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Taxonomic studies on *Psammoecus* Latreille (Coleoptera, Silvanidae, Brontinae) from the Indian subcontinent and new records from adjacent regions

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Abstract. Diagnoses for species of the genus *Psammoecus* Latreille, 1829 known from the Indian subcontinent are provided. Three new species of *Psammoecus* are described: *Psammoecus convexicollis* sp. nov., *P. pandu* sp. nov., and *P. rahu* sp. nov. *Psammoecus incommodus* (Walker, 1859), formerly synonymised with *P. trimaculatus* Motschulsky, 1858, is restituted. Six new synonyms are discovered: *Psammoecus convexus* Grouvelle, 1888 = *P. khasia* Pal, 1985 syn. nov.; *Psammoecus hirsutus* Olliff, 1883 = *P. tereticollis* Grouvelle, 1919 syn. nov.; *Psammoecus incommodus* (Walker, 1859) = *P. gratiosus* Grouvelle, 1908 syn. nov. and = *P. labyrinthicus* Yoshida & Hirowatari, 2014 syn. nov.; *Psammoecus nitidus* Grouvelle, 1908 = *P. impressicollis* Grouvelle, 1908 syn. nov. and = *P. personatus* Grouvelle, 1919 syn. nov. Faunistic data, including numerous new records for the Indian subcontinent and adjacent areas, are provided.

Keywords. Coleoptera, *Psammoecus*, taxonomy, Indian subcontinent.

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Introduction

The Old World genus *Psammoecus* Latreille, 1829 (Coleoptera, Silvanidae, Brontinae, Telephanini) is the second largest genus within the Silvanidae Kirby, 1837. It represents a dark taxon in the sense that its numerous species are small in size and inconspicuous in appearance, have attracted the interest of only few collectors and taxonomists, and are therefore poorly known.

Psammoecus is composed of about 80 described species (Thomas & Leschen 2010). Grouvelle (1908) published the first comprehensive treatise on *Psammoecus* from India and Sri Lanka, mentioning 12 species. Hetschko (1930) listed 16 species of *Psammoecus* for the Indian subcontinent including Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, and Sri Lanka: *Psammoecus andrewesi* Grouvelle, 1888; *P. bellus* Grouvelle, 1908; *P. decoratus* Grouvelle, 1919; *P. delicatus* Grouvelle, 1908; *P. elegans*

Grouvelle, 1908; *P. felix* (Waterhouse, 1876); *P. gentilis* Grouvelle, 1908; *P. gratiosus* Grouvelle, 1908; *P. harmandi* Grouvelle, 1912; *P. impressicollis* Grouvelle, 1908; *P. incommodus* (Walker, 1859); *P. lepidus* Grouvelle, 1908; *P. nitidus* Grouvelle, 1908; *P. raffrayi* Grouvelle, 1919; *P. simoni* Grouvelle, 1892; *P. trimaculatus* Motschulsky, 1858.

In 1979, T.K. Pal and T. Sengupta described *Psammoecus wittmeri* from Darjeeling. Based on parts of his 1979 doctoral thesis, Pal (1985) published a revision of Indian *Psammoecus*. He recorded 16 species occurring in Bhutan, India, Nepal, and Sri Lanka and described five of them as new. He also provided illustrations of the genitalia of some species. The contents of this paper were again published by Sengupta & Pal (1996).

As part of a revision of the entire genus *Psammoecus*, specimens from the Indian subcontinent and adjacent regions were examined, including type material. Besides adding to the knowledge of the distribution of known species, the studies led to the discovery of three new species, six new synonyms, and the restitution of a formerly synonymized species.

Material and methods

The preparation of genitalia followed the protocol outlined by Karner (2012, 2020). Images were produced as described by Karner (2020), eye distance is measured between the inner margins of the eyes at their closest distance; all other measurements are according to the definitions given by Karner (2020). To avoid damage to the extremely fragile pubescence, no surface cleaning of specimens was attempted (see also Karner 2014).

Observations and measurements were made with an Olympus SZX16 stereo microscope. Habitus photographs were taken with a Canon EOS 7D Mark II digital camera and a Canon MP-E 65 mm macro objective. Higher magnifications for photography of head, pronotum, and antennae were obtained with Mitutoyo M Plan Apo objectives (10× and 20×), attached to Asahi Takumar 200 mm and Carl Zeiss MC Sonnar 135 mm telephoto lenses. Genitalia were photographed with a Canon EOS 7D Mark II digital camera attached to an Olympus CH microscope. Images and image layers were processed with Zerene Stacker (ver. 1.04), Adobe Lightroom 5.7 and GIMP (ver. 2.10.30) software.

A total of 417 specimens from the following collections were studied:

EUMJ	=	Ehime University Museum, Matsuyama, Japan
HNHM	=	Hungarian Natural History Museum (Termesztudományi Múzeum), Budapest, Hungary
MHNG	=	Muséum d'histoire naturelle de la Ville de Genève, Geneva, Switzerland
MKF	=	coll. Michael Karner, Frankfurt, Germany
MNHN	=	Muséum national d'Histoire naturelle, Paris, France
MSNG	=	Museo civico di Storia naturale Giacomo Doria, Genova, Italy
NHMUK	=	Natural History Museum, London, UK
NHRS	=	Swedish Museum of Natural History (Naturhistoriska Riksmuseet), Entomology Collections, Stockholm, Sweden
NMB	=	Naturhistorisches Museum Basel, Basel, Switzerland
NMEG	=	Naturkundemuseum Erfurt, Erfurt, Germany
NMPC	=	National Museum Prague, Prague, Czech Republic
SHTU	=	Shanghai Normal University, Department of Biology, Insect Collection, Shanghai, China
ZMHB	=	Museum für Naturkunde der Humboldt-Universität, Berlin, Germany

For type material from previous authors, label data are cited verbatim.

Results

Class Insecta Linnaeus, 1758
Order Coleoptera Linnaeus, 1758
Superfamily Cucujoidea Latreille, 1802
Family Silvanidae Kirby, 1837
Subfamily Brontinae Erichson, 1845
Tribe Telephanini LeConte, 1861

Genus *Psammoecus* Latreille, 1829

Ecology

As far as ecological information is available, species of *Psammoecus* are associated with plant detritus as well as dead and moldy leaves. Specimens are usually collected at light, in flight intercept and pitfall traps, and in various types of plant detritus. Ecological information is only occasionally provided on specimen labels, so it is currently neither possible to reliably discern ecological specifics, nor to distinguish ecological preferences of different species.

Psammoecus convexus Grouvelle, 1888

Fig. 1

Psammoecus convexus Grouvelle, 1888: 628.

Psammoecus khasia Pal, 1985: 12. **Syn. nov.**

Psammoecus convexus – Hetschko 1930: 82.

Psammoecus khasia – Sengupta & Pal 1996: 165.

Diagnosis

The following combination of character states distinguishes this species:

Body (Fig. 1A) oval, dark testaceous, elytra with small piceous maculae at posterior $\frac{1}{3}$, antennae uniformly testaceous; head (Fig. 1B) transversely impressed behind eyes, within that impression with about 15 large, flat punctures with a diameter somewhat larger than an eye facet, frontal grooves curved, deep, almost attaining posterior margin of eyes, punctuation on vertex moderate, punctures strongly elongate, of variable size, mostly about $\frac{5}{3}$ as long as eye facet diameter, pubescence on vertex composed of setae of variable length, directed anteriorly, microsculpture on vertex absent; eyes small, strongly protruding, somewhat unevenly rounded with stronger curvature posteriorly; temples small, very steep, temple angle 41° ; antennae (Fig. 1D) short, stout; pronotum (Fig. 1C) widest near middle, pronotal punctuation denser than on head, punctures widened, pubescence as on head, setae directed medially, microsculpture on pronotal disk absent, lateral pronotal margins with seven small teeth, tooth I much smaller than teeth II–VII, anterior denticles distinct, slightly larger than lateral tooth I, posterior denticles minute, tubercle-like; scutellum with transverse carina; elytra (Fig. 1A) widest at middle, striae distinctly wider than interstices, elytral pubescence composed of short strial and slightly longer interstitial setae, setae on interstices longer and more erect towards lateral margins and elytral apex, anterior half of elytral margin serrate, bearing long setae, microsculpture on elytral disk absent; male genitalia (Fig. 1E–H) moderately sclerotized, median lobe lancet-shaped with blunt tip, apex bent ventrally, parameres wide, flat, widened towards apical $\frac{1}{3}$, apical part with numerous long setae along margins.

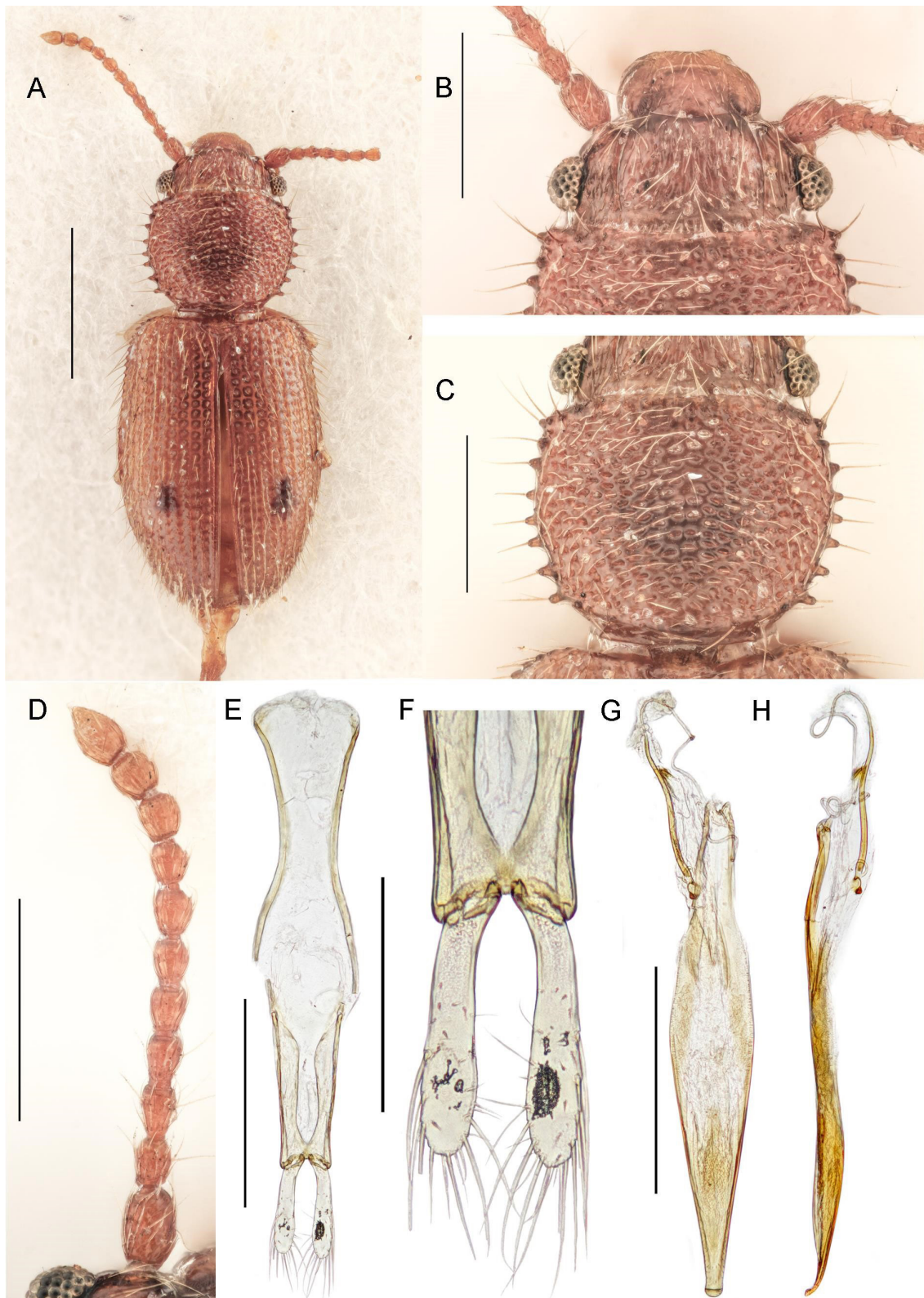


Fig. 1. *Psammoecus convexus* Grouvelle, 1888. **A–D.** Lectotype, ♀ (MSNG). **A.** Habitus. **B.** Head. **C.** Pronotum. **D.** Left antenna. **E–H.** Male specimen from Chiang Mai Province, Thailand (NMB). **E.** Tegmen, ventral view. **F.** Parameres, ventral view. **G.** Median lobe, dorsal view. **H.** Median lobe, lateral view. Scale bars: A = 1.0 mm; B–E, G–H = 0.5 mm; F = 0.2 mm.

Type material

Lectotype (by present designation)

MYANMAR • ♀; “Teinzo / Birmania / Fea, Maggio 1886 // Typus [red print] // *convexus* / Grouv. // *Psammoecus* [sic!] / *convexus* / typus! Grouv. [not Grouvelle’s hand]”; MSNG.

Paralectotype

MYANMAR • 1 ♀; “Bhamò / Birmania / Fea VIII 1886 // Syntypus / *Psammoecus* / *convexus* / Grouvelle, 1888 [red label]”; MSNG.

Other material examined

CHINA – **Yunnan** • 1 ♂; Nabanhe Nature Reserve, Mandian; 12 Jan. 2004; Li and Tang leg.; SHTU.

THAILAND – **Chiang Mai** • 1 ♂; Chiang Mai, Daen Lao Range, Doi Chiang Lao; 1000 m a.s.l.; 19°25' N, 98°52' E; 17–24 May 1991; Kubán leg.; NMB.

VIETNAM – **Lào Cai** • 1 spec.; Lào Cai; 26 Nov. 1971; Topál leg.; HNHM • 1 spec.; Lào Cai, Co-xan; 27 Nov. 1971; Topál leg.; HNHM.

Distribution

Psammoecus convexus was previously recorded from Myanmar and India (the latter record by Pal 1985 as *P. khasia*); it is now recorded for the first time from China, Thailand, and Vietnam.

Remarks

The sex of the holotype of *Psammoecus khasia* is unknown; Pal (1985) gives no description of genitalia. A photograph of the holotype by Mrs Sheela Ghosh (Zoological Survey of India, Kolkata) was provided to the present author. *Psammoecus convexus* is a very distinct species; the photograph leaves no doubt that the holotype of *P. khasia* is conspecific with it.

Psammoecus convexicollis sp. nov.

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Figs 2–3

Etymology

The specific epithet refers to the rounded surface of the pronotum.

Type material

Holotype

SRI LANKA • ♂; 12 Apr. 1881; G. Lewis leg.; NHMUK.

Paratypes

SRI LANKA – **Central Province** • 1 ♀; Dikoya; 1160–1280 m a.s.l.; 6 Dec. 1881–16 Jan. 1882; G. Lewis leg.; NHMUK • 1 ♀; Nuwara Eliya; 1900–2440 m a.s.l.; 6–11 Nov. 1882; G. Lewis leg.; NHMUK.

Description of holotype

BODY (Fig. 2A). Oval, length 2.42 mm; testaceous, elytra with brown maculae at middle connected with brown sutural macula behind middle, antennomere 7 slightly darkened towards apex, antennomere 8 brown, antennomeres 9–10 dark brown, antennomere 11 castaneous.

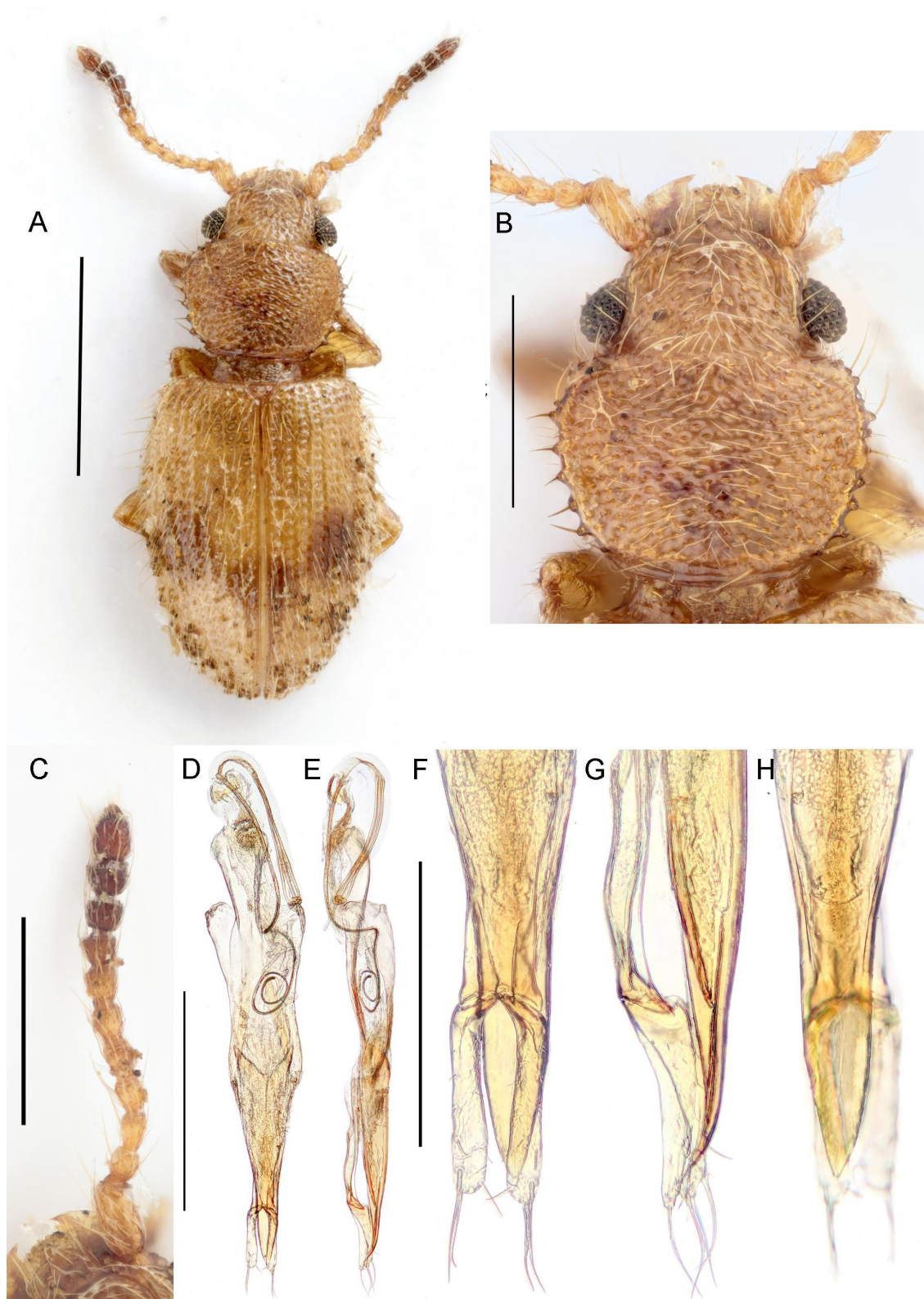


Fig. 2. *Psammoecus convexicollis* sp. nov., holotype, ♂ (NHMUK). **A.** Habitus. **B.** Head and pronotum. **C.** Right antenna. **D.** Aedeagus, ventral view. **E.** Aedeagus, lateral view. **F.** Detail of aedeagus, ventral view. **G.** Detail of aedeagus, lateral view. **H.** Detail of aedeagus, dorsal view. Scale bars: A = 1.0 mm; B–E = 0.5 mm; F–H = 0.2 mm.

