

On the myrmecophilous genus *Systellus* Kleine (Coleoptera: Brentidae), with systematic and biological notes on *S. mentaweicus* (Senna)

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Abstract. The myrmecophilous brentid genus *Systellus* Kleine, 1917 (Eremoxenini) is redescribed. *Amorphocephalus mentaweicus* Senna, 1898 is transferred to the genus *Systellus* (new combination) and becomes a senior synonym of *S. rex* Kleine, 1917 (new synonymy) which is the type species of the genus. The systematic position of *Systellus* within the tribe Eremoxenini is briefly discussed. This genus is easily recognised by the antennae with nine segments instead of 11, but is close to *Paramorphocephalus* in most other character states. *Systellus mentaweicus* is recorded for the first time from Peninsular Malaysia and Thailand. In Malaysia several specimens were found in a nest of the ant *Camponotus* (*Tanaemyrmex*) sp. This is the first host record for the genus *Systellus*.

Key words. *Camponotus*, distribution, myrmecophily, synonymy, Malaysia, Thailand, taxonomy

INTRODUCTION

The genus *Systellus* was established by Kleine (1917a) in the tribe Amorphocephalini (= Eremoxenini, in current nomenclature) of the family Brentidae, based on a female of the species *Systellus rex* Kleine, described in the same paper and designated as the type-species of the genus. One of the main characters of the genus is the antenna which consists of nine segments, distinct from most eremoxenines which have 11-segmented antennae. Later, Kleine (1926) also briefly described the male of *S. rex*. Damoiseau (1979) revised the Amorphocephalini genera, including *Systellus*, but overlooked Kleine's (1926) male description, stating that only the female of this species was known. Up until now, only the single species *S. rex* is known in the genus *Systellus*.

Senna (1898) described *Amorphocephalus mentaweicus* (subsequently placed in *Paramorphocephalus*) from Mentawai, Indonesia, prior to Kleine (1917a). We recently studied the holotype of this species and discovered that it is identical to *Systellus rex*, of which the type-specimens were also examined. It is remarkable that a taxonomist as careful as Angelo Senna overlooked a peculiar character, the reduction of the antennal segments from 11 to nine; the

remainder of the description perfectly fits the type-specimen. Due to Senna's (1898) mistake, all the subsequent authors considered the species among those with 11-segmented antennae, and finally Damoiseau (1979) placed it in the genus *Paramorphocephalus* Kleine, 1920. Consequently, *Paramorphocephalus mentaweicus* (Senna) should be transferred to the genus *Systellus*, making its type species, *S. rex*, a synonym of *S. mentaweicus*.

The purpose of this paper is to redescribe more accurately the genus and the species, to give supplementary data on both sexes, and provide notes on the systematic position and biology of *S. mentaweicus* observed in Malaysia and Thailand.

MATERIAL AND METHODS

Material of the following institutions was examined: KUM: M. Maruyama Collection at The Kyushu University Museum, Fukuoka, Japan; MSNG: Museo civico di Storia naturale, Genoa, Italy; MZUF: Museum of Natural History of the University of Florence, Italy; NBCL: Naturalis Biodiversity Center, Leiden, the Netherlands; SDEI: Senckenberg Deutsche Entomologische Institut, Müncheberg, Germany.

Photographs were taken with a Canon 50D and Canon MP-E65 macro lens and mounted with the software CombineZM.

TAXONOMY

Systellus Kleine, 1917

Systellus Kleine, 1917a: 175 (type-species: *Systellus rex* Kleine 1917, by original designation); Alonso-Zarazaga & Lyal, 1999: 49 (= *Eusystellus*, unjustified replacement name); Sforzi & Bartolozzi, 2004: 321 (catalogue).

Eusystellus Kleine, 1917b: 316 (replacement name for *Systellus* Kleine, 1917, not *Systella* Westwood, 1841); Kleine, 1920: 238 (key); Kleine, 1924: 204 (redescription); Kleine, 1926:

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35 (male description); Kleine, 1927a: 80 (key); Kleine, 1927b: 31 (catalogue); Kleine, 1937: 28 (key); Kleine, 1938a: 12 (catalogue); Kleine, 1938b: 76, 78 (redescription); Damoiseau, 1979: 3, 21 (key and female redescription).

