting only of discrete tubercles, however, yet distinct. The third transverse ridge of the pronotum very narrow, the fourth ridge quite flat. The elytra length to the elytra width ratio 1 : 0.68. Reddish brown, 3 to 3.5 mm. — Morocco, Algeria, Libya, Yemen, Somalia, Sudan, Ethiopia, Djibouti

P. (G.) plicatulus (Fairmaire)

- 20 (19) The genae moderately protruding. Oblique ridges on the head vertex indistinct. The width and height of the third transverse pronotal ridge comparable to those of the fourth ridge. The elytra

length-to-elytra width ratio 1:0.74. Specimens of *P. (G.) loebli* Pittino [see 3 (2)] with longer terminal spurs of posterior tibiae.

Subgenus *Brindalus* LANDIN

Phycochus (Brindalus) Landin, 1960: 65.

Psammadius (Brindalus): Pittino, 1980a: 337.

The type species: *Psammadius porcicollis* (Illiger)

The name *Brindalus* was first used by Landin (1960) in a combination *Phycochus (Brindalus) azoricus* Landin. Landin (1960) considered *Brindalus* Landin and *Sicardia* Reitter to be subgenera of the genus *Phycochus* Brown. In a revision of Australian *Psammodiini* (Rakovič, 1981) I refused this combination, however, I did not have a chance to examine the animal described by Landin (1960). Pittino (1980a), who examined a paratype found the *Phycochus (Brindalus) azoricus* Landin to be a synonym of *Psammadius porcicollis* (Illiger). Simultaneously, he proposed to remove two species — *Psammadius porcicollis* (Illiger) and *Psammadius rotundipennis* Reitter from my subgenera *Psammadius* s. str. and *Granulopsammadius*, respectively, and to put them into the subgenus *Brindalus* Landin. I completely agree with this action. The two species represented inhomogeneities in the two above mentioned subgenera. I just hesitated to consider a separate subgenus for two species. Pittino (1980a, 1983a) described further two *Psammadius* species which belong to this subgenus and which are not contained in my revision (Rakovič, 1981). Thus, at the present time, we can consider the subgenus *Brindalus* Landin to include the four species as follows.

Psammadius (Brindalus) porcicollis (Illiger)

Aphodius porcicollis Illiger, 1803: 195.

Psammobius porcicollis: Schmidt, 1922: 475 (rev.); Balthasar, 1964: 531 (rev.).

Psammobius rugulosus Mulsant, 1842, 323 (syn.).

Psammadius (s. str.) *porcicollis*: Rakovič, 1981: 58.

Phycochus (Brindalus) azoricus Landin, 1960: 65.

Psammadius (Brindalus) porcicollis: Pittino, 1980a: 342.

L. c.: Tavira, Portugal.

Neotype in Museum e Laboratorio Zoologico da Universidade de Coimbra (Port.).

Psammadius (Brindalus) rotundipennis Reitter

Psammadius rotundipennis Reitter, 1892: 159.

Psammadius (Granulopsammadius) rotundipennis: Rakovič, 1981: 74.

Psammadius (Brindalus) rotundipennis: Pittino, 1980a: 348.

Psammobius rotundicollis: d'Orbigny, 1896: 254 (lapsus).

L. c.: Andalusia.

Neotype in Museo Civico di Storia Naturale di Milano.

Psammodius (Brindalus) schatzmayri Pittino

Psammodius (Brindalus) schatzmayri Pittino, 1980a: 345.

L. c.: Mogador, Morocco.

Holotype in Museo Civ. do Storia Nat. di Milano.

The species was described by Pittino (1980a) on the basis of specimens found in collections, formerly mostly considered as *Psammodius porcicollis* (Illiger).

Psammodius (Brindalus) granulicollis Pittino

Psammodius (Brindalus) granulicollis Pittino, 1980a: 352.

L. c.: Tagiura, Tripolitania.

Holotype in Muséum d'histoire naturelle, Genève.

Pittino (1980a) distinguished this species from the *Psammodius rotundipennis* Reitter.

Psammodius (Brindalus) maderae (Pittino)

Psammodius (Brindalus) maderae Pittino, 1983a: 98.

L. c.: Madera Porto Santo, Madeira.

Holotype in Muséum d'histoire naturelle, Genève.

The typical series (13 specimens) comes from the isle Madeira.