HEAD (Fig. 2B). $1.83 \times$ as wide as long. Frontal grooves distinct, strongly curved, converging anteriorly, subparallel posteriorly, almost attaining anterior $\frac{1}{3}$ of eyes. Vertex with moderate punctation; punctures distinctly elongate, directed antero-medially, as large as eye facet diameter. Pubescence on vertex directed antero-medially, most setae of moderate length, about $\frac{2}{5}$ as long as eyes, few setae on lateral parts of vertex and adjacent to eyes longer, $\frac{4}{5}$ as long as eyes, setae near eyes directed antero-laterally. Microsculpture on vertex absent. Eyes 0.16 mm long, protruding, irregularly rounded with strongest curvature near temples, separated from vertex by a distinct groove; eye distance 0.42 mm. Temples (Fig. 3) very strongly curved, steep, temple angle 100° . Antennae (Fig. 2C) short, stout, 1.22 mm long, antennomere proportions 2.8 : 1.2 : 1.3 : 1.3 : 1.3 : 1.2 : 1.3 : 1.0 : 1.0 : 1.0 : 2.1.

PRONOTUM (Fig. 2B). $1.35 \times$ as wide as long, widest at anterior $\frac{2}{5}$; at anterior denticles $1.23 \times$ as wide as at posterior denticles. Lateral margins curved along entire length, curvature stronger anteriorly, with five distinct, small teeth, teeth I and V slightly larger than teeth II–IV. Anterior denticles small, spread across a large area on anterior pronotal angle; posterior denticle distinct. Punctation on disk as on vertex, punctures strongly widened, almost slit-like; setae on disk as long as on vertex, directed medially. Microsculpture on disk absent.

ELYTRA (Fig. 2A). Oval, humeral swelling comparatively weak, $1.43 \times$ as long as wide; widest at middle. Striae distinctly wider than interstices, interstitial setae slightly longer than strial setae; 10th interstice along basal half of elytra with small denticles bearing long setae. Microsculpture on disk absent.

MALE GENITALIA (Fig. 2D–H). Moderately sclerotized. Median lobe evenly narrowed towards apex, slender, lancet-shaped, slightly bent ventrally near apex. Parameres in ventral view elongate, slightly widened towards apical third; in lateral view with wide basis, evenly narrowed toward apex; bearing few short setae along entire length, one longer seta at medial face of apex and two long, thick setae at lateral face of apex.

Variation

Paratypes range in body length from 2.45 mm to 2.65 mm. The body colouration of both paratypes is distinctly brighter than the colouration of the holotype.

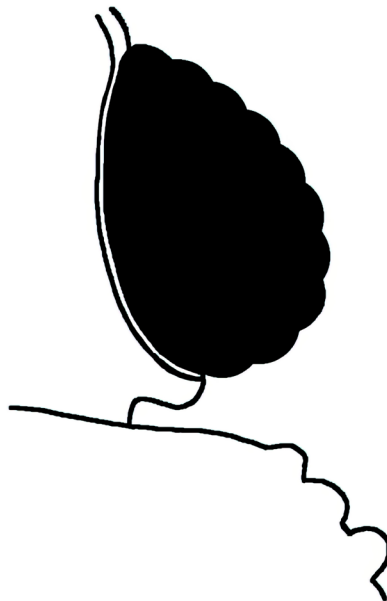


Fig. 3. *Psammoecus convexicollis* sp. nov. Shape of right temple and eye.

Distribution

Psammoecus convexicollis sp. nov. has only been found in Sri Lanka.

Remarks

The habitus of *Psammoecus convexicollis* sp. nov. somewhat resembles that of *P. convexus* Grouvelle, 1888. It differs from *P. convexus* by its colouration, the distinct, well rounded temples, more transverse pronotum, the scutellum bearing no transverse carina, and the shape of the male genitalia.

Psammoecus andrewesi Grouvelle, 1908

Fig. 4

Psammoecus andrewesi Grouvelle, 1908: 476.

Psammoecus andrewesi – Hetschko 1930: 81. — Pal 1985: 10. — Sengupta & Pal 1996: 164.

Diagnosis

The following combination of character states distinguishes this species:

Body (Fig. 4A) oval, testaceous, elytra with dark maculae, antennomeres 11 or 10 and 11 in few specimens very slightly brighter; head (Fig. 4B) with distinct, deep, almost straight frontal grooves that attain anterior $\frac{3}{5}$ of eyes, punctation on vertex moderate, punctures elongate, slightly smaller than eye facet diameter, pubescence on vertex moderate, setae directed anteriorly, microsculpture on vertex mostly absent, in some specimens shallow, reticulate; eyes small, strongly protruding, somewhat unevenly rounded with stronger curvature posteriorly; temples very short, steep, almost obsolete; antennae (Fig. 4D) short, stout; pronotum (Fig. 4C) widest at anterior third, pronotal punctation moderate, punctures elongate, slightly shorter than eye facet diameter, microsculpture distinct, composed of transverse wrinkles, pronotal pubescence as on vertex, setae directed antero-medially, lateral pronotal margins with 6–8 short teeth, anterior denticles distinct, very large, hindmost one positioned behind anterior angle, appearing to be lateral tooth I, posterior denticle absent; scutellum with transverse carina; elytra (Fig. 4A) widest near anterior third, with irregular piceous maculae typically forming patches at anterior and posterior third that are connected by darkened areas along the third and fifth interstices, elytral pubescence moderate, longer setae on outmost interstices, anterior half of lateral elytral margin distinctly serrate, bearing long setae; male genitalia (Fig. 4E–H) weakly sclerotized, aedeagus with slim strut about $\frac{9}{10}$ as long as body, apex of median lobe blunt, rounded, parameres long, parallel-sided, with five distinct, long setae near apex and numerous smaller setae on inner face.

Type material

Lectotype (by present designation)

INDIA • ♂; “Type [round label with red border] // Nilgiri Hills. / H. L. Andrewes. // H. L. Andrewes / Nilgiri Hills // Andrewes / Bequest / B.M. 1922-221. // *Psammoecus / andrewesi* / ty. Grouv [Grouvelle’s hand] // Type [red label]”; NHMUK.

Paralectotype

INDIA • 1 spec.; “Co- / type [round label with blue border] // Nilgiri Hills. / H. L. Andrewes. // H. L. Andrewes / Nilgiri Hills // Andrewes / Bequest / B.M. 1922-221. // *Psammoecus / andrewesi* / ty. Grouv [Grouvelle’s hand]”; NHMUK.

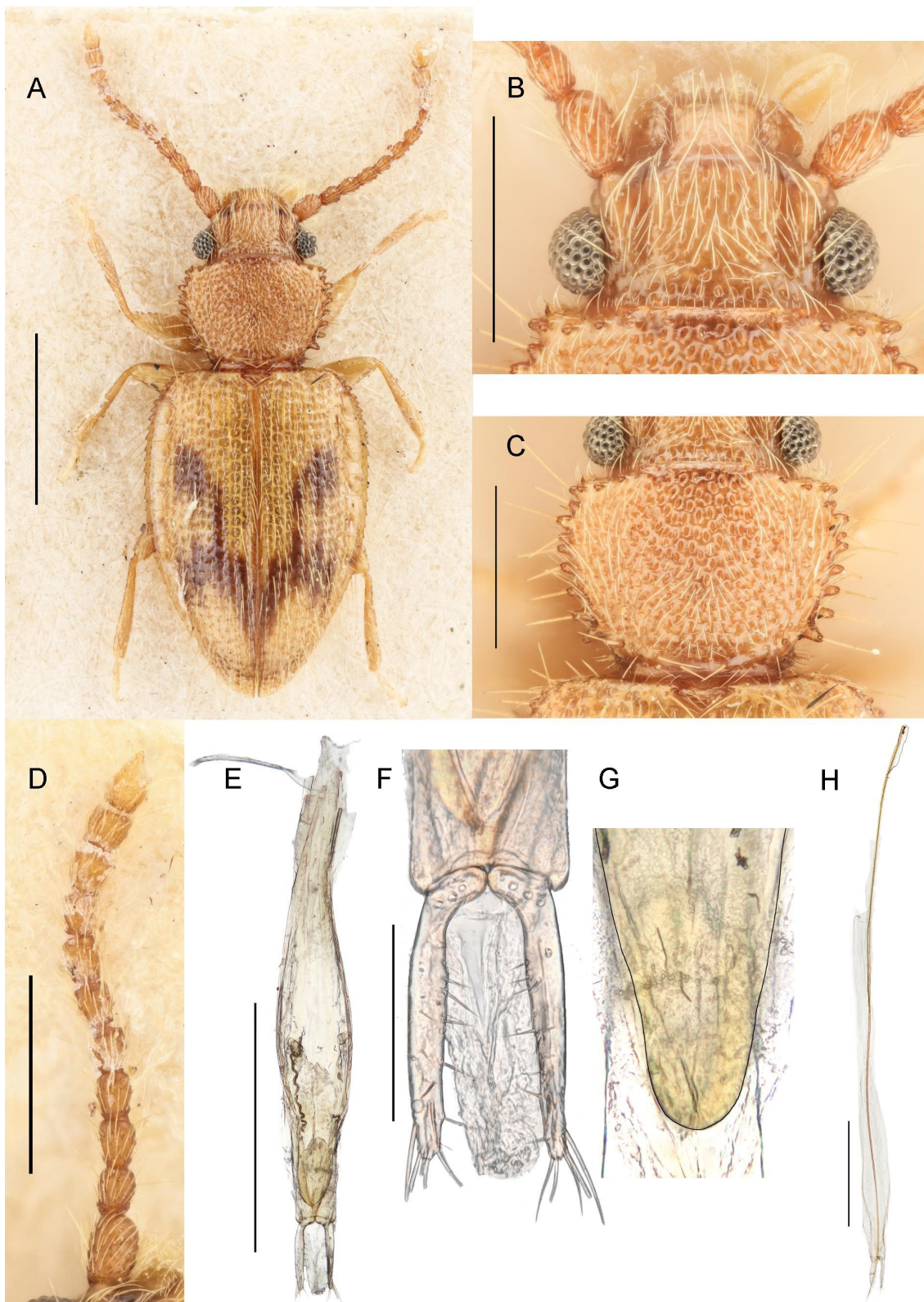


Fig. 4. *Psammoecus andrewesi* Grouvelle, 1908. **A–G.** Lectotype, ♂ (NHMUK). **A.** Habitus. **B.** Head. **C.** Pronotum. **D.** Left antenna. **E.** Aedeagus, ventral view. **F.** Aedeagus, detail of ventral view. **G.** Aedeagus, detail of median lobe, dorsal view. **H.** Male specimen from Nepal, Bagmati (NMEG), aedeagus, ventral view. Scale bars: A = 1.0 mm; B–E, H = 0.5 mm; F–G = 0.1 mm.

Other material examined

INDIA – **Kerala** • 1 spec.; Idukki, Thekkady; 29 Apr. 2006; Aneesh leg.; pitfall trap; HNHM. – **Tamil Nadu** • 2 specs; Nilgiri Hills, 15 km SE of Kotagiri, Kunchappanai; 900 m a.s.l.; 17–28 Nov. 1993; Boukal and Keyval leg.; MKF.

NEPAL – **Bagmati** • 1 spec.; Chitwan, Sauraha, Hotel Sweet Home; 27°35'10" N, 84°29'29" E; 190 m a.s.l.; 5–7 Jul. 2022; Kopetz leg.; at light; NMEG • 9 specs; Kathmandu, Gokarna Forest; 1400 m a.s.l.; 30 Mar. 1981; Löbl and Smetana leg.; MHNG • 7 specs; same locality as for preceding; 31 Mar. 1981; Löbl and Smetana leg.; MHNG • 11 specs; same locality as for preceding; 1 Apr. 1981; Löbl and Smetana leg.; MHNG • 1 spec.; same locality as for preceding; 1300 m a.s.l.; 20 Oct. 1983; Smetana and Löbl leg.; MHNG.

THAILAND – **Nakhon Ratchasima** • 1 spec.; Pak Chong District, Khao Yai National Park; 750–850 m a.s.l.; 26 Nov.–3 Dec. 1985; Burckhardt and Löbl leg.; MHNG • 1 spec.; Pak Chong District, Khao Yai National Park, E Haew Suwat Waterfalls; 800–900 m a.s.l.; 1 Dec. 1985; Burckhardt and Löbl leg.; MHNG.

Distribution

Psammoecus andrewesi was previously found in India and Nepal and is now for the first time recorded from Thailand.

Remarks

Pal (1985) gives a redescription based on three specimens, stating that T. Sengupta compared his material with the types at the NHMUK. Due to its very distinctive external characters, the determination of *Psammoecus andrewesi* is comparatively simple.

The extremely long strut-like structure of the male genitalia is not connected to the tegmen, but seemingly a structure within the internal sac of the penis. It is remarkable and, so far, unique within the genus. During preparation of the respective specimen, the strut was pulled out of the anterior part of the body, without appearing curled or folded. It is not clear whether this structure truly extends from the abdominal tip anteriorly to the head in living animals, or whether it is folded or coiled within the abdomen.

Psammoecus incommodus (Walker, 1859) sp. restit.
Figs 5–6

Cucujus incommodus Walker, 1859: 53.

Psammoecus gratiosus Grouvelle, 1908: 484. **Syn. nov.**

Psammoecus labyrinthicus Yoshida & Hirowatari, 2014: 29. **Syn. nov.**

Cucujus incommodus – Waterhouse 1876a: 14.

Telephanus incommodus – Waterhouse 1876b: 124.

Psammoecus trimaculatus – Grouvelle 1908: 476. — Pal 1985: 41. — Sengupta & Pal 1996: 186 (misidentification).

Psammoecus incommodus – Hetschko 1930: 83.

Psammoecus labyrinthicus – Yoshida *et al.* 2018: 12.

Diagnosis

The following combination of character states distinguishes this species:

Body (Fig. 5A) oval, testaceous, head and margins of pronotum often darkened, elytra with piceous maculae and mostly with darkened apices, antennomeres 7–10 or 8–10 piceous, antennomere 11

yellowish white; head (Fig. 5B) with distinct frontal grooves that are curved outwards, attaining anterior $\frac{1}{4}$ of eyes, vertex with sparse punctation, punctures round, small, slightly larger than half of eye facet diameter, pubescence on vertex of moderate length, setae directed anteriorly, microsculpture on vertex distinct, reticulate; eyes large, protruding, evenly rounded; temples distinct, evenly rounded, temple angle 66° ; antennae (Fig. 5D) moderately slender; pronotum (Fig. 5C) widest at anterior $\frac{1}{3}$, pronotal disk with moderate punctation, punctures in most specimens slightly elongated antero-medially, in few specimens almost round, pubescence moderate, setae of varying length, directed antero-medially, microsculpture on pronotal disk distinct, reticulate, lateral margin with five teeth, teeth III and IV largest, of similar size, tooth II somewhat smaller, teeth I and V very small, anterior denticles distinct, small, posterior denticle very small and inconspicuous; elytra (Fig. 5A) oval, with piceous maculae near middle and at suture at posterior $\frac{1}{3}$, in most specimens with dark apex, in some specimens with slightly darkened basis, elytral striae somewhat wider than interstices, pubescence of moderate length, interstitial setae longer and more erect than striae setae, 10th interstice with long setae near humeral swelling, setae gradually shorter towards elytral apex, microsculpture on elytral disk absent; male genitalia (Fig. 5E–G) moderately sclerotized, median lobe with comparatively wide apical part, narrowed in a convex, then concave curve towards blunt tip, parameres club-shaped, widened basal part $\frac{2}{5}$ as long as entire paramere, inner margin with short setae, apex with long seta.

Type material

Holotype of *Psammoecus incommodus*

SRI LANKA • ♂; “Type [round label with red border] // [18]63 / 52 [round label] // *incommodus* / W. // *Cucujus* ?” [last two labels in Walker’s hand]; NHMUK.

The locality Sri Lanka is inferred from the title of Walker’s paper (‘Characters of some apparently undescribed Ceylon Insects’, Walker 1859). The NHMUK registration number on the holotype ‘[18]63/52’ refers to 175 Coleoptera including types, collected by Mr Walker in Sri Lanka (M.V.L. Barclay pers. com.).

Holotype of *Psammoecus gratiosus*

INDIA • ♂; “H. L. Andrewes / Nilgiri Hills // Type [red label] // *Psammoecus* / *gratiosus* / ty. Grouv [in Grouvelle’s hand]”; MNHN.

Holotype of *Psammoecus labyrinthicus*

JAPAN • ♂; “I. Hachijo / Tokyo Pref. / July. 21. 1957 / S. Hisamatsu // HOLOTYPE: ♂ / *Psammoecus labyrinthicus* / Yoshida & Hirowatari, / 2014 [red label]”; EUMJ.

Other material examined

CHINA – **Fujian** • 1 spec.; Kuantun, Tschung Sen; 26 Mar. 1946; HNHM • 19 specs; Wuyishan Mountains National Nature Reserve, Guadun env.; 1075–1250 m a.s.l.; $27^\circ44.02'$ N, $117^\circ38.37'$ E; 25 and 29 May 2018; Hájek, Král, Růzicka and Sekerka leg.; tea plantation, mixed forest and bamboo; NMPC • 4 specs; same data as for preceding; MKF. – **Guangdong** • 1 spec.; Danxia Shan National Park, Wo Long Gang Forest Walkway; 100 m a.s.l.; $25^\circ1.3'$ N, $113^\circ44.5'$ E; 23–26 Apr. 2013; Hájek and Ruzicka leg.; NMPC • 2 specs; Nangling National Nature Reserve, Dadongshan; 690 m a.s.l.; $24^\circ56.0'$ N, $112^\circ42.9'$ E; 18–21 Apr. 2013; Hajek and Ruzicka leg.; NMPC • 1 spec.; same data as for preceding; MKF. – **Zhejiang** • 1 spec.; Chusan Id.; NHMUK.