Eurystellus: Kleine, 1931: 307 (misspelling).

Redescription. Male: Head (Figs. 1–4) short, twice as wide as long to basal constriction, with three longitudinal sulci on vertex; eyes large, occupying almost entire side margin of head, strongly convex laterally, contiguous with basal constriction at base; antennae (Fig. 5) with nine segments, weakly asymmetrical; rostrum longer than wide, separated from head by deep transverse depression at base; metarostrum short, mesorostrum subquadrangular, parallel-sided, broadly depressed dorsally, longitudinally carinate along side margins; prorostrum narrower than mesorostrum, convex at sides, longitudinally depressed in the middle, connected to mesorostrum, costate at each side of depression, costae incurved along antennal insertion from anterior margin of mesorostrum, auriculate on each side of the costa; rostral apophyses well expanded laterally beyond meso- and metarostrum; underside of pro- and mesorostrum strongly compressed laterally on each side of median carina, latter well produced and arcuate ventrally, narrowest between antennal sockets in ventral view and distally enlarged with a pair of narrow sulci to bottom of hypopharyngeal sinus, each side of medial carina broadly depressed.

Pronotum (Fig. 1) longer than wide, punctuated, with trace of median sulcus on disc. Scutellum not visible.

Elytra (Fig. 1) parallel-sided, slightly wider than pronotum, lamellate at apex, striae very narrow, with row of punctures, intervals wide, depressed along entire length, with costate sides, seventh interval with row of 9 distinct umbilicate pores (Fig. 6: arrows).

Legs (Figs. 1, 7) robust, femora compressed from base to middle; tibiae bisinuate internally, compressed with weak swelling at basal third, tibial spurs 1-2-2.

Prosternum between coxae linear. Metasternum with median sulcus on posterior half. Venter not sulcate; sternite III behind coxa shorter than IV, sternite VIII truncate at apex, with large depression in middle.

Female: Head (Figs. 8–10): similar to male, but prorostrum short, cylindrical, slightly upturned towards apex, with weak median sulcus at base; underside without carina; mesorostrum weakly expanded laterally below antennal sockets; head and rostrum without conspicuous setae; sternite VIII without depression.

Systellus mentaweicus (Senna, 1898), new combination

Amorphocephalus mentaweicus Senna, 1898: 237 (original description based on male; no figure); Schönfeldt, 1908: 29 (catalogue).

Leptamorphocephalus mentaweicus: Kleine, 1918: 133, 141 (new generic combination); Kleine, 1924: 215 (comment); Kleine,

1926: 36 (key); Kleine, 1927b: 33 (list); Kleine, 1938a: 84 (catalogue); Kleine, 1938b: 15 (key).

Paramorphocephalus mentaweicus: Damoiseau, 1979: 19 (female, head characters; new generic combination); Sforzi & Bartolozzi, 2004: 310 (catalogue).

Systellus rex Kleine, 1917a: 177 (original description based on female; figs.: antenna, head and rostrum). New synonymy

Eusystellus rex: Kleine, 1917b: 316 (new generic combination); Kleine, 1926: 35, figs. 50, 51 (male description: head and rostrum, antenna); Kleine, 1927b: 31 (catalogue); Kleine, 1938a: 79 (catalogue); Kleine, 1938b: 12 (catalogue); Damoiseau, 1979: 20, 21, figs. 22–25 (female redescription: head, rostrum and prothorax, fore leg and antenna); Alonso-Zarazaga & Lyl, 1999: 49 (catalogue); Sforzi & Bartolozzi, 2004: 321 (catalogue).

Type material. Holotype male of *A. mentaweicus* (MSNG): Mentawai: Si Oban [= Indonesia, W. Sumatra, Kepulauan Mentawai, Pulau Sipora: Sioban].