Notes

Kim and Lumaret (1981) presented a study of ecological conditions for the life of *P. porcicollis* (Illiger) in South France. The occurrence of this species was shown to depend on the sand grain size and on the presence of plants. Laboratory experiments revealed these insects to remain unaffected by fasting or heating, by dry conditions or long exposure to fresh or sea water. The results may help to understand the wide distribution of *P. (B.) porcicollis* (Illiger) along Atlantic and Mediterranean sandy shores.

Key to species of the sbg. *Brindalus* Landin

- 1 (6) The tenth elytral interval achieving only 1/2 elytra length.
- 2 (3) The first to fourth transverse ridges of the pronotum quite flat. The width of elytral striae equals 1/2 of that of elytral intervals. Reddish brown, 3.7 to 4.5 mm. — Madeira

P. (B.) maderae Pittino

- 3 (2) All the pronotal ridges of about the same height, convex. The elytral striae width at most $1/4$ to $1/3$ of the elytral interval width.
- 4 (5) Elytral intervals (when observing a specimen from side, in an inclined position) granulate on the disc. Reddish brown to dark brown. 3.3 to 4.3 mm. — Morocco, Canary
P. (B.) schatzmayri Pittino
- 5 (4) Elytral intervals quite smooth on the disc. Reddish brown to dark brown, 2.6 to 4.9 mm. — S. England, Portugal, Spain, France, Italy, Corsica, Sicily, Greece, Crete, Turkey, Austria (?), Hungary (?), The Azores, Canary, Morocco, Algeria, Libya, United Arab Republic, Syria, Lebanon
P. (B.) porcicollis (Illiger)
- 6 (1) The tenth elytral interval complete, extended nearly up to the elytra apex.
- 7 (8) The first pronotal ridge broken into discrete tubercles, lower than the remaining four ridges. Dark brown, 3.5 to 4.1 mm. — Libya
P. (B.) granulicollis Pittino
- 8 (7) All the pronotal ridges continuous, their surfaces at about the same level. Dark brown, 2.8 to 3.9 mm. — S. Spain, S. Italy, Morocco, Algeria, Tunisia
P. (B.) rotundipennis Reitter

Conclusion

Today, 59 species of the genus *Psammodius* Fallén are known from the Old World. They fall in the following four subgenera:

Psammodius (Leiopsammodius) Rakovič — 22 species. This is a subgenus with a typically southern distribution. Four species are present in the Palearctic Region (Europe, North America, Arabic countries, Iran, Japan), one is shared with the Palearctic and Ethiopian Regions, ten and three species occur in Ethiopian and Oriental Regions, respectively, and one species is shared with these two regions. The Japanese species and three European species (Hungary, Bulgaria, Greece) represent a northern limit of the distribution. The fact that *Leiopsammodius* Rakovič is a southern subgenus is also supported by that it also occurs in the Australian Region (4 species) and in the Western Hemisphere (26 species) — Southern U. S., Mexico, isles in the Caribbean Sea, Central America and South America.

Psammodius s. str. — 20 species, out of them 13 and 7 species occur in the Palearctic and Oriental regions, respectively. This subgenus is present only in the Old World.

Granulopsammodius Rakovič — 11 species. The species of this sub-

genus are characteristic for North Africa and Eastern Palearctic areas. The southern limit of its distribution is in Somalia (one species).

Brindalus Landin — 5 species — is a morphologically very homogeneous subgenus and its distribution is also rather limited — The Azores, Canary, W. Mediterranean area, North Africa and Arabic countries.

Thus, the four subgenera can be not only easily differentiated from each other morphologically. They also have characteristic areas of their distribution.