INDIA • 1 spec.; India [‘Ind. or.’]; Motschulsky leg.; NHRS. – **Arunachal Pradesh** • 1 spec.; Bhalukpong; 150 m a.s.l.; $27^\circ02'$ N, $92^\circ35'$ E; 26 May–3 Jun. 2006; Dembicky leg.; NHMUK.

LAOS – **Houaphanh** • 2 specs; Ban Saluei, Phu Phan Mountain; 1300–2000 m a.s.l.; $20^\circ13'$ N, $103^\circ59'$ E; 6–18 May 2004; Bezdek leg.; NMPC.

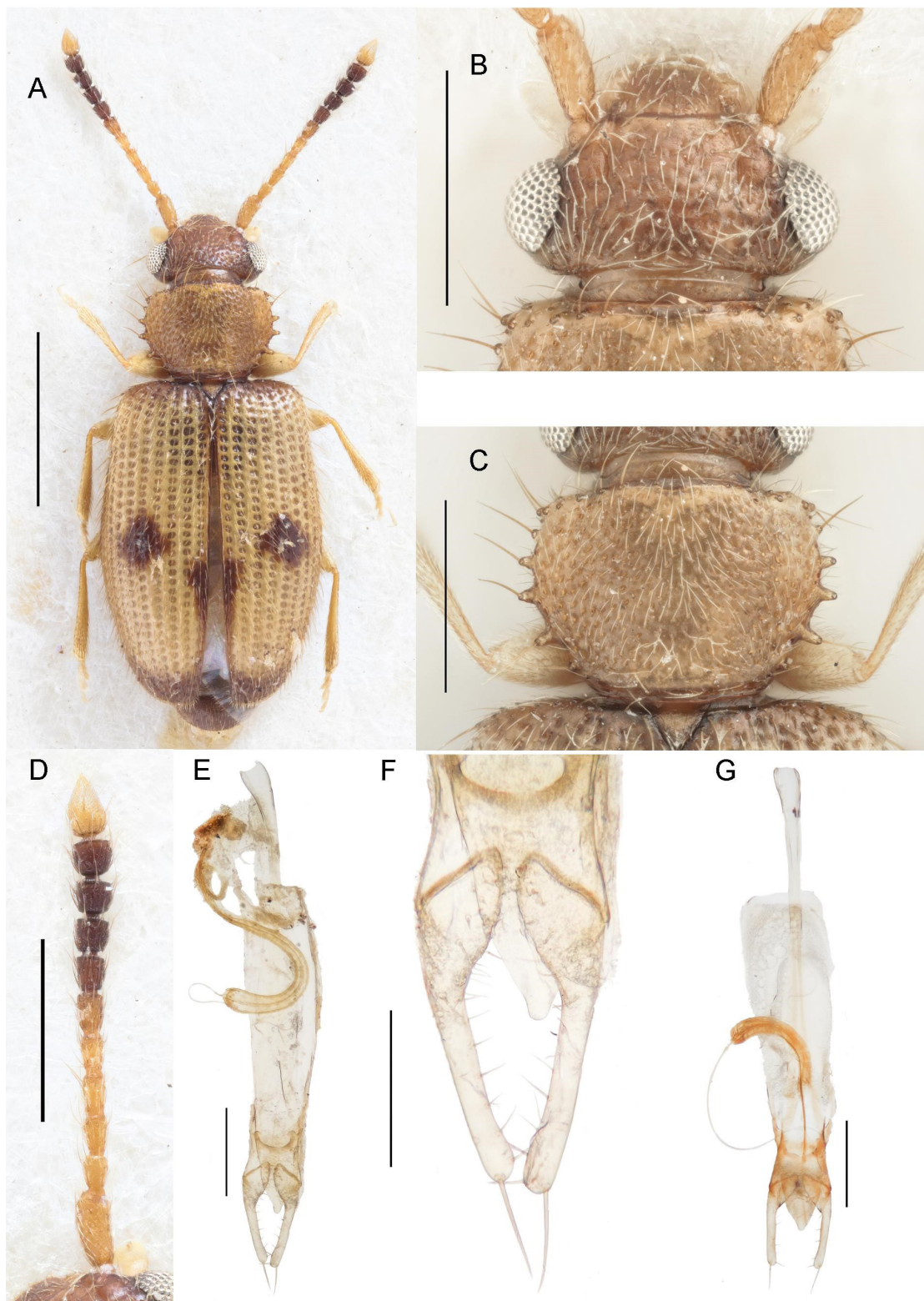


Fig. 5. *Psammoecus incommodus* (Walker, 1859). **A–D.** Male specimen from Lâm Đồng Province, Vietnam (MKF, ex coll. HNHM). **A.** Habitus. **B.** Head. **C.** Pronotum. **D.** Right antenna. **E–F.** Holotype, ♂ (NHMUK). **E.** Aedeagus, ventral view. **F.** Parameres, ventral view. **G.** Holotype, ♂, of *Psammoecus gratiosus* Grouvelle, 1908, junior synonym to *P. incommodus* (MNHN), aedeagus, ventral view. Scale bars: A = 1.0 mm; B–D = 0.5 mm; E, G = 0.2 mm; F = 0.1 mm.

NEPAL – **Koshi** • 1 spec.; Arun River, Hedangan-Num; 800 m a.s.l.; 16 Jun. 1983; Brancucci leg.; NMB.

SRI LANKA • 1 spec.; Sihalan; NHMUK • 1 spec.; Hadley [Estate in Dikoya]; NHMUK.

VIETNAM – **Lâm Đông** • 2 specs; Bảo Lộc; 27 Oct. 1988; Mahunka and Vasarhelyi leg.; HNHM • 1 spec.; Suoi Baco River, 12 km S of Bảo Lộc; 26 Oct. 1988; Mahunka and Vasarhelyi leg.; HNHM • 3 specs; Suoi Lok Chau River, 5 km E of Bảo Lộc; 24 Oct. 1988; Mahunka and Vasarhelyi leg.; HNHM • 1 spec.; same data as for preceding; MKF.

Distribution

Psammoecus incommodus was described from Sri Lanka. It is also recorded from Japan (Yoshida & Hirowatari 2014) and Taiwan (Yoshida *et al.* 2018), in both instances as *Psammoecus labyrinthicus*. It is a widely distributed species, now recorded for the first time for China, Laos, Nepal, and Vietnam.

Remarks

Described by Walker (1859) as *Cucujus incommodus*, this species was later mentioned as belonging to “*Psammoecus* or a closely allied genus” by Waterhouse (1876a: 14). Shortly afterwards, Waterhouse (1876b: 124) placed it in the genus *Telephanus* and described the type specimen as being immature and “in a very injured condition”. He stated that it might be conspecific with *Telephanus trimaculatus*



Fig. 6. *Psammoecus incommodus* (Walker, 1859). Holotype, ♂ (NHMUK). Scale bar = 1.0 mm.

(= *Psammoecus trimaculatus* Motschulsky, 1858). Grouvelle (1908) and Pal (1985) treated it as a junior synonym of *P. trimaculatus*.

Although the holotype of *Psammoecus incommodus* is in a very poor condition indeed (Fig. 6), the abdomen could be dissected and the genitalia could be isolated. The aedeagus is very delicate, due to the specimen being teneral; its structure shows considerable differences from *P. trimaculatus*. Furthermore, the remaining fragment of the pronotal disk shows a distinct reticulate microsculpture, which also distinguishes *P. incommodus* from *P. trimaculatus*. Hence, *P. incommodus* is restituted as a valid species.

The aedeagus of the male holotype of *Psammoecus gratiosus* shows no difference to that of *P. incommodus*; the fragments of the holotype of *P. incommodus* show similar character states (lateral teeth of pronotum, punctation and microsculpture, shape, punctation and pubescence of elytra). The holotype of *Psammoecus labyrinthicus* was studied and also found to be conspecific with *P. incommodus*.

Psammoecus trimaculatus Motschulsky, 1858

Psammoecus trimaculatus Motschulsky, 1858: 45.

Psammoecus excellens Grouvelle, 1908: 115 (synonymy by Karner 2012: 24).

Psammoecus alluaudi Grouvelle, 1912a: 409 (synonymy by Karner 2012: 24).

Psammoecus trimaculatus – Waterhouse 1876b: 124. — Reitter 1879: 509. — Grouvelle 1906: 125; 1908: 476. — Hetschko 1930: 81. — Hisamatsu 1982: 16. — Pal 1985: 41. — Sato 1989: 377. — Sengupta & Pal 1996: 186. — Sasaki *et al.* 2002: 224. — Halstead *et al.* 2007. — Hirano 2009: 66; 2010: 15. — Karner 2012: 24. — Yoshida *et al.* 2018: 12. — Mola & Yoshida 2019.

non *Cucujus incommodus* – Grouvelle 1908: 476. — Pal 1985: 41. — Sengupta & Pal 1996: 186. (misidentifications).

non *Telephanus cruciger* – Grouvelle 1908: 476. — Pal 1985: 41. — Sengupta & Pal 1996: 186. (misidentifications).

non *Psammoecus ypsilon* – Pal 1985: 41 (misidentification).

non *Psammoecus cephalotes* – Pal 1985: 41 (misidentification).

Material examined

INDIA – **Tamil Nadu** • 1 spec.; Coimbatore; 440 m a.s.l.; 22 Nov. 1972; Besuchet, Löbl and Mussard leg.; MHNG. – **West Bengal** • 8 specs; W Kolkata, Sarda; NHMUK • 1 spec.; same data as for preceding; MKF.

NEPAL – **Bagmati** • 17 specs; Chitwan, Sauraha, Hotel Sweet Home; 27°35'10" N, 84°29'29" E; 190 m a.s.l.; 5–7 Jul. 2022; Kopetz leg.; at light; NMEG • 4 specs; same data as for preceding; MKF • 68 specs; Kathmandu; Jun. 1983; Brendell leg.; at light; NHMUK • 2 specs; same data as for preceding; MKF • 2 specs; Kathmandu, British Embassy; 1370 m a.s.l.; 20 May–23 Jun. 1983; Brendell leg.; at light; NHMUK.

SRI LANKA – **Central Province** • 1 spec.; Nuwara Eliya; 1900–2440 m a.s.l.; 8–11 Feb. 1882; Lewis leg.; NHMUK. – **Uva** • 1 spec.; Inginiyagala; 12 Feb. 1970; Mussard, Besuchet and Löbl leg.; MHNG.

Distribution

Psammoecus trimaculatus was described from Sri Lanka and has also been found in Bhutan, France (La Réunion), India, Italy, Japan, Madagascar, Mauritius, Nepal, Russia, South Africa, Taiwan, Tanzania, Uganda (Yoshida *et al.* 2018: 13). It was reported from Brazil (Thomas & Yamamoto 2007) likely due to misidentification.

Remarks

Pal (1985) was the first author to illustrate *Psammoecus trimaculatus*, including the male genitalia. His description of the species was based on five type specimens from the collections of the Moscow State University with following data: “*Psammoecus trimaculatus* Motsch., Mt Nura Ellia, Ceylon [Motschulsky’s handwriting on rectangular yellow label]”. According to Pal (1996, pers. com.), these specimens were mounted together on a single mounting board, and only one specimen was intact. No lectotype was designated. Attempts of the present author to study the five specimens mentioned by Pal have been unsuccessful for more than 20 years (see also Karner 2012). The specimens could not be located in the Moscow State University collection (Aleksey A. Gusakov 2017, pers. com.), and their whereabouts remain unclear. However, it seems premature to consider the specimens as lost. In an attempt to locate other type material, a specimen determined by Motschulsky from the NHRS collection was examined. It is conspecific to *Psammoecus incommodus*, and not considered to be a type of *P. trimaculatus* (locality data given above).

Examination of three specimens from Coimbatore (India, Tamil Nadu) in MHNG labelled by Pal as *Psammoecus trimaculatus* revealed that two are *P. nitidus* (locality data are given below), while one specimen is indeed *P. trimaculatus*. Pal (1985: 46) mentioned only two specimens of *Psammoecus* from this location, both identified as *P. trimaculatus*.

Thomas & Yamamoto (2007) reported *Psammoecus trimaculatus* from São Paulo, Brazil. Four of the nine specimens mentioned in this article were studied by the present author and found to be *Psammoecus nitidus* (then determined by the present author as *P. personatus*). While it can not be ruled out that one or more of the other five specimens is indeed *P. trimaculatus*, this seems unlikely.

Psammoecus t-notatus Blackburn, 1903

Psammoecus t-notatus Blackburn, 1903: 154.

Psammoecus amoenus Grouvelle, 1912b: 92 (synonymy by Karner 2020: 144).

Psammoecus t-notatus – Hetschko 1930: 84. — Karner 2020: 144.

Material examined

INDIA – **Tamil Nadu** • 3 specs; Nilgiri Hills; Andrewes leg.; NHMUK.

SRI LANKA • 1 spec.; Lewis leg.; NHMUK. – **Central Province** • 1 spec.; Nuwara Eliya District, Nuwara Eliya; 1900–2440 m a.s.l.; 8–11 Feb. 1882; Lewis leg.; NHMUK.

Distribution

Psammoecus t-notatus has previously been recorded from Australia, Fiji, Indonesia, Malaysia, Papua New Guinea, Thailand, and Vanuatu. It is now for the first time recorded from India and Sri Lanka.

Remarks

Karner (2020) provides illustrations and a redescription of this species.

Psammoecus nitidus Grouvelle, 1908

Fig. 7

Psammoecus nitidus Grouvelle, 1908: 479.

Psammoecus bellus Grouvelle, 1908: 479 (synonymy by Pal 1985: 38).

Psammoecus impressicollis Grouvelle, 1908: 480. **Syn. nov.**

Psammoecus personatus Grouvelle, 1919: 34. **Syn. nov.**

Psammoecus nitidus – Hetschko 1930: 83. — Pal 1985: 38. — Sengupta & Pal 1996: 184.

Psammoecus bellus – Hetschko 1930: 81.

Psammoecus impressicollis – Hetschko 1930: 83. — Pal 1985: 40.

Psammoecus personatus – Hetschko 1930: 84. — Karner 2012: 3; 2014: 11.

Psammoecus impressiocollis [sic] – Sengupta & Pal 1996: 185 [misspelling].

Diagnosis

The following combination of character states distinguishes this species:

Body (Fig. 7A) elongate oval, testaceous, antennomere 6 slightly darkened, antennomere 7 brown, antennomeres 8–10 piceous, antennomere 11 testaceous, elytra with piceous maculae near middle and along apical part of suture; head (Fig. 7B) with distinct, curved frontal grooves that reach anterior $\frac{2}{5}$ of eyes, punctuation on vertex sparse, punctures in most specimens separated by about twice their diameter, very slightly elongate, somewhat smaller than eye facet diameter, pubescence on vertex moderate, setae directed antero-medially, microsculpture absent; eyes large, protruding, almost evenly rounded, curvature somewhat stronger near temples, temples almost straight, evenly curved, flat, temple angle 62° ; antennae (Fig. 7C) moderately slender; pronotum (Fig. 7B) widest just anterior of middle, lateral pronotal margins with four distinct teeth, tooth III largest, teeth II and IV smaller, tooth I very small, anterior and posterior denticles distinct, pronotal punctuation moderate, punctures round, as large as eye facets, separated by about their diameter, pubescence moderate, setae directed antero-medially, microsculpture on pronotal disk absent; elytra elongate oval (Fig. 7A), widest at middle, striae slightly wider than interstices, pubescence moderate, interstitial setae slightly longer than striae setae, microsculpture absent; male genitalia moderately sclerotized (Fig. 7D–F), median lobe lancet shaped, evenly narrowed towards apex, tip blunt, parameres elongate, basal part evenly narrowed, apical $\frac{2}{3}$ straight, narrow, parallel-sided with short setae along inner margins and single long seta at apex.

Type material

Lectotype of *Psammoecus nitidus* (by present designation)

INDIA • ♂; “Kanara // Type [red label] // *nitidus* / Inde. Grouv. [Grouvelle’s hand]”; MNHN.

Lectotype of *Psammoecus bellus* (by present designation)

INDIA • ♂; “Shembaganur / Inde // Type [red label] // *Psammoecus* / *bellus* / ty. Grouv. [Grouvelle’s hand]”; MNHN.

Paralectotype of *Psammoecus bellus*

INDIA • 1 ♀; “Inde / Shembaganur // Type [red label]”; MNHN.

Holotype of *Psammoecus impressicollis*

INDIA • ♂; “Nilgiri Hills // Type [red label] // *Psammoecus* / *impressicollis* / ty. Grouv. [Grouvelle’s hand]”; MNHN.

Other material examined

INDIA – **Karnataka** • 1 spec.; Belgaum; Andrewes leg.; NHMUK • 1 spec.; Kanara; Andrewes leg.; NHMUK • 1 spec.; Mysuru District, Mysore; 29 Sep. 1991; Schuh leg.; MKF. – **Kerala** • 1 spec.; Idukki Distr., Cardamom Hills, S Kumily, Periyar, Aranya Nivas; 950 m a.s.l.; 4 Nov. 1972; Besuchet, Löbl and Mussard leg.; MHNG [published as *Psammoecus trimaculatus* by Pal (1985)]. – **Tamil Nadu** • 2 specs; Kongu Nadu, Coimbatore; 440 m a.s.l.; 22 Nov. 1972; Besuchet, Löbl and Mussard leg.; MHNG [published as *Psammoecus trimaculatus* by Pal (1985)].