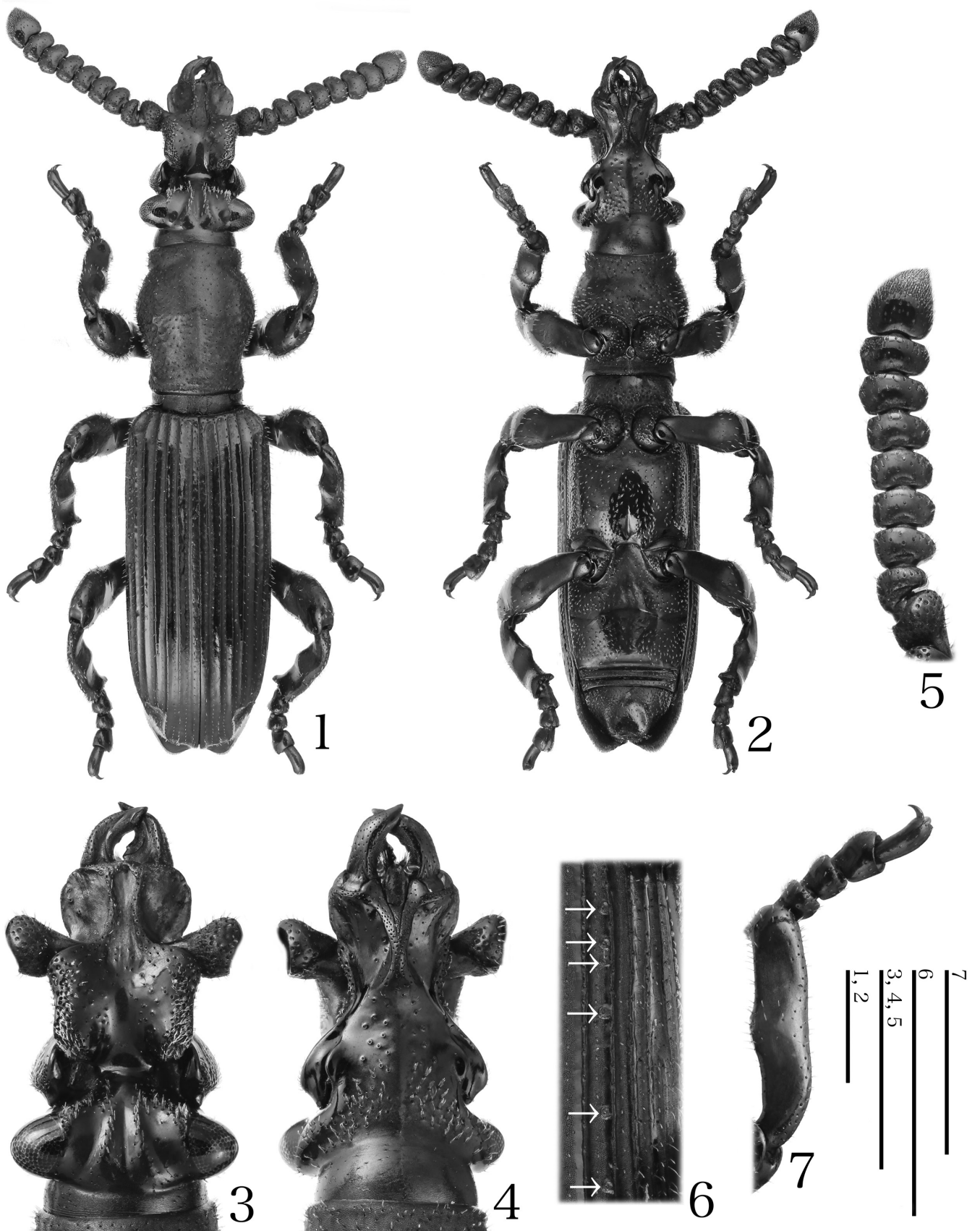
Holotype female of *S. rex* (SDEI): East Sumatra. Paratype female of *S. rex* (NBCL): Borneo.