References

- Ádám, L., 1979: Lamellicornia (Coleoptera) from Tunisia. *Folia ent. hung.*, 32 (1): 5—10.
- Ádám, L., 1980: Lamellicornia aus Nesten von Vögeln und Säugetieren (Coleoptera). *Folia ent. hung.*, 41 (2): 17—19.
- Balthasar, V., 1964: Monographie der Scarabaeidae und Aphodiidae der paläarktischen und orientalischen Region, Band 3, Praha, NČSAV, 652 pp.
- Baraud, S., Branco, T., 1980—81: Nouveaux Coléoptères Scarabaeoïdes de la faune ibérique. *Bolm Soc. port. Cienc. nat.*, 20: 91—95.
- Chromý, J., 1983: A new *Psammodius* Fallén Species from Europe belonging to the subgenus *Leiopsammodius* Rakovič (Coleoptera, Scarabaeidae). *Acta ent. bohemoslov.*, 80: 210—214.
- Endrődi, S. and Rakovič, M., 1981: Key to the Species of South and South West African Aphodiinae. *Folia ent. hung.*, 42: 31—77.
- Illiger, J. K. W., 1803: Verzeichnis der in Portugal einheimischen Käfer. *Mag. Ins. Kunde*, 2: 186—258.
- Kim, J. I., 1980: Deux nouvelles espèces sabulenses appartenant au genre *Psammodius* (Col. Aphodiidae) de la Corée. *The Korean J. Ent.*, 10 (1): 7—8.
- Kim, J. I. and Lumaret, J. P., 1981: Écologie de *Psammodius porcicollis* (Ill.) (Col., Aphodiidae), insecte sabulicole des dunes littorales du golfe du Lion. *Annls. Soc. ent. Fr.*, 17: 449—462.
- Landin, B. O., 1960: The Lamellicorn beetles of the Azores (Coleoptera) with some reflexions on the classification of certain Aphodiini. *Bolm. Mus. munic. Funchal.*, 32 (13): 49—81.
- Menci, L., 1982: Eine neue Art der Gattung *Psammodius* aus Bulgarien (Coleoptera, Aphodiidae). *Acta ent. bohemoslov.*, 79: 310—314.
- Mulsant, E., 1842: Histoire Naturelle des Coléoptères de France. Lamellicornes. Paris-Lyon.
- Orbigny, H., 1896: Synopsis des Aphodiens d'Europe et du bassin de la Méditerranée. *Abeille*, 28: 197—271.
- Pierotti, H., 1980: *Psammodius belloi* n. sp. di Grecia (Coleoptera, Aphodiidae). *Boll. Mus. civ. Stor. nat. Verona*, 411—413.
- Pittino, R., 1980a: Revisione del genere *Psammodius* Fallén: 4 le species palearctiche del sottogenere *Brindalus* Landin (Coleoptera, Aphodiidae). *Atti Soc. ital. Sci. nat.*, 121: 337—359.
- Pittino, R., 1980b: Revisione del genera *Psammodius* Fallén: 3. Le specie del gruppo *plicatulus* del Continente Antico (Coleoptera, Aphodiidae). *Revue suisse Zool.* (Genève), 87: 67—79.
- Pittino, R., 1982: Revisione del genera *Psammodius* Fallén: 6. considerazioni tassonomiche su alcune specie a nuove segnalazioni (Coleoptera, Aphodiidae) (XXI Contributo alla conoscenza dei Coleoptera Scarabaeoidea). *Boll. Soc. ent. ital.* (Genova), 114: 159—164.

- Pittino, R., 1983a: Revisione del genere „Psammodius“ Fallén: 5. Una nuova specie del sottogenere „Brindalus“ Landin dell'Isola di Madera (Coleoptera, Aphodiidae). *Revue suisse Zool.* (Genève), 90, 97—100.
- Pittino, R., 1983b: Psammodiini nuovi o interessanti di Europa, Asia e Africa (Coleoptera, Aphodiinae) (XXII contributo alla conoscenza dei Coleoptera Scarabaeoidea). *G. it. Ent.*, 1: 91—122.
- Pittino, R., 1984: Taxonomic considerations on types revisions, lectotypes designations and descriptions of new or little known Psammodiini from Palearctic, Oriental and Ethiopian Regions (Coleoptera, Aphodiidae) (XXVI contribution to the knowledge of Coleoptera Scarabaeoidea). *G. it. Ent.*, 2: 13—98.
- Rakovič, M., 1979: On some Psammodius Fallén from the Seychelles and La Réunion Coleoptera, Scarabaeidae). *Revue Zool afr.* (Tervuren), 93: 633—638.
- Rakovič, M., 1981: A revision of the Psammodius Fallén species from Europe, Asia and Africa. *Rozp. CSAV, Rada MPV*, 91 (1): 82 pp. + 5 pl.
- Rakovič, M., 1984: A review of the genus *Tesarius* Rakovič (Coleoptera, Scarabaeidae, Aphodiinae). *Acta ent. bohemoslov.*, 81: 448—452.
- Reitter, E., 1892: Bestimmungstabelle der Lucanides und coprophagen Lamellicornien. XXIV. Heft. Brün, Verlag des Verfassers, 230 pp.
- Schmidt, A., 1922: Das Tierreich, Aphodiinae. Berlin und Leipzig, Walter de Gruyter et Co., 614 pp.
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