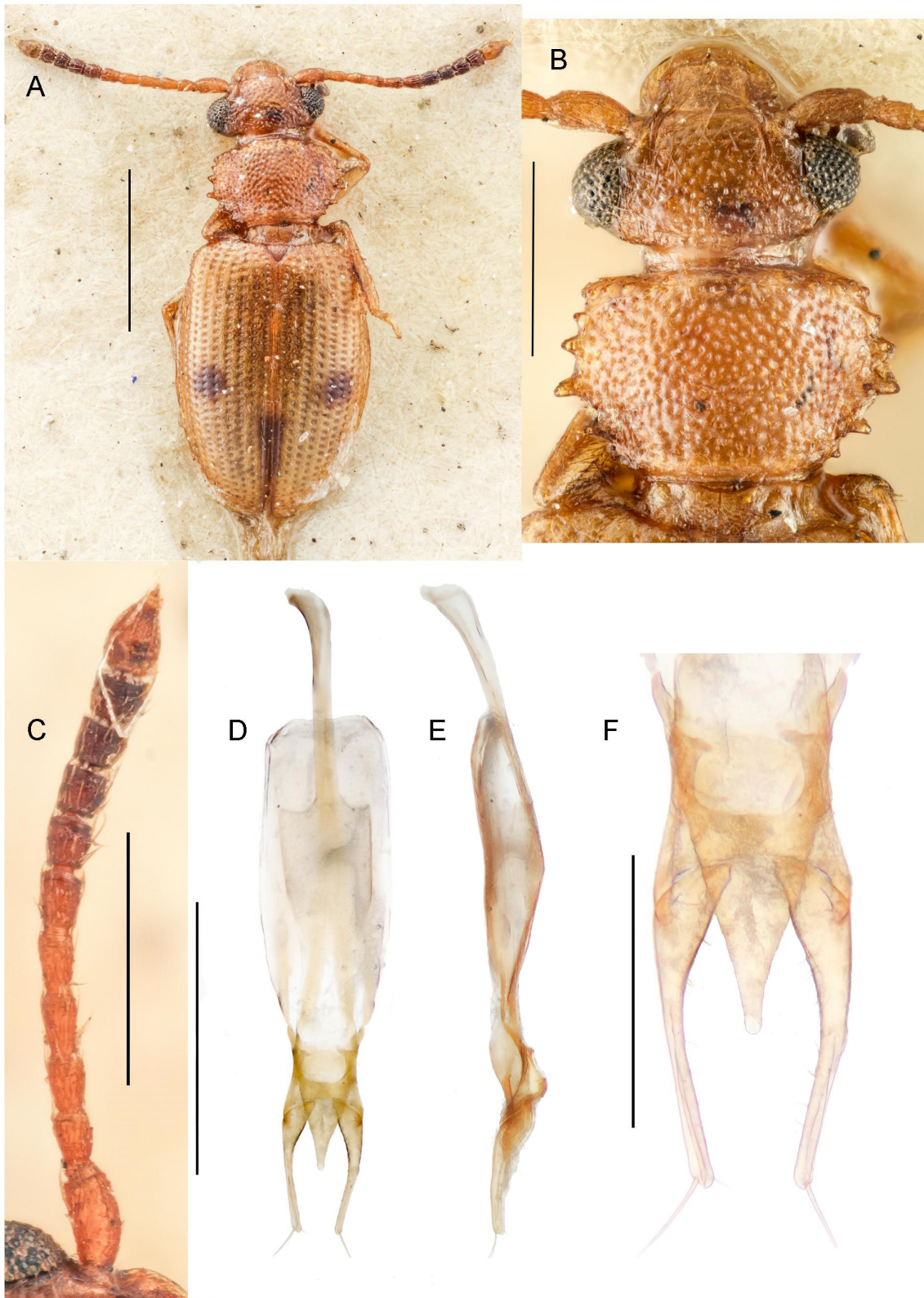


Fig. 7. *Psammoecus nitidus* Grouvelle, 1908. **A–C.** Lectotype, ♂ (MNHN). **A.** Habitus. **B.** Head and Pronotum. **C.** Right antenna. **D–F.** Male specimen from Madras, India (MHNG). **D.** Aedeagus, ventral view. **E.** Aedeagus, lateral view. **F.** Detail of aedeagus, ventral view. Scale bars: A = 1.0 mm; B–E = 0.5 mm; F = 0.2 mm.

Distribution

Psammoecus nitidus was described from India. It was found in several African countries (Congo, South Africa, Tanzania, Uganda), and from Portugal (Madeira) by Karner (2012, 2014), then named *P. personatus*. The species was reported from Brazil (São Paulo) by Thomas & Yamamoto (2007), see remarks for *P. trimaculatus* above.

Remarks

Grouvelle (1908) mentions type specimens of *Psammoecus nitidus* in his collection and in coll. Andrewes. A single type specimen is stored in the MNHN collection, bearing Grouvelle's type label. No other type specimen could be found in the NHMUK collection (Roger Booth 2014, pers. com.). The specimen from the MNHN collection was examined in August, 2014 and is designated as lectotype.

Pal (1985: 38) synonymised *Psammoecus bellus* Grouvelle, 1908: 485 with *Psammoecus nitidus* Grouvelle, 1908: 479, based on a type specimen of *P. bellus* that he examined.

In August 2014, two syntypes of *Psammoecus bellus* stored in the MNHN were studied, one of which is here designated as the lectotype. Both specimens are indeed conspecific with *P. nitidus*.

Of *Psammoecus impressicollis*, Grouvelle (1908: 480) does not mention the number of specimens he saw, only stating “Nilgiri Hills. Collection H. E. Andrewes”. Pal (1985: 41) studied a “type” (India: Tamil Nadu, Nilgiri Hills) from the MNHN. This specimen was examined; it is considered to be the holotype. No other specimens were found in the NHMUK collection (Booth 2014, pers. com.); it can be concluded that Grouvelle kept the only type specimen for his own collection.

In his redescription of *Psammoecus impressicollis*, Pal (1985: 40) mentions a “distinct depression near the posterior margin” of the pronotum, as did Grouvelle (1908: 480): “Espèce remarquable par la forte impression transversale de la base du prothorax”.

A rather flat impression of the pronotal surface near the posterior margin is indeed visible, but this does not differ from the pronotal structure of *P. nitidus*. No other character states differentiating *P. impressicollis* from *P. nitidus* were found; therefore, *P. impressicollis* is considered to be a junior synonym of *P. nitidus*.

Psammoecus nitidus is also conspecific with *P. personatus*, a species that was redescribed by Karner (2012: 3), based on the holotype from Madeira. It has been reported as occurring in several African countries, as well as having been imported to Brazil (Thomas & Yamamoto 2007; Karner 2012, 2014).

Psammoecus quadrimaculatus Reitter, 1874

Psammoecus quadrimaculatus Reitter, 1874: 525.

Psammoecus quadrimaculatus – Hetschko 1930: 84. — Yoshida & Hirowatari 2014: 39.

Material examined

SRI LANKA – **Central Province** • 1 spec.; Kandy District, Kandy; Nov. 1908; Bryant leg.; NHMUK.

Distribution

This species was previously solely known from Japan. It is here recorded for the first time for Sri Lanka.

Remarks

Yoshida & Hirowatari (2014: 39 ff.) provide a redescription and illustrations of *P. quadrimaculatus*. They mention only the holotype, collected by Lewis in Nagasaki Prefecture.

Psammoecus elegans Grouvelle, 1908

Fig. 8

Psammoecus elegans Grouvelle, 1908: 481.

Psammoecus elegans – Hetschko 1930: 82.

Diagnosis

The following combination of character states distinguishes this species:

Body (Fig. 8A) elongate oval, dark brown, antennomere 11 white, antennomeres 7–10 piceous, antennomere 6 brown, elytra with bright testaceous maculae; head (Fig. 8B) with long, narrow frontal grooves that are slightly curved outwards and attain posterior $\frac{1}{3}$ of eyes, punctation on vertex moderate, punctures round, about as large as eye facet diameter, microsculpture absent, pubescence on vertex moderate with few very long setae near frontal grooves; eyes large, very slightly unevenly rounded, temples distinct, well rounded, temple angle ca 60° ; antennae (Fig. 8C) short, stout; pronotum (Fig. 8B) widest at anterior $\frac{1}{5}$, pronotal punctation somewhat denser than on head, punctures distinct, deep, very slightly transverse, pubescence as on head, setae directed antero-medially on the disk and anteriorly along the middle, lateral pronotal margins with four stout, cone-shaped teeth, anterior denticles large, distinct, posterior denticles small; elytra (Fig. 8A) widest just in front of middle, with large testaceous maculae on anterior and posterior third, elytral pubescence moderate, striae setae somewhat shorter than interstitial setae, 10th interstice with very long setae near humeral swelling, setae shorter towards elytral apex; male genitalia (Fig. 8D–F) moderately sclerotized, median lobe elongate with blunt tip, almost parallel-sided towards apex, parameres with widened basis, slightly curved inwards, slightly widened at apex, bearing one larger apical seta and few small setae along inner margins.

Type material

Lectotype (by present designation)

SRI LANKA • ♂; “Ceylan / Nawalapytia // Simon // Type [red label] // *P. elegans* / Grou [Grouvelle’s hand]”; MNHN.

Paralectotypes

SRI LANKA • 2 ♀♀; “Ceylan / Nawalapytia // Type [red label]”; MNHN.

Other material examined

MALAYSIA – Sarawak • 1 spec.; Kuching, Mt Matang; Dec. 1913; Bryant leg.; NHMUK.

Distribution

This species was described from Sri Lanka, it is now recorded for the first time from Malaysia (Borneo).

Remarks

Psammoecus elegans very closely resembles *P. quadrimaculatus*. It can be distinguished from the latter by its narrower pronotum and elytra, wider elytral striae, and by the slightly widened apices of its parameres.

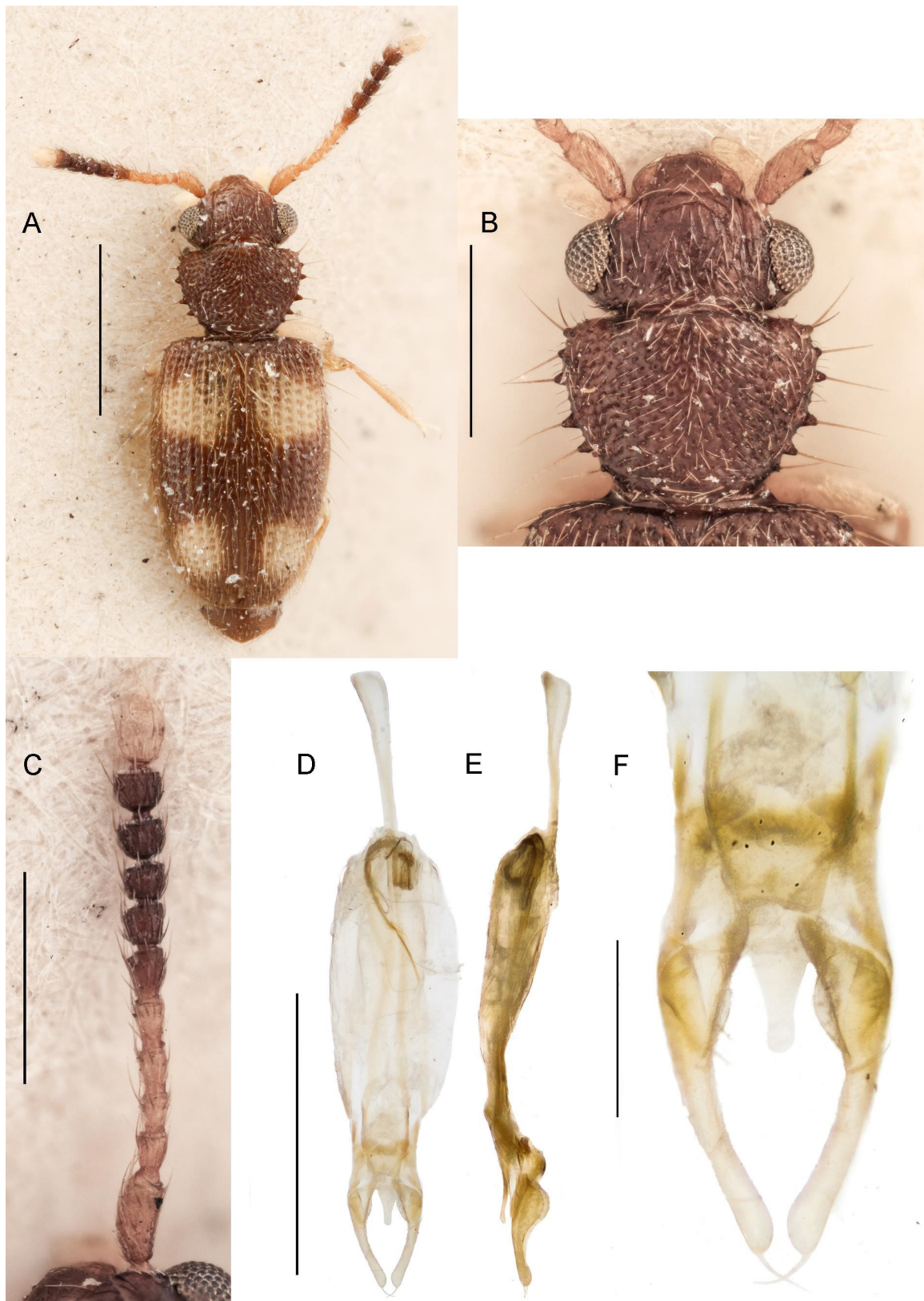


Fig. 8. *Psammoecus elegans* Grouvelle, 1908. Lectotype, ♂ (MNHN). **A.** Habitus. **B.** Head and pronotum. **C.** Right antenna. **D.** Aedeagus, ventral view. **E.** Aedeagus, lateral view. **F.** Detail of aedeagus, ventral view. Scale bars: A = 1.0 mm; B–E = 0.5 mm; F = 0.1 mm.

Psammoecus lepidus Grouvelle, 1908

Fig. 9

Psammoecus lepidus Grouvelle, 1908: 483.

Psammoecus lepidus – Hetschko 1930: 83. — Pal 1985: 16. — Sengupta & Pal 1996: 168.

Diagnosis

The following combination of character states distinguishes this species:

Body (Fig. 9A) elongate oval, testaceous with antennomere 8 slightly, antennomeres 9 and 10 distinctly darkened, antennomere 11 yellowish white; head (Fig. 9B) with distinct but narrow, slightly outwardly curved frontal grooves that attain anterior $\frac{1}{3}$ of eyes, vertex with dense punctation, punctures as large as eye facet diameter, elongated antero-medially on basal part of vertex, round and sparser near clypeus, setae on vertex of varying length, longest setae $\frac{2}{3}$ as long as eyes, microsculpture absent; eyes (Fig. 9B) slightly protruding, almost evenly rounded, with curvature very slightly stronger near temples, temples distinct, well rounded, temple angle 50° ; antennae (Fig. 9D) slender; pronotum (Fig. 9C) widest at anterior third, pronotal disk with very dense punctation, punctures elongate, directed antero-medially, punctures slightly larger than those on vertex, setae of varying length, longest setae almost as long as eyes, microsculpture on pronotal disk absent, lateral margin with five small teeth, in few specimens six to seven teeth, tooth I largest, teeth II to IV very small, tooth V almost as large as tooth I, anterior denticles distinct, small, posterior denticle very small, inconspicuous; elytra (Fig. 9A) oval, with small castaneous or piceous maculae on posterior half of disk and sutural macula in posterior fourth, maculae sometimes missing, entire apical part of suture sometimes darkened, striae on disk about $\frac{1}{3}$ wider than interstices, strial and interstitial setae of similar length, longer along lateral margin near humerus, microsculpture absent; male genitalia (Fig. 9E–H) moderately sclerotized, median lobe wide, narrowed and evenly curved towards its somewhat pointy, ventrally bent apex, dorsal face of median lobe mostly straight, curved ventrally towards apex, parameres slender, parallel-sided with only slightly widened basis, curved inwards, bearing few short setae along lateral margin and three large apical setae.

Type material

Lectotype (by present designation)

INDIA • ♀; “Inde / Shembagnaur [blue ink, Grouvelle’s hand] // 56 [blue ink] // Type [red label] // *Psammoecus / lepidus / ty. Grouv* [Grouvelle’s hand]”; MNHN.

Paralectotype

INDIA • 1 ♀; “Shembagan / Inde [blue ink, Grouvelle’s hand] // Type [red label]”; MNHN.

Other material examined

INDIA – **Tamil Nadu** • 13 specs; Dindigul District, Palani Hills Nat. Park, Kodaikanal; 2100 m a.s.l.; 11 Nov. 1972; Besuchet, Löbl and Mussard leg.; MHNG • 4 specs; Dindigul District, Palani Hills Nat. Park, 10 km NE of Kodaikanal; 2150 m a.s.l.; 15 Nov. 1972; Besuchet, Löbl and Mussard leg.; MHNG • 48 specs; Dindigul District, Kodaikanal, Palani Hills Nat. Park, Berijam Lake; 2165 m a.s.l.; 14 Nov. 1972; Besuchet, Löbl and Mussard leg.; MHNG • 1 spec.; same data as for preceding; MKF.

Distribution

Psammoecus lepidus is solely recorded from India.