Other material. MALAYSIA: 1 male, Ulu Gombak (Univ. Malaya Field Studies Centre), 250 m alt, Selangor, 9 May 2005, M. Maruyama leg. (KUM); 2 males 3 females, same data, 11 May 2005, from a nest of *Camponotus (Tanaemyrmex)* sp. (KUM); 1 male, Balungan Camp c/o Kampung Semelor (E-shore of Lake Tasek-Temengor), 230 m alt., Perak, 10–19 July 2007, L. Bartolozzi leg. (MZUF); THAILAND: 1 male, Khao Luang National Park, 200 m alt, Nakhon Sri Thammarat, Thailand, 1 November 2010, M. Maruyama leg., at UV light (KUM); 1 male, Ban Krang Camp, 350 m alt, Kaeng Krachan National Park, 7 May 2013, M. Maruyama leg., at UV light (KUM).

Distribution. Borneo, Sumatra, Peninsular Malaysia (new record), Thailand (new record).

Redescription. Body (Figs. 1, 2, 8, 9) chocolate brown, matt, with yellowish bifid setae on head along anterior margin, on longitudinal raised parts between sulci and underside, mesorostrum at sides and rostral apophyses at lateral surface.

Head (Figs. 1–4, 8–10) twice as long as wide including eyes (from basal constriction), with three broad longitudinal sulci on vertex, lateral sulci converging anteriorly, sulci smooth, impunctate, longitudinal obtuse ridges between sulci, inner and anterior margins of eyes and anterior declivitous margin with setiferous punctures; antennae with first segment robust, second segment strongly bent, asymmetrical, third to eighth subequal in shape to one another, twice as wide as long excepting neck, ninth segment subpentagonal in dorsal aspect, as smooth as preceding segments in basal third, then pubescent to apex; prorostrum widest at apical third, impunctate excepting for ridges, mesorostrum about 1.4 times as wide as long, impunctate and smooth on median depressed area, with large setiferous punctures on lateral convex areas, becoming denser basally, rostral apophyses with dense setiferous punctures on external surfaces, underside of head with scattered large setiferous punctures; underside of rostrum produced ventrally in arcuate longitudinal carina (in lateral view), sides of carina strongly compressed longitudinally, with large and smooth lateral depression distally on each side.



Figs. 1–7. *Systellus mentaweicus*, male (from Ulu Gombak, Selangor, Peninsular Malaysia): 1, Habitus, dorsal view; 2, ditto, ventral view; 3, head, dorsal view; 4, ditto, ventral view; 5, left antenna; 6, umbilicate pores on right elytra; 7, right fore leg. Scale bars = 1.0 mm.

Pronotum (Figs. 1, 8) 1.25 times as long as wide, apical and basal margins subequal in width, disc with sparse and small punctures and short dark pubescence, with faint median groove and two pairs of faint, broad longitudinal depressions.