Remarks

Grouvelle (1908: 483) does not mention the number of type specimens that his description was based upon. Pal (1985: 18) stated that a “type” was studied for his redescription of the species. Two female specimens in the MNHN collection are labelled as “type”. Their locality labels read “Shembagnaur” and

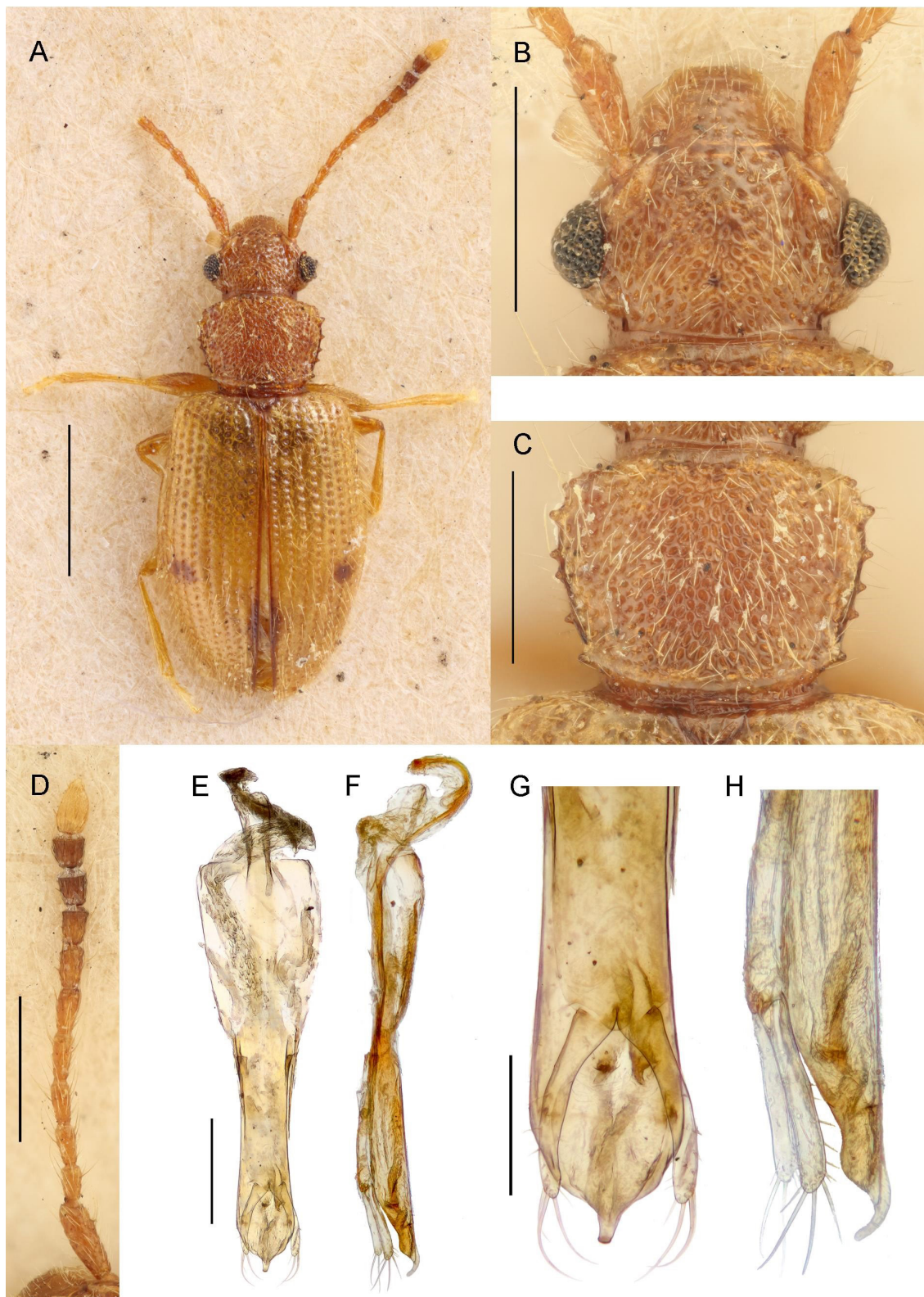


Fig. 9. *Psammoecus lepidus* Grouvelle, 1908. **A–D.** Lectotype, ♀ (MNHN). **A.** Habitus. **B.** Head. **C.** Pronotum. **D.** Right antenna. **E–H.** Male specimen from Tamil Nadu, India (MHNG). **E.** Aedeagus, ventral view. **F.** Aedeagus, lateral view. **G.** Detail of aedeagus, ventral view. **H.** Detail of aedeagus, lateral view. Scale bars: A = 1.0 mm; B–D = 0.5 mm; E–F = 0.2 mm; G–H = 0.1 mm.

“Shembagan”, both are obviously misspellings. Grouvelle (1908: 484) calls the locality “Shembaganur”, only slightly different from the nowadays frequently used “Shenbaganur”. The specimen bearing Grouvelle’s handwritten label, saying “... ty. Grouv.” is hereby designated as lectotype.

The record from Bhutan provided by Pal (1985: 18) is due to misidentification; the specimen that Pal mentioned is clearly *P. trilochana* Pal, 1985 (locality data are given below).

Psammoecus rahu sp. nov.

[urn:lsid:zoobank.org:act:F8CCE04D-E7C4-4CC6-92FE-FEACF9C03F68](https://doi.org/10.21203/rs.3.rs-1000000)

Fig. 10

Etymology

The specific epithet is a noun in apposition, derived from Rāhu (Sanskrit: राहु), one of the nine major celestial bodies in Hindu texts.

Type material

Holotype

NEPAL • ♂; Bagmati, Kathmandu, Gokarna Forest; 1400 m a.s.l.; 1 Apr. 1981; Löbl and Smetana leg.; MHNG.

Paratypes

NEPAL – **Bagmati** • 2 specs; Kathmandu District, above Sundarimal; 2000 m a.s.l.; 4 Apr. 1981; Löbl and Smetana leg.; MHNG • 1 spec.; Kathmandu Valley, Phulchowki; 2550 m a.s.l.; 17 Oct. 1983; Smetana and Löbl leg.; MHNG • 2 specs; Kathmandu, Gokarna Forest; 1400 m a.s.l.; 30 Mar. 1981; Löbl and Smetana leg.; MHNG • 2 specs; same locality as for preceding; 31 Mar. 1981; Löbl and Smetana leg.; MHNG • 10 specs; same locality as for preceding; 1 Apr. 1981; Löbl and Smetana leg.; MHNG • 4 specs; same locality as for preceding; MKF • 1 spec.; same locality as for preceding; 1300 m a.s.l.; 10 Sep. 1983; Smetana and Löbl leg.; MHNG • 1 spec.; same locality as for preceding; 20 Oct. 1983; Smetana and Löbl leg.; MHNG • 2 specs; Lalitpur, Godawari; 1700 m a.s.l.; 20 Oct. 1983; Smetana and Löbl leg.; MHNG • 1 spec.; same locality as for preceding; 1600 m a.s.l.; 31 Mar. 1984; Löbl leg.; MHNG.

Description of holotype

BODY (Fig. 10A). Oval, 2.36 mm long; castaneous, legs, antennae and mouth parts light brown, elytra with transverse piceous maculae near middle and diffusely darkened apical area, antennomere 7 slightly darkened, antennomeres 8–10 distinctly darkened, antennomere 11 light brown.

HEAD (Fig. 10B). $1.54 \times$ as wide as long. Frontal grooves distinct, deep, converging anteriorly, only slightly diverging posteriorly, attaining anterior $\frac{2}{5}$ of eyes. Vertex with dense and coarse punctation; punctures distinctly elongate, stretched antero-medially, very few punctures irregularly stretched postero-medially, punctures $\frac{1}{4}$ to $\frac{1}{5}$ larger than eye facet diameter. Setae on vertex of variable length, few setae about $\frac{2}{3}$ as long as eyes, directed antero-medially. Microsculpture on vertex absent. Eyes 0.19 mm long, slightly unevenly rounded with stronger curvature posteriorly, eye distance 0.42 mm. Temples slightly rounded, steep, temple angle 70° . Antennae (Fig. 10D) moderately stout, 1.49 mm long, antennomere proportions: 3.3 : 1.1 : 1.3 : 1.7 : 1.7 : 1.6 : 1.4 : 1.2 : 1.2 : 1.0 : 2.0.

PRONOTUM (Fig. 10C). $1.23 \times$ as wide as long, widest near anterior $\frac{2}{5}$; at anterior denticles $1.34 \times$ as wide as at posterior denticles. Lateral margin curved anteriorly, almost straight and converging along posterior $\frac{3}{5}$, bearing five distinct, small teeth; teeth I and V about twice as large as teeth II–IV. Lateral margin forming a raised ridge between teeth I and V. Anterior pronotal denticles composed of one large lateral and one smaller denticle; posterior denticle very small and inconspicuous. Disk with dense and coarse punctation, punctures slightly larger than on vertex, distinctly elongate, stretched antero-medially.

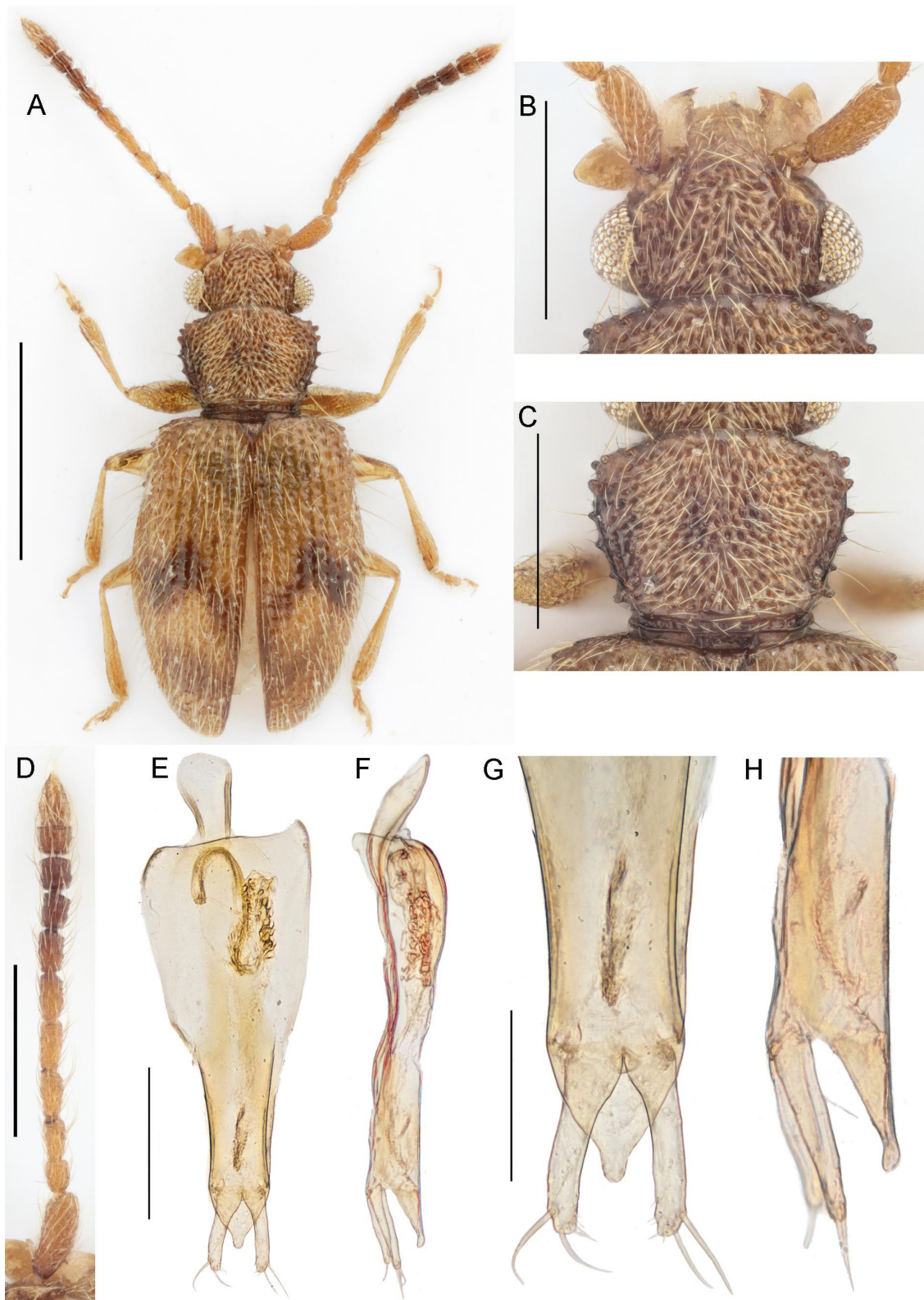


Fig. 10. *Psammoecus rahu* sp. nov. Holotype, ♂ (MHNG). **A.** Habitus. **B.** Head. **C.** Pronotum. **D.** Right antenna. **E.** Aedeagus, ventral view. **F.** Aedeagus, lateral view. **G.** Detail of aedeagus, ventral view. **H.** Detail of aedeagus, lateral view. Scale bars: A = 1.0 mm; B–D = 0.5 mm; E–F = 0.2 mm; G–H = 0.1 mm.

Punctures close to posterior half of margin fused to form an irregular impression. Setae on disk about as long as longest setae on vertex, of less variable length, directed antero-medially. Microsculpture on disk absent.

ELYTRA (Fig. 10A). Oval, $1.42 \times$ as long as wide; widest at middle. Striae as wide as interstices. Strial setae semierect, of moderate length, interstitial setae distinctly longer, interstice between 9th and 10th stria near humerus with distinct denticles that bear very long setae and along entire lateral margin somewhat longer setae. Microsculpture on disk absent.

MALE GENITALIA (Fig. 10E–H). Moderately sclerotized. Median lobe in dorsal view parallel-sided near basis, narrowed towards apex, tip slightly waisted, blunt. In lateral view, the apex of the median lobe forms a small knob. Internal sac with numerous strongly sclerotized denticles. Parameres about $3.5 \times$ as long as their basal width, slightly curved inwards, with one long apical and one subapical seta and few short, inconspicuous setae on inner face near apex. Phallobase almost parallel-sided near parameres, widened towards basis.

Variation

Paratypes range in length from 2.22 mm to 2.81 mm. General colour ranges from testaceous (in teneral specimens) to castaneous. In some specimens, the pronotum is darkened – almost piceous – along its lateral margins while uniformly coloured in other specimens. The colouration of the apical antennomeres varies considerably; the 11th antennomere is sometimes whitish, sometimes testaceous; the 10th antennomere is in few specimens much brighter than the 9th, even whitish near its apex.

Distribution

The species is solely recorded from Nepal (Bagmati Province).

Remarks

Psammoecus rahu sp. nov. somewhat resembles both *P. felix* and *P. trilošana*. It differs from *P. felix* by the distinctly stronger punctation on head and pronotum, from *P. trilošana* by the smaller teeth along the pronotal margin, and from both species by its larger eyes and the shape of the male genitalia.

Psammoecus felix (Waterhouse, 1876)

Fig. 11

Telephanus felix Waterhouse, 1876b: 124.

Psammoecus felix – Grouvelle 1908: 476. — Hetschko 1930: 83.

Diagnosis

The following combination of character states distinguishes this species:

Body (Fig. 11A) oval, head and pronotum castaneous, anterior part of head, anterior and posterior margins of pronotum lighter, antennomeres 7–9 and apical part of antennomere 6 darkened, antennomeres 10 and 11 whitish, elytra with piceous maculae near lateral margins at middle, along apical part of suture and covering apex; head (Fig. 11B) with distinct frontal grooves that are curved outwards and attain anterior $\frac{1}{3}$ of eyes, vertex moderately punctate, punctures distinctly elongated antero-medially, as large as eye facet diameter, setae of varying length, directed antero-medially, microsculpture absent; eyes of moderate size, well rounded, temples flat, evenly curved, temple angle 50° ; antennae (Fig. 11D) slender; pronotum (Fig. 11C) widest at anterior fourth, lateral margins almost straight from widest point towards basis, anterior margin somewhat curved, punctures on pronotal disk as those on vertex,

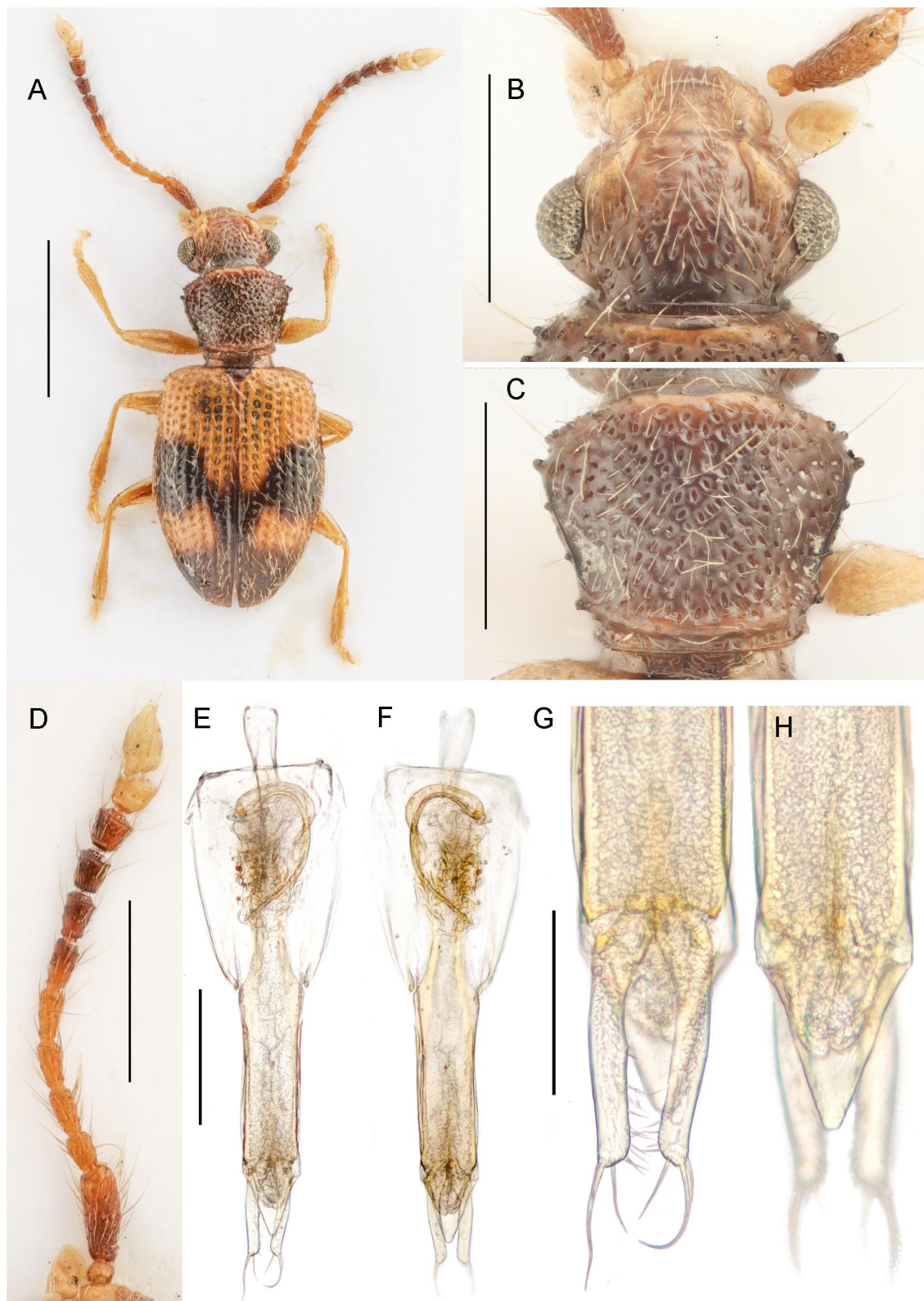


Fig. 11. *Psammoecus felix* (Waterhouse, 1876). A–D. Holotype, ♂ (NHMUK). A. Habitus. B. Head. C. Pronotum. D. Left antenna. E–H. Male specimen from Sri Lanka (NHMUK). E. Aedeagus, ventral view. F. Aedeagus, dorsal view. G. Parameres, ventral view. H. Median lobe, ventral view. Scale bars: A = 1.0 mm; B–D = 0.5 mm; E–F = 0.2 mm; G–H = 0.1 mm.

microsculpture absent, lateral margin with four teeth, tooth I largest, teeth II and III very small and inconspicuous, tooth IV almost as large as tooth I, anterior group of denticles distinct, small, posterior denticle very inconspicuous, lateral pronotal margin forming a raised ridge beginning near tooth I and ending in front of tooth IV; elytra (Fig. 11A) widest at middle, striae slightly narrower than interstices, striae setae slightly shorter than interstitial setae, humeral area between striae 9 and 10 with slightly prominent tubercles, microsculpture absent; male genitalia (Fig. 11E–H) moderately sclerotized, median lobe elongate, slightly narrowed towards apex, strongly narrowed near apex, tip blunt in dorsal view, somewhat sharp in lateral view, parameres with widened basis, parallel-sided with several small setae along apical part of inner margins, one large and one very large seta near apex.

Type material

Holotype

SRI LANKA • ♂; “Type [round, printed label with red border] // Ceylon [light blue label] // *Telephanus / felix* / (Type) C. Waterh.”; NHMUK.

Other material examined

SRI LANKA • 1 ♂; G. Lewis leg.; NHMUK

Remarks

Psammoecus felix closely resembles *P. piceus* Grouvelle, 1882: 289. It can be distinguished from *P. piceus* by its colouration with distinctly darkened elytral apex (not darkened in *P. piceus*) and by its straight parameres (curved in *P. piceus*).

Psammoecus trilošana Pal, 1985

Fig. 12

Psammoecus trilošana Pal, 1985: 29.

Psammoecus trilošana – Sengupta & Pal 1996: 178.

Diagnosis

The following combination of character states distinguishes this species:

Body (Fig. 12A) elongate oval, testaceous with transverse, piceous maculae behind middle of elytra, antennomere 8 very slightly darkened, antennomeres 9 and 10 distinctly darkened, antennomere 11 light yellowish brown; head (Fig. 12B) with distinct frontal grooves that are slightly curved outwards and attain anterior $\frac{1}{4}$ of eyes, punctation on vertex moderate, punctures elongated antero-medially, slightly smaller than eye facet diameter, pubescence moderate, setae directed antero-medially, microsculpture on vertex absent; eyes protruding, slightly unevenly rounded with strongest curvature near temples, temples steep, slightly curved, temple angle 56° ; antennae (Fig. 12D) slender; pronotum (Fig. 12B) widest at anterior third, lateral pronotal margins with five to six teeth, tooth I largest, wide-based, last tooth second largest with narrower basis, teeth between first and last tooth distinctly shorter, anterior denticles distinct, very large, posterior denticles very small, almost obsolete, punctation on pronotal disk slightly stronger than on vertex, punctures dense, slightly larger than on vertex, elongate, directed antero-medially, pubescence as on vertex, directed antero-medially, microsculpture on pronotal disk absent; elytra (Fig. 12A) elongate oval, widest just behind middle, striae slightly wider than interstices, pubescence moderate, interstitial setae slightly longer than striae setae, microsculpture absent; male genitalia (Fig. 12E–H) moderately sclerotized, median lobe elongate, abruptly narrowed towards its blunt tip, slightly bent dorsally, parameres elongate, wide, slightly curved inwards, with numerous setae along inner margins and few setae along outer margins; two distinctly longer setae near apex.

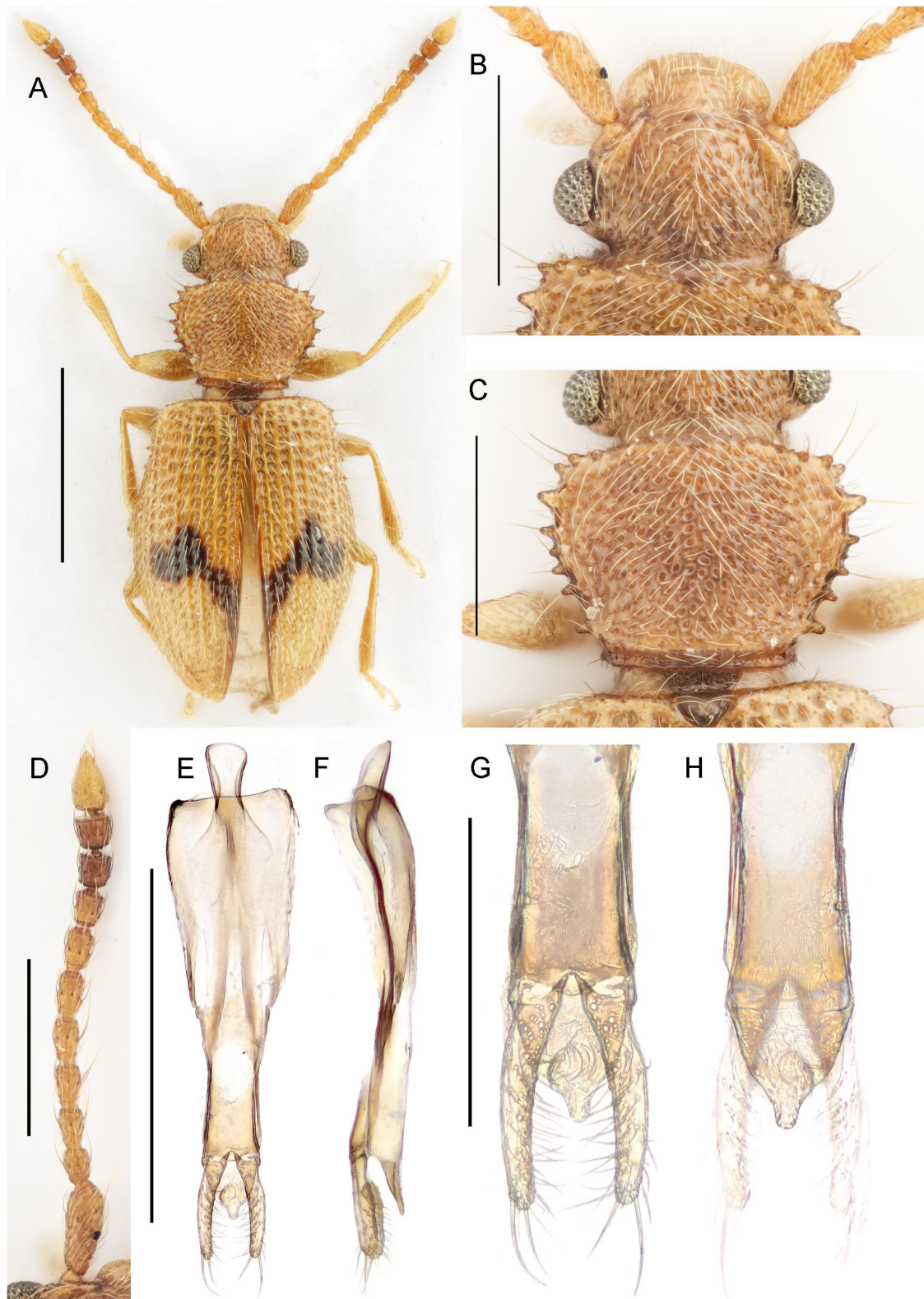


Fig. 12. *Psammoecus trilochana* Pal, 1985. Male specimen from Uttar Pradesh, India (MHNG). A. Habitus. B. Head. C. Pronotum. D. Left antenna. E. Aedeagus, ventral view. F. Aedeagus, lateral view. G. Parameres, ventral view. H. Apex of median lobe, dorsal view. Scale bars: A = 1.0 mm; B–F = 0.5 mm; G–H = 0.2 mm.

Material examined

BHUTAN • 1 spec.; Chimakothi [most likely = Chimakha, Gewog Dopshari, Chiwog Rinchhending Sharri]; 1900–2300 m a.s.l.; 22 May 1972; NMB (published as *Psammoecus lepidus* Grouvelle, 1908 by Pal (1985)).

INDIA – **Himachal Pradesh** • 1 spec.; Shimla, Chaupal, Nallah; 2250 m a.s.l.; 7 Jul. 1977; Wittmer and Brancucci leg.; NMB (published as *Psammoecus lepidus* Grouvelle, 1908 by Pal (1985)). – **Sikkim** • 1 spec.; Chhuba Khola, near Sintam; 25 Apr. 1978; NMB. – **Uttar Pradesh** • 3 specs; Kumaon, Rangarh; 2000 m a.s.l.; 9 Dec. 1979; Löbl leg.; MHNG. – **Uttarakhand** • 1 spec.; 30 km N of Bageshwar, W of Loharket; 1800–1900 m a.s.l.; 24 Jun. 2006; Z. Kejval and M. Tryzna leg.; NHMUK • 3 specs; Chamoli, Joshimath; 2100 m a.s.l.; 27 Oct. 1979; Löbl leg.; MHNG • 5 specs; same data as for preceding, above Joshimath; 2100 m a.s.l.; 27 Oct. 1979; Löbl leg.; MHNG • 1 spec.; Kumaon, Nainital; 2000–2100 m a.s.l.; 8 Oct. 1979; Löbl leg.; MHNG • 1 spec.; Tehri Garhwal, Chamba; 2200 m a.s.l.; 20 Oct. 1979; Löbl leg.; MHNG • 1 spec.; Tehri Garhwal, Dhanaulti; 2200 m a.s.l.; 20 Oct. 1979; Löbl leg.; MHNG • 2 specs; same data as for preceding, 2 km E of Dhanolti; 2250 m a.s.l.; 21 Oct. 1979; Löbl leg.; MHNG • 1 spec.; Almora, Ranikhet, 10 km E of Chaubatia; 2200 m a.s.l.; 20 Oct. 1979; Löbl leg.; MHNG • 1 spec.; same data as for preceding, Chaubatia env.; 1800 m a.s.l.; 12–18 Oct. 1979; Löbl leg.; MHNG • 1 spec.; same data as for preceding; 1950 m a.s.l.; 14 Oct. 1979; Löbl leg.; MHNG • 1 spec.; Uttarkashi, 4 km S of Bhatwari; 1400 m a.s.l.; 23 Oct. 1979; Löbl leg.; MHNG • 1 spec.; same locality as for preceding; 12 Oct. 1979; Löbl leg.; MHNG

NEPAL – **Gandaki** • 1 spec.; Manang District, W Tachi Bagarchhap; 2400 m a.s.l.; 23 Sep. 1983; Smetana and Löbl leg.; MHNG • 1 spec.; Manang District, Latha Manang, W Bagarchhap; 2400 m a.s.l.; 23 Sep. 1983; Smetana and Löbl leg.; MHNG. – **Bagmati** • 2 specs; Godawari; 1600 m a.s.l.; 31 Mar. 1984; Löbl leg.; MHNG • 2 specs; Gandaki, Manang District, Forest W Tachi Bagarchhap; 2200 m a.s.l.; 21 Sep. 1983; Smetana and Löbl leg.; MHNG.

Distribution

The species is recorded from Bhutan, India, and Nepal.

Remarks

In his description of *P. trilochana*, Pal (1985) provides illustrations of habitus and male genitalia. It was not possible for the present author to examine type specimens. A photograph of the holotype provided by Mrs Sheela Ghosh (Zoological Survey of India, Kolkata) leaves no doubt about the identity of this species. The present diagnosis of *P. trilochana* is based on material from MHNG that was determined by T.K. Pal.

Psammoecus harmandi Grouvelle, 1912

Psammoecus harmandi Grouvelle, 1912a: 413.

Psammoecus boreas Yoshida & Hirowatari, 2014: 31 (synonymy by Yoshida *et al.* 2018: 10).

Psammoecus triguttatus – Nakane 1963: 165.

Psammoecus harmandi – Hetschko 1930: 83. — Pal 1985: 19. — Sengupta & Pal 1996: 170. — Yoshida *et al.* 2018: 10.

Material examined

INDIA – **Arunachal Pradesh** • 1 spec.; East Kameng, Lumdung, 22 km E of Seppa; 29 Nov. 1990; Pal leg.; under bark; MSNG. – **Meghalaya** • 1 spec.; Cherrapunji; 900 m a.s.l.; 25°13' N, 91°40' E; 1–24

May 2005; Dembicky leg.; NHMUK. – **West Bengal** • 1 spec.; Kalimpong, Shakta Bahadur; 2 Apr. 1977; NMB.

NEPAL – **Bagmati** • 1 spec.; Kathmandu District, Sundarikal; 2000 m a.s.l.; 4 Sep. 1981; Löbl and Smetana leg.; MHNG. – **Koshi** • 1 ♂; Arun Valley, Mure Num; 1550–2000 m a.s.l.; 4–7 Jun. 1983; Brancucci leg.; NMB • 1 ♂; Sankhuwasabha Distr., Num; 1050 m a.s.l.; 20 Apr. 1984; Löbl and Smetana leg.; MHNG.

Distribution

This species was recorded from India, Japan, Nepal, Taiwan, and Thailand.

Remarks

Pal (1985: 19) mentions a single type specimen from MNHN, but no specimen could be found there. Therefore, the type should be considered lost. Based on Pal's redescription of the species, there is no doubt about its identity, so there is no exceptional need to designate a neotype. Yoshida *et al.* (2018) provide a redescription of this widely distributed species.

Psammoecus hirsutus Olliff, 1883

Fig. 13

Psammoecus hirsutus Olliff, 1883: 183.

Psammoecus tereticollis Grouvelle, 1919: 24. **Syn. nov.**

Psammoecus hirsutus – Hetschko 1930: 83.

Diagnosis

The following combination of character states distinguishes this species:

Body (Fig. 13A) elongate oval, testaceous, apex of antennomere 6 slightly darkened, antennomeres 7–10 piceous, antennomere 11 whitish-brown, elytra with piceous maculae near middle; head (Fig. 13B) with distinct frontal grooves that are curved outwards and attain anterior $\frac{1}{3}$ of eyes, vertex with moderate punctation, punctures elongate, somewhat longer than eye facet diameter, setae on vertex of variable length, longest setae about one $\frac{1}{3}$ as long as eyes, microsculpture absent; eyes large, unevenly rounded with strongest curvature near temples, temples short, evenly curved, temple angle 61° ; antennae (Fig. 13D) stout; pronotum (Fig. 13C) subquadrate, widest slightly in front of middle, pronotal disk with moderate punctation, punctures widened, pubescence as on vertex, setae directed medially, microsculpture absent, lateral pronotal margin with six short teeth, tooth VI largest, teeth I and II somewhat smaller, teeth III–V very small, anterior denticles distinct, posterior denticle very small and inconspicuous; elytra (Fig. 13A) elongate oval, striae as wide as interstices, strial and interstitial setae short, slightly erect, 10th interstice with long setae near humeral swelling, setae gradually shorter towards elytral apex, microsculpture absent; male genitalia (Fig. 13E–H) strongly sclerotized, median lobe lancet shaped with blunt tip in ventral view, tip sharp and curved ventrally in lateral view, parameres very large, wide, bearing five longer setae near apex and five to six shorter setae along dorso-lateral margin; internal sac with complex structures (Fig. 13E–F).

Type material

Lectotype of *Psammoecus hirsutus* (by present designation)

MALAYSIA • ♀; “Sandakan / N. Borneo // Type [round label with red border] // Sandakan, / N. Borneo. / W. B. Pryer. / B.M. 1925-264 // *Psammoecus* / *hirsutus* / (Type.) Olliff”; NHMUK.

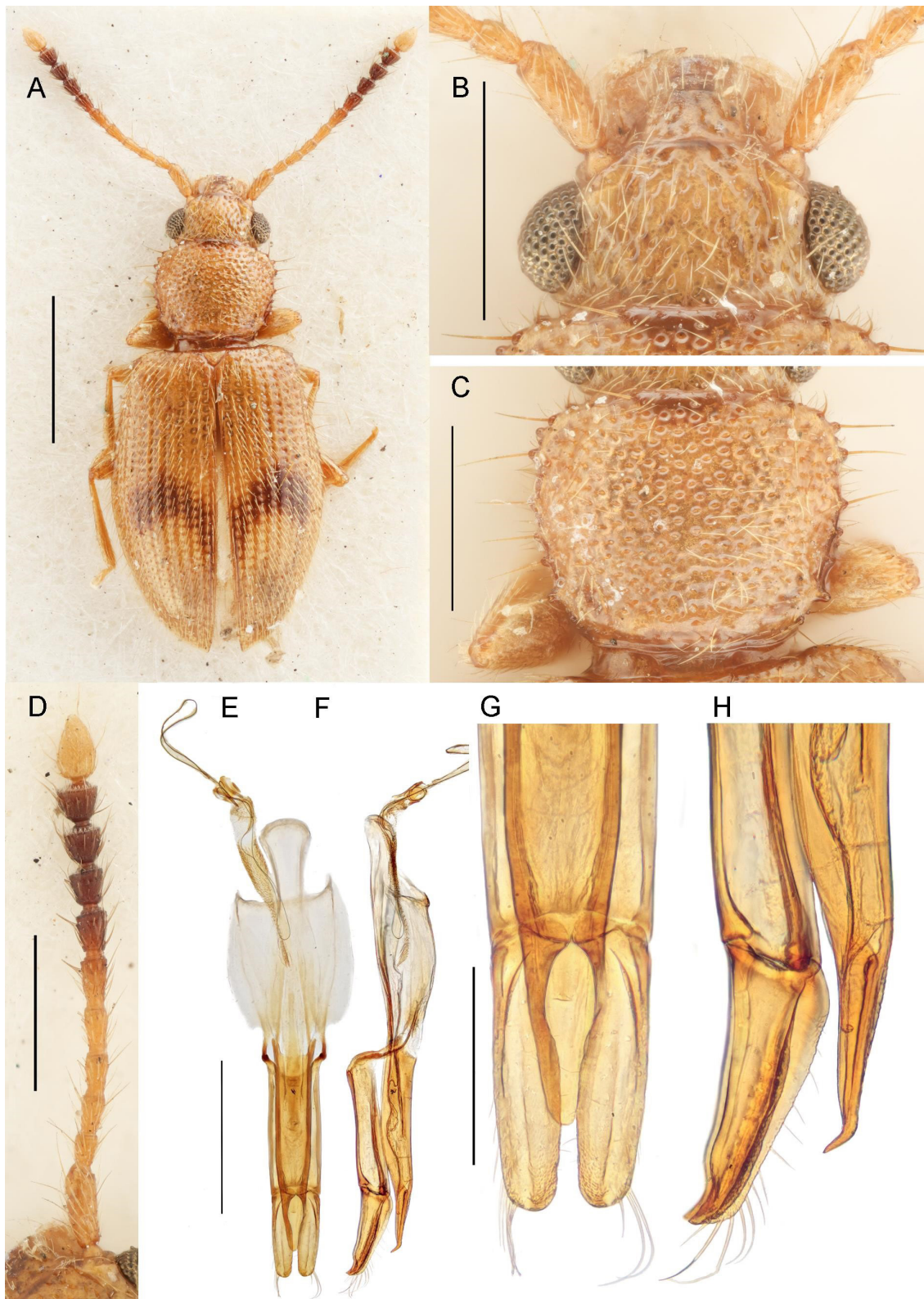


Fig. 13. *Psammoecus hirsutus* Olliff, 1883. A–D. Lectotype, ♀ (NHMUK). A. Habitus. B. Head. C. Pronotum. D. Right antenna. E–H. Male specimen from Sri Lanka (ZMHB). E. Aedeagus, ventral view. F. Aedeagus, lateral view. G. Detail of aedeagus, ventral view. H. Detail of aedeagus, lateral view. Scale bars: A = 1.0 mm; B–F = 0.5 mm; G–H = 0.2 mm.

Paralectotype of *Psammoecus hirsutus*

MALAYSIA • 1 ♂; “N.E. Borneo / 99.179. // *Psammoecus / hirsutus* var. / (co.type) Olliff. // ? SYN- / TYPE [round label with blue border]”; NHMUK.

Holotype of *Psammoecus tereticollis*

MALAYSIA • ♀; “Banguay / Waterstradt [red label] // type [red label] // *Psammoecus / tereticollis* / ty. Grouv. [Grouvelle’s hand]”; MNHN.

Other material examined

SRI LANKA • 1 ♂; Nietner leg.; ZMHB.

Distribution

The species was previously recorded from Malaysia (Sabah); the specimen from Sri Lanka represents the first record of this species from the Indian subcontinent.

Remarks

Olliff (1883: 183) gives no hints regarding the number of specimens he studied and the type deposition. Two specimens from the NHMUK collection were examined: one female that is labelled “Type” and one conspecific male specimen that is labelled “?Syntype”. The female was designated as lectotype of *Psammoecus hirsutus*.

Of *Psammoecus tereticollis*, Grouvelle (1919: 26) mentions a single type specimen collected by Waterstradt. It is stored in the MNHN collection and considered conspecific with *P. hirsutus*.

Psammoecus hirsutus very closely resembles *P. pradierei* Grouvelle, 1878. It can be reliably distinguished from the latter by the proportions of the male genitalia. In *P. hirsutus*, the length ratios of parameres, tegmen, and median lobe of the male genitalia equal 1.0 : 1.7 : 2.5, while for *P. pradierei*, these ratios equal 1.0 : 1.3 : 2.0. *Psammoecus hirsutus* also resembles *P. obesus* Grouvelle, 1919; it can be distinguished from the latter by its much narrower parameres and by its distinctly ventrally bent tip of the median lobe.

***Psammoecus pandu* sp. nov.**

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Fig. 14

Etymology

The specific epithet is derived from Pandu (Sanskrit: पाण्डु), king of the Kuru Kingdom in the Hindu epic Mahabharata.

Type material

Holotype

INDIA • ♂; Uttarakhand, Haldwani, Kaldbunga; 28 Mar. 1923; Champion leg.; on or at banana plants; NHMUK.

Paratype

INDIA • 1 ♂; same data as for holotype; NHMUK.

Description of holotype

BODY (Fig. 14A). Elongate oval, 2.83 mm long; testaceous, elytra with dark brown maculae just behind middle and a very slightly darkened patch at posterior $\frac{1}{3}$ of suture, antennomere 8 very inconspicuously darkened, antennomeres 9 and 10 castaneous.

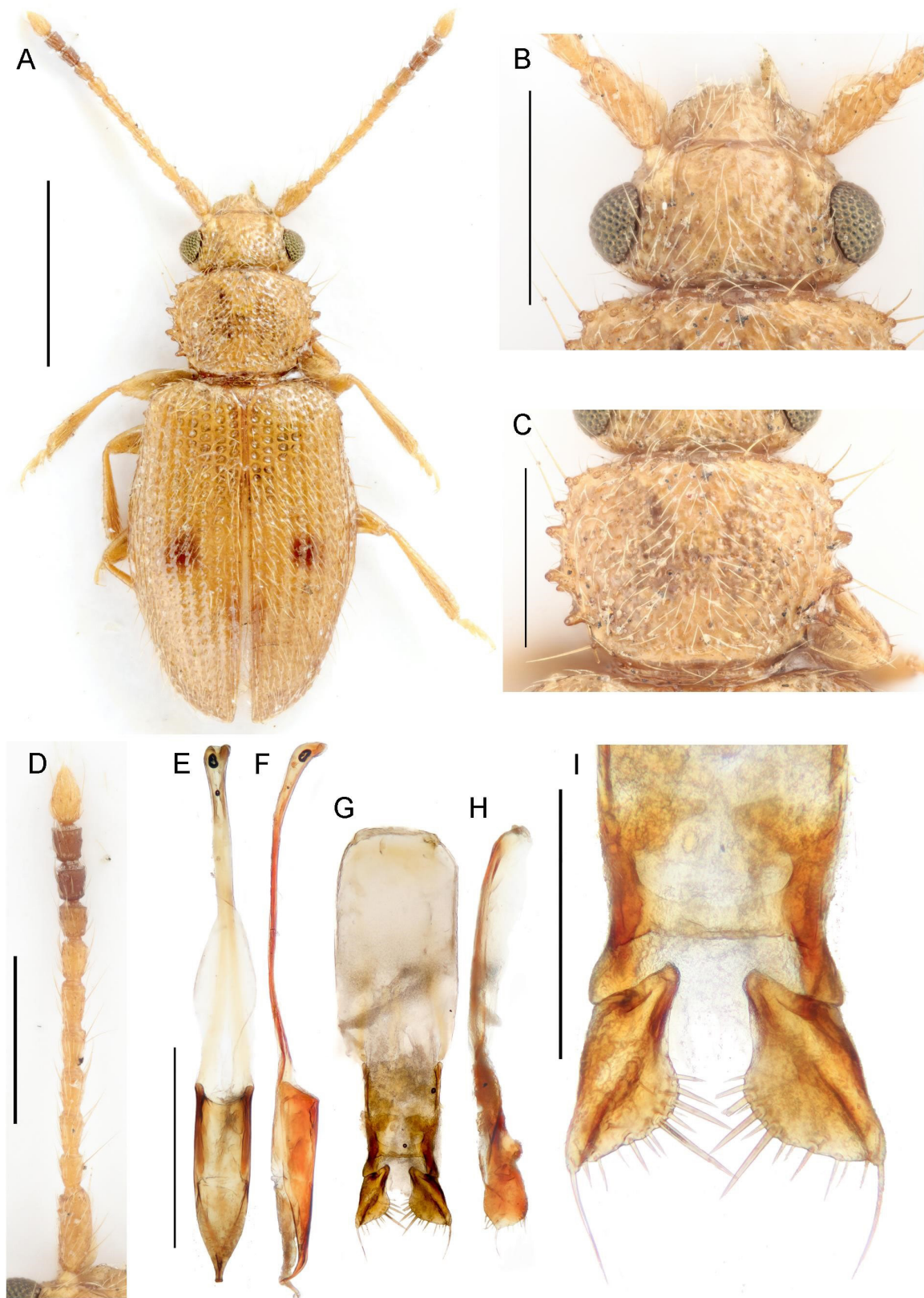


Fig. 14. *Psammoecus pandu* sp. nov. Holotype, ♂ (NHMUK). **A.** Habitus. **B.** Head. **C.** Pronotum. **D.** Left antenna. **E.** Median lobe, dorsal view. **F.** Median lobe, lateral view. **G.** Tegmen, ventral view. **H.** Tegmen, lateral view. **I.** Parameres, ventral view. Scale bars: A = 1.0 mm; B–H = 0.5 mm; I = 0.2 mm.

HEAD (Fig. 14B). $1.70\times$ as wide as long. Frontal grooves moderately deep, short, almost parallel, slightly curved outward, attaining $\frac{2}{5}$ of eyes. Vertex with sparse punctation, punctures round, distinctly smaller than eye facet diameter. Pubescence on vertex inconspicuous, setae a little less than half as long as eyes, directed antero-medially. Microsculpture on vertex absent. Eyes 0.20 mm long, evenly rounded, eye distance 0.44 mm. Temples evenly rounded, temple angle 65° . Antennae (Fig. 14D) moderately slender, 1.53 mm long, antennomere proportions 2.6 : 1.0 : 1.2 : 1.2 : 1.1 : 1.3 : 1.2 : 1.0 : 1.0 : 1.0 : 1.9.

PRONOTUM (Fig. 14C). $1.21\times$ as wide as long, widest slightly in front of middle; at anterior denticles $1.51\times$ as wide as at posterior denticles. Lateral margin somewhat unevenly curved, with stronger curvature along anterior half, with four distinct teeth of moderate length, tooth I small, teeth II and III larger, basis of tooth III on both sides with an additional, inconspicuous tooth. Anterior and posterior denticles distinct, small. Punctation on disk moderate, a little stronger and denser than on vertex, punctures slightly smaller than eye facet diameter, somewhat elongated antero-medially. Pubescence on disk as on vertex, setae directed antero-medially; surface areas between punctures slightly bulged. Microsculpture on disk absent.

ELYTRA (Fig. 14A). Elongate oval, $1.53\times$ as long as wide; widest at middle. Striae distinctly wider than interstices, strial setae short, semierect, interstitial setae slightly longer; 10th interstice near humerus with distinct denticles and along most of its length with longer, erect setae. Microsculpture on disk absent.

MALE GENITALIA (Fig. 14E–I). Strongly sclerotized. Median lobe in dorsal view lancet-shaped with blunt tip, apex in lateral view strongly bent ventrally, tip sharp. Parameres short, wide, somewhat trough-shaped with numerous thick setae of variable length along inner margin.

Variation

The paratype is 2.88 mm long. It lacks elytral maculae, otherwise the colouration is similar to that of the holotype.

Distribution

The type specimens were found in India.

Remarks

Habitus and colouration of *Psammoecus pandu* sp. nov. resemble species such as *P. incommodus*, *P. trimaculatus* or *P. nitidus*. It differs from all other species by its very distinct and unusually shaped male genitalia, especially regarding the parameres.

Psammoecus bambusae Pal, 1985

Fig. 15

Psammoecus bambusae Pal, 1985: 33.

Psammoecus bambusae – Sengupta & Pal 1996: 181.

Diagnosis

The following combination of character states distinguishes this species:

Body (Fig. 15A) elongate oval, distinctly flattened, castaneous, antennomeres 1–6 testaceous, antennomeres 7 and 8 increasingly darkened, 8 and 9 dark brown, antennomere 11 dark brown with lighter apex head lighter, elytra with testaceous maculae; head (Fig. 15B) with distinct, short, posteriorly slightly diverging frontal grooves attaining anterior $\frac{1}{5}$ of eyes, punctation on vertex moderate, punctures

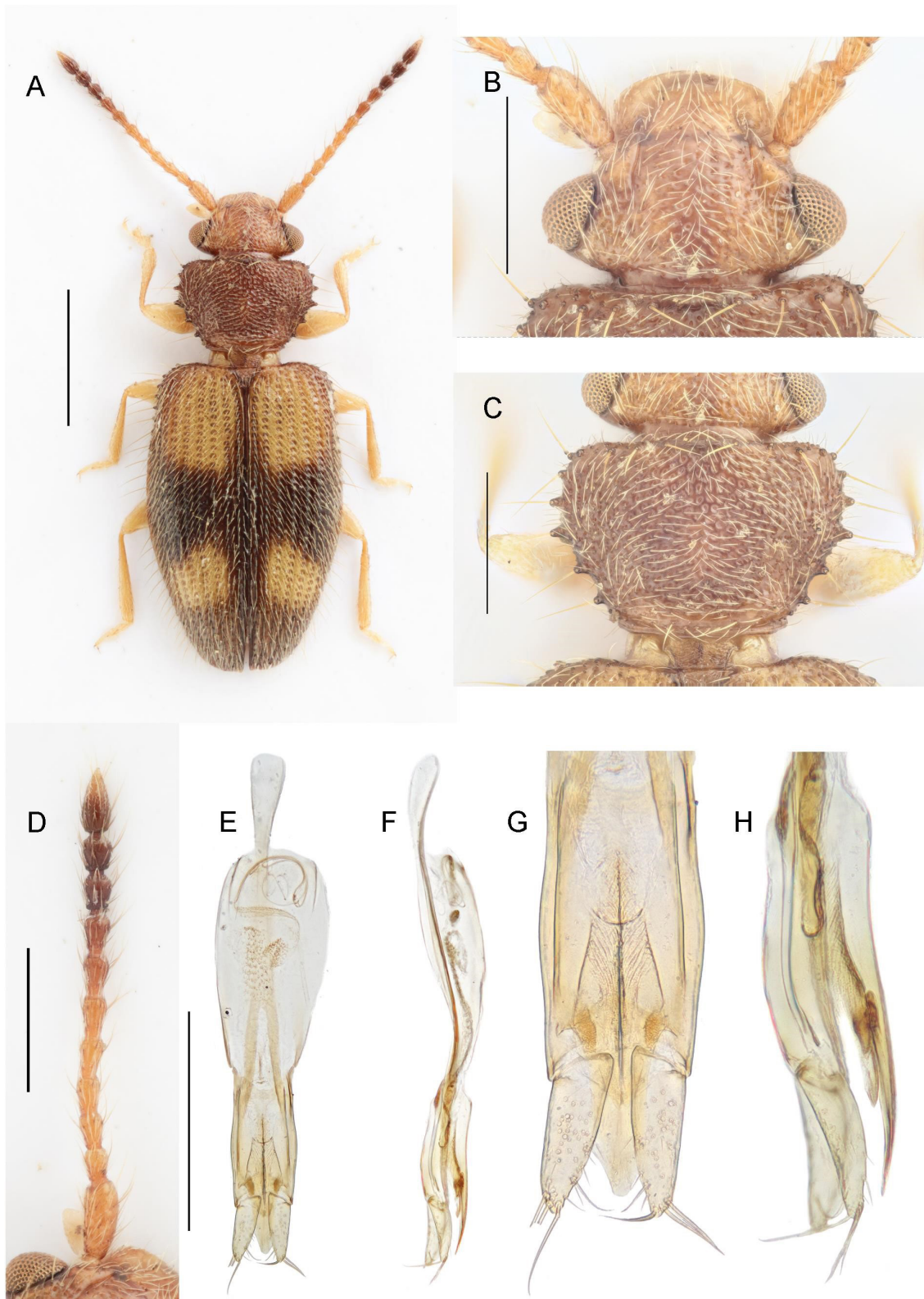


Fig. 15. *Psammoecus bambusae* Pal, 1985. Male specimen from Yunnan, China (SHTU). **A.** Habitus. **B.** Head. **C.** Pronotum. **D.** Left antenna. **E.** Aedeagus, ventral view. **F.** Aedeagus, lateral view. **G.** Detail of aedeagus, ventral view. **H.** Detail of aedeagus, lateral view. Scale bars: A = 1.0 mm; B–F = 0.5 mm; G–H = 0.2 mm.

about as large as eye facet diameter, slightly widened, microsculpture on vertex absent, pubescence on vertex moderate, setae about $\frac{1}{3}$ as long as eyes, directed anteriorly along middle and near eyes, antero-medially on a narrow zone between middle and frontal grooves; eyes strongly protruding, unevenly rounded with stronger curvature towards temples, temples slightly rounded, flat, temple angle 65° ; antennae (Fig. 15D) short, stout; pronotum (Fig. 15C) widest at anterior $\frac{1}{3}$, strongly narrowed towards basis, punctation on disk denser than on vertex, punctures moderately widened, pubescence as on vertex, setae directed antero-medially along middle, medially on inner part of disk, and anteriorly along lateral margins, microsculpture on pronotal disk absent, lateral margins with five teeth, tooth III largest, teeth II and IV somewhat smaller, teeth I and V smallest, anterior denticles distinct, small, posterior denticle small; elytra (Fig. 15A) elongate oval, piceous with testaceous maculae, widest just in front of middle, striae as wide as interstices, strial and interstitial setae of similar length, comparatively short, 8th interstice forming a ridge near humerus, 10th interstice with long setae along entire length and distinct tubercles along basal third; male genitalia (Fig. 15E–H) moderately sclerotized, median lobe wide, evenly narrowed towards blunt tip, slightly curved ventrally, parameres wide, basal half almost parallel sided, moderately narrowed toward apex, apical area with three large setae, inner margin with several small setae, one larger seta close to apex.

Material examined

CHINA – Yunnan • 3 specs; Nabanhe Nature Reserve, Xiaonuoyoushangzhai; 6 Jan. 2004; Li and Tang leg.; SHTU • 1 spec.; same data as for preceding; MKF.

Distribution

Psammoecus bambusae was described from India, it is now for the first time recorded from China.

Remarks

Pal (1985: 35) described this very distinct species based on the male holotype and 10 paratypes, all stored in the National Zoological Collection, Zoological Survey of India. A photograph of the holotype was provided to the present author. The images given here depict a specimen from China / Yunnan (coll. SHTU), representing the first Chinese record of *Psammoecus bambusae*.

Psammoecus complexus Pal, 1985

Fig. 16

Psammoecus complexus Pal, 1985: 23.

Psammoecus complexus – Sengupta & Pal 1996: 173.

Diagnosis

The following combination of character states distinguishes this species:

Body (Fig. 16A) oval, testaceous, vertex slightly darkened, antennomeres 8 and 9 somewhat darkened, antennomeres 10 and 11 whitish yellow, antennomere 10 more or less darkened or of same colour as antennomere 9, pronotal disk darkened, elytra with piceous maculae; head (Fig. 16B) with long, deep, slightly curved frontal grooves that almost attain posterior $\frac{1}{5}$ of eyes, punctation on vertex moderate, punctures slightly elongate, microsculpture absent, pubescence moderate with 3–5 very long setae near frontal grooves; eyes large, somewhat unevenly rounded, temples steep, temple angle 90° ; antennae (Fig. 16D) slender; pronotum (Fig. 16C) widest at anterior $\frac{1}{3}$, punctation sparser and somewhat larger than on head, punctures very slightly elongate, pubescence as on head, few very long setae located on both sides along lateral margins and near middle, lateral margins with three very large and sharp teeth, setae inserted not at tips of teeth, but at antero-dorsal face near tip, tooth I with additional seta on antero-

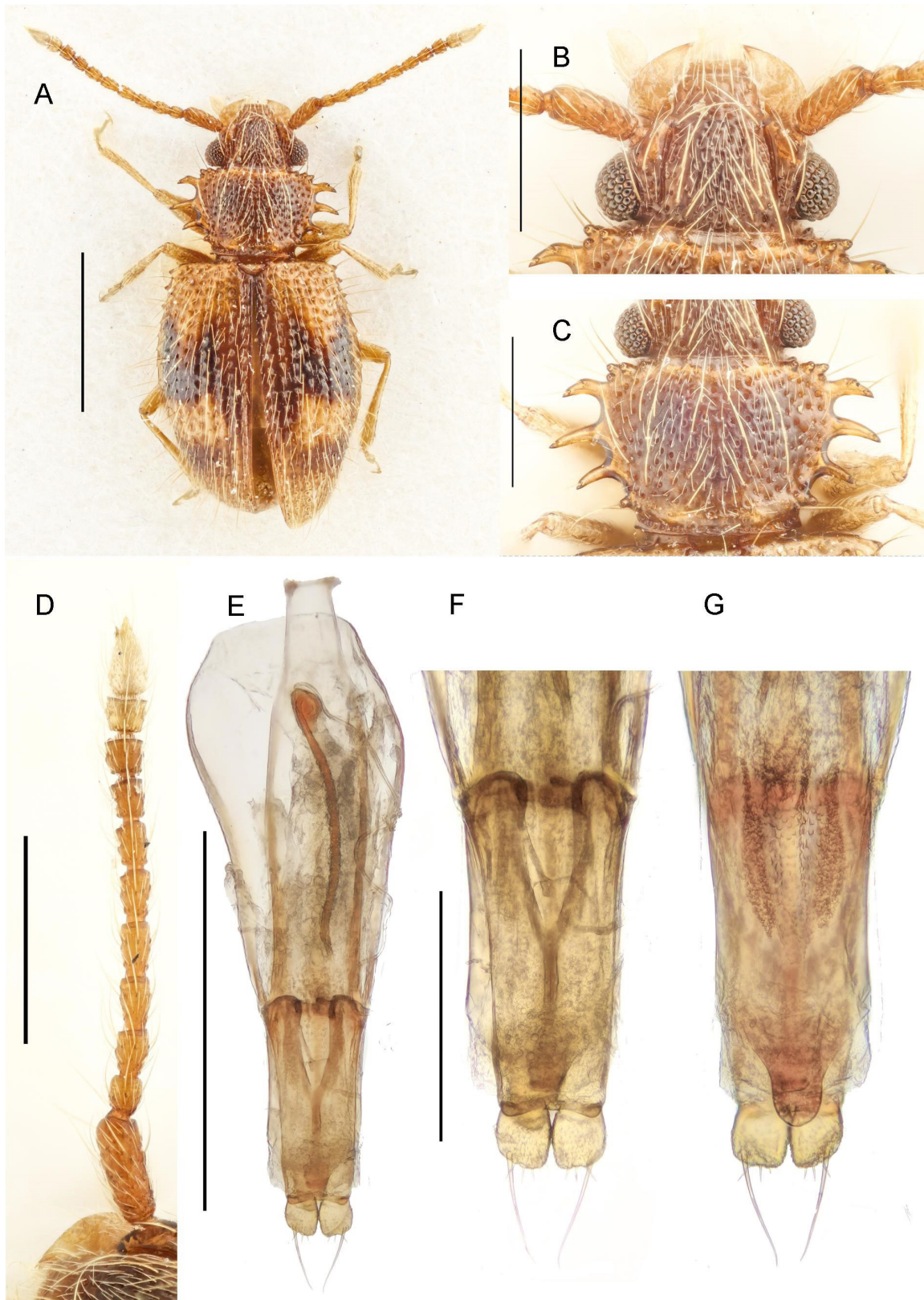


Fig. 16. *Psammoecus complexus* Pal, 1985. Male specimen from Darjeeling, India (MHNG). **A.** Habitus. **B.** Head. **C.** Pronotum. **D.** Right antenna. **E.** Aedeagus, ventral view. **F.** Detail of aedeagus, ventral view. **G.** Detail of aedeagus, dorsal view. Scale bars: A = 1.0 mm; B–E = 0.5 mm; F–G = 0.2 mm.

dorsal face near middle, anterior and posterior denticles distinct; elytra (Fig. 16A) widest at middle, with piceous maculae forming an irregular, wide band near middle and darkened or piceous apex, striae setae short, interstriae setae somewhat longer but much longer towards lateral margins, anterior half of elytral margin somewhat serrate, 10th interstice near humeral swelling with setae-bearing tubercles; male genitalia (Fig. 16E–G) moderately sclerotized, median lobe short, blunt, parameres short, bearing one very long seta, three shorter and numerous very short setae.

Material examined

INDIA – **Assam** • 4 specs; Cachar Hills District, Mt Borail, Phamai Hunting Camp; 1350 m a.s.l. ; 25°06'09" N, 93°03'35" E; 18 Oct. 2005; Cuccodoro and Marletta leg.; sifted from dry leaf litter with fungi and moss in mixed broadleaved forest; MHNG. – **West Bengal** • 1 spec.; Darjeeling, Tonglu; 3100 m a.s.l.; 16 Oct. 1978; Besuchet and Löbl leg.; MHNG • 15 specs; Darjeeling, between Ghum and Lopchu; 2000 m a.s.l.; 14 Oct. 1978; Besuchet and Löbl leg.; MHNG • 19 specs; same locality as for preceding; 12 Oct. 1978; Besuchet and Löbl leg.; MHNG • 7 specs; Darjeeling, Tiger Hill; 2200–2300 m a.s.l.; 13 Oct. 1978; Besuchet and Löbl leg.; MHNG.

Distribution

Psammoecus complexus is solely recorded from India.

Remarks

Pal (1985) described *P. complexus* based on a single specimen from West Bengal and provided an illustration of the habitus, but no illustration of the male genitalia. According to the original description, the holotype is kept in the Termesztudományi Múzeum, Budapest. Ottó Merkl (2013, pers. com.) could not find the holotype in this collection nor any evidence that the specimen ever arrived there. The holotype is therefore considered lost.

Psammoecus complexus is a very distinct species whose characteristics leave no doubt about its identity. The present author is of the opinion that there is currently no exceptional need for a name-bearing type. Hence, no neotype is designated.

Psammoecus delicatus Grouvelle, 1908

Psammoecus delicatus Grouvelle, 1908: 477.

Psammoecus x-notatus Grouvelle, 1912b: 84 (synonymy by Yoshida *et al.* 2018: 6).

Psammoecus nitidior Grouvelle, 1919: 18 (synonymy by Yoshida *et al.* 2018: 6).

Psammoecus raffrayi Grouvelle, 1919: 28 (synonymy by Yoshida *et al.* 2018: 6).

Psammoecus delicatus – Hetschko 1930: 82. — Pal 1985: 21. — Sengupta & Pal 1996: 172. — Yoshida *et al.* 2018: 6.

Material examined

INDIA – **Assam** • 1 spec.; Manas; 200 m a.s.l.; 22 Oct. 1978; Besuchet and Löbl leg.; MHNG. – **Kerala** • 1 spec.; Cardamom Hills, Valara Fall; 450–500 m a.s.l.; 25 Jun. 1972; Besuchet, Löbl and Mussard leg.; MHNG [record previously published by Pal 1985]. – **Meghalaya** • 1 spec.; Khasi Hills, Nongpoh; 700 m a.s.l.; 5 Nov. 1978; Besuchet and Löbl leg.; MHNG. – **Uttarakhand** • 1 spec.; Almora, Chaubatia; 1800 m a.s.l.; 12–13 Jul. 1979; Löbl leg.; MHNG. – **West Bengal** • 1 spec.; Darjeeling, Teesta; 250 m a.s.l.; 10 Oct. 1978; Besuchet and Löbl; MHNG.

SRI LANKA • 1 ♂; Nietner leg.; ZMHB • 1 ♀; Jan. 1965; Mussard leg.; MHNG [record previously published by Pal 1985].

Distribution

Psammoecus delicatus has been recorded from India, Indonesia, Singapore, Sri Lanka, and Taiwan.

Remarks

Psammoecus delicatus was first redescribed by Pal (1985: 21) and recently again by Yoshida *et al.* (2018: 6), where a diagnosis is provided.

Psammoecus simonis Grouvelle, 1892

Psammoecus simonis Grouvelle, 1892: 287.

Psammoecus stultus Grouvelle, 1912b: 81 (synonymy by Yoshida *et al.* 2018: 13).

Psammoecus simonis – Yoshida *et al.* 2018: 13.

Psammoecus simoni – Grouvelle 1908: 476, 488. — Hetschko 1930: 81. — Pal 1985: 31. — Sengupta & Pal 1996: 179. — Hirano 2009: 63, 65, 82; 2010: 11, 14. — Karner 2012: 25; 2014: 15. — Yoshida & Hirowatari 2014: 34 [misspellings].

Material examined

SRI LANKA • 1 spec.; Nietner leg.; ZMHB. – **Central Province** • 1 spec.; Nuwara Eliya; 1900–2440 m a.s.l.; 8–11 Nov. 1882; Lewis leg.; NHMUK • 1 spec.; Mahaweli Ganga, 7 miles from Kandy; 450 m a.s.l.; 30 Jan. 1970; Mussard, Besuchet and Löbl leg.; MHNG [specimen mentioned by Pal (1985: 33)]. – **Southern Province** • 1 spec.; Galle District, Bentota; 23 Mar. 1973; at light; Zimmermann leg.; ZMHB • 5 specs; Galle District, Habaraduwa; 20 Aug.–4 Sep. 1982; Bremer leg.; HNHM • 2 specs; same data as for preceding; MKF • 1 spec.; Galle District, Dodanduwa, 15 km NW of Galle; 3–20 Mar. 1986; Munk leg.; HNHM.

Distribution

This species has been recorded from France (Réunion), India, Indonesia, Japan, Madagascar, Malaysia, Philippines, Seychelles, Sri Lanka, and Taiwan. It was introduced to the USA (Minnesota) as reported by Ouellette (2018)

Remarks

Redescriptions of this widely distributed species have been provided by Pal (1985: 31), Karner (2012: 24), and Yoshida & Hirowatari (2014: 34). Due to its general appearance and typical colour pattern, *Psammoecus simonis* is one of the most easily identified species within the genus.

Psammoecus wittmeri Pal & Sengupta, 1979

Fig. 17

Psammoecus wittmeri Pal & Sengupta, 1979: 76.

Psammoecus wittmeri – Pal 1985: 25. — Sengupta & Pal 1996: 175.

Diagnosis

The following combination of character states distinguishes this species:

Body (Fig. 17A) elongate oval, testaceous with piceous maculae on elytra; head (Fig. 17B) with distinct, narrow, outwardly curved frontal grooves that attain anterior $\frac{1}{3}$ of eyes, vertex with dense punctation that is somewhat sparser towards clypeus, punctures elongate, directed antero-medially, about $1.5 \times$ as large as eye facet diameter, microsculpture absent; eyes of moderate size, only slightly protruding, evenly

rounded; temples small, slightly rounded, temple angle 57° ; antennae (Fig. 17D) slender, testaceous, scape slightly darkened, antennomeres 9 and 10 dark brown, antennomere 11 yellowish white; pronotum (Fig. 17C) widest at anterior third, pronotal disk with dense punctation, puncture shape somewhat irregular, slightly elongated on posterior part of disk, irregularly widened toward anterior margin, microsculpture absent, lateral pronotal margin with five distinct teeth, tooth I largest, triangular with wide basis, teeth II–IV much smaller, tooth V somewhat smaller and narrower than tooth I, anterior denticles distinct, larger than teeth II–IV, posterior denticle very small and inconspicuous; elytra (Fig. 17A) widest at middle, with piceous maculae on apical part, elytral striae somewhat wider than interstices, strial and interstitial setae of similar length, microsculpture absent.

Type material

Holotype

INDIA • ♀; “Lebong 11.5. / 1800 / 1900 m 75 // Distr. Darjeeling / India, W. Wittmer // *Psammoecus wittmeri* / Pal & Sengupta // HOLOTYPE [red print on white label]”; NMB.

Distribution

Psammoecus wittmeri is only recorded from in India.

Remarks

This species is only known from the female holotype that is in rather poor condition, so diagnostic information for several characters had to be omitted. However, *Psammoecus wittmeri* is well defined by the distinct shape of the teeth along the lateral pronotal margins.

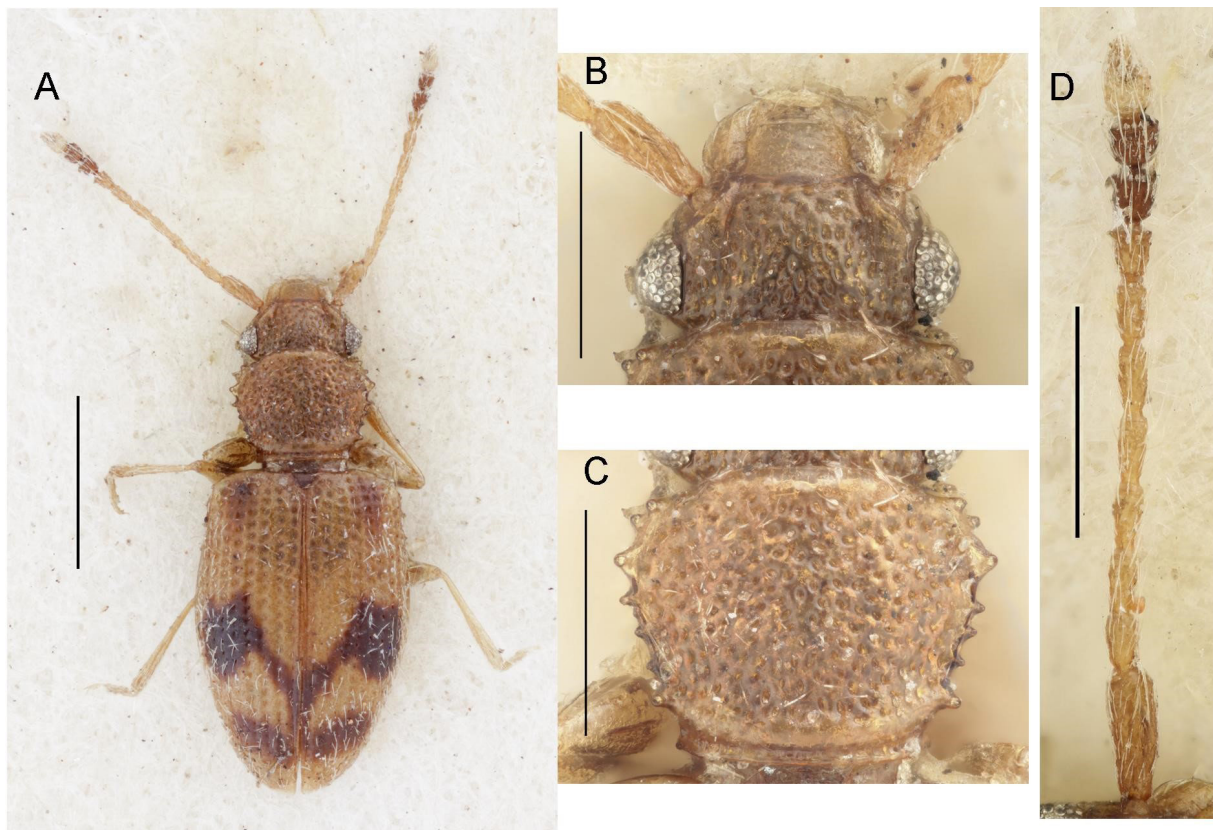


Fig. 17. *Psammoecus wittmeri* Pal & Sengupta, 1979. Holotype, ♀ (NMB). **A.** Habitus. **B.** Head. **C.** Pronotum. **D.** Left antenna. Scale bars: A = 1.0 mm; B–D = 0.5 mm.

An incorrect record, an unsolved problem and a nomen dubium

Psammoecus decoratus Grouvelle, 1919: 29

The inclusion of this species in the Indian fauna by Pal (1985) is due to an error. As Arrow (1927: 46) pointed out, Grouvelle (1919: 31) misinterpreted the label data of the type specimens of *P. decoratus* (two specimens mounted on a single label, kept in the NHMUK collection): the label reads “Samboangan”, referring to Zamboanga, Mindanao, Philippines, and not “Shembagnaur”. Pal (1985) and Sengupta & Pal (1996) did not recognise this and treated *P. decoratus* as part of the Indian fauna. The present author is not aware of any records of *Psammoecus decoratus* from the Indian subcontinent.

Psammoecus bhutanicus Pal, 1985: 27

According to the description of this species (Pal 1985: 27), based on a single specimen of unknown sex, it resembles *P. trilošana*. Several differentiating character states are mentioned in the description: larger eyes, less transverse prothorax with posterior part of lateral margins slightly sinuate, different colouration of antennae, and different colour pattern of elytra.

The holotype of *Psammoecus bhutanicus* is stored in the collection of the Zoological Survey of India, Kolkata, West Bengal, India. A photograph of the holotype was kindly provided. The specimen does not resemble *Psammoecus trilošana*, but, as far as can be concluded from the picture, it resembles *Psammoecus trimaculatus*, *P. nitidus*, or *P. triguttatus* Reitter, 1874: 524. As identification of these species is impossible without examination of the male genitalia, and as neither the original description nor the photograph of the holotype reveal distinguishing character states, no diagnosis of *P. bhutanicus* can be provided with the present paper.

Psammoecus gentilis Grouvelle, 1908: 480

In his description of this species, Grouvelle mentions one or more type specimens as follows: “Ceylan: Nawalapya (E. Simon). Collection A. Grouvelle.”.

The description contains no information on the variability, so it is probably based on a single specimen. No type specimen could be found in the MNHN collection (Taghavian 2014, pers. com.) or in any other collection. The original description does not provide information of sufficient diagnostic value; therefore, *Psammoecus gentilis* is considered to be a nomen dubium.

Discussion

Compared to the last revision of Indian *Psammoecus* by Pal (1985), the number of species recorded from the Indian subcontinent now increases from 16 to 21. Many of these species have a large area of distribution: *Psammoecus incommodus*, *P. trimaculatus*, *P. t-notatus*, *P. nitidus*, *P. quadrimaculatus*, *P. harmandi*, *P. bambusae*, *P. delicatus*, and *P. simonis*. As noted previously (e.g., Karner 2020, 2023), it is likely that the distribution of these species is at least partially driven by human trade. Recent publications (Lu & Han 2006; Ouellette 2018; Yoshida 2020) on related species found associated with packaged goods and trade infrastructures support this hypothesis.

It was a conscious decision not to provide an identification key for the species treated here. The main reason for this is that all these species can be easily and quickly recognised using the figures provided. Using a key to identify them would be much more time consuming, without adding to the certainty of identification.

The species discussed in this paper represent almost the entire spectrum of morphological diversity within the genus. It could be hypothesised that *Psammoecus* consists of several distinct genera. However, given the current, still very poor knowledge of species from the Indo-Malayan and Papua-Melanesian

regions, where, according to the present author's current studies, the greatest richness of *Psammoecus* species occurs, any attempt to divide *Psammoecus* into genera still seems very premature.

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