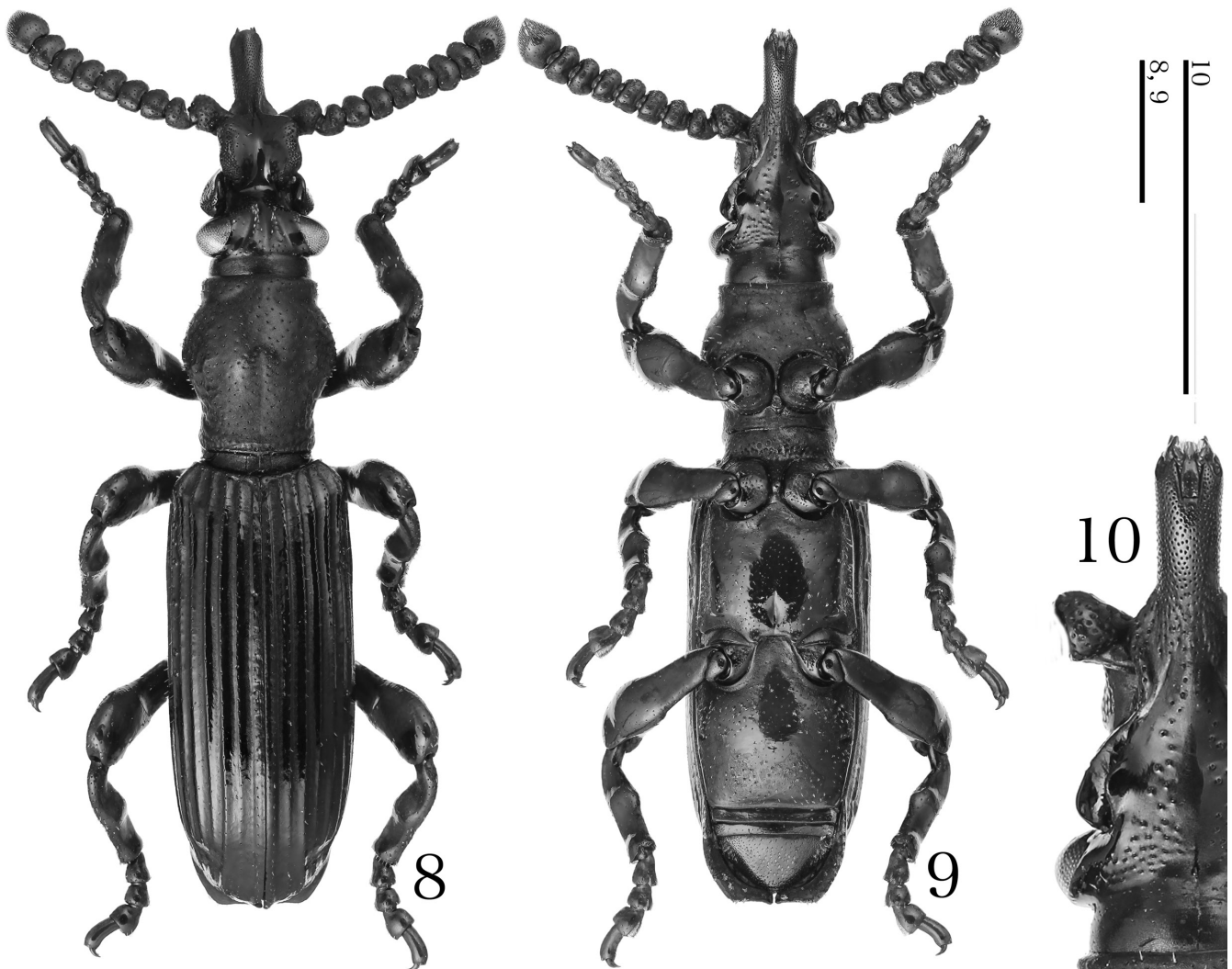
Elytra (Figs. 1, 8) 2.4 times as long as pronotum, striae very narrow, with row of small punctures, intervals depressed in entire length, smooth, costate on each side, first to sixth intervals reaching base, seventh and eighth intervals conjoined behind humeral callus, ninth and tenth intervals and striae obsolete at base leaving smooth surface below humeral callus; apical area weakly expanded and obtusely triangular at each apex.

Legs (Figs. 1, 7, 8) robust; femora weakly dilated to middle, depressed, then weakly swollen to flattened apical margin; tibiae bisinuate internally, broadly depressed on each side of swollen area at middle.

Body length: 10.7–15.2 mm (including rostrum).

SYSTEMATIC POSITION

This genus belongs to the *Amorphocephala* group in the tribe Eremoxenini (Damoiseau, 1979) and is easily recognised by the antennae of nine segments instead of 11. With the notable discrepancy of the number of antennal segments, this genus has close relationships to *Paramorphocephalus* (as already pointed out by Damoiseau, 1979) in having asymmetrical antennae, a short head, large eyes, parallel-sided mesorostrum, prorostrum slightly narrower than metarostrum in male, rostrum wider at the level of the apophyses, deeply depressed at base, and three sulci on head. The presence of a deep and large depression on each side of the median arcuate carina on the underside of the male rostrum is somewhat similar to *Cobalocephalus* Morimoto, 1982 but the carina widens apically, and the dorsal surface of the rostrum is depressed at the base. To our knowledge, the umbilicate pores on the elytra are recognised here for the first time in the superfamily Curculionoidea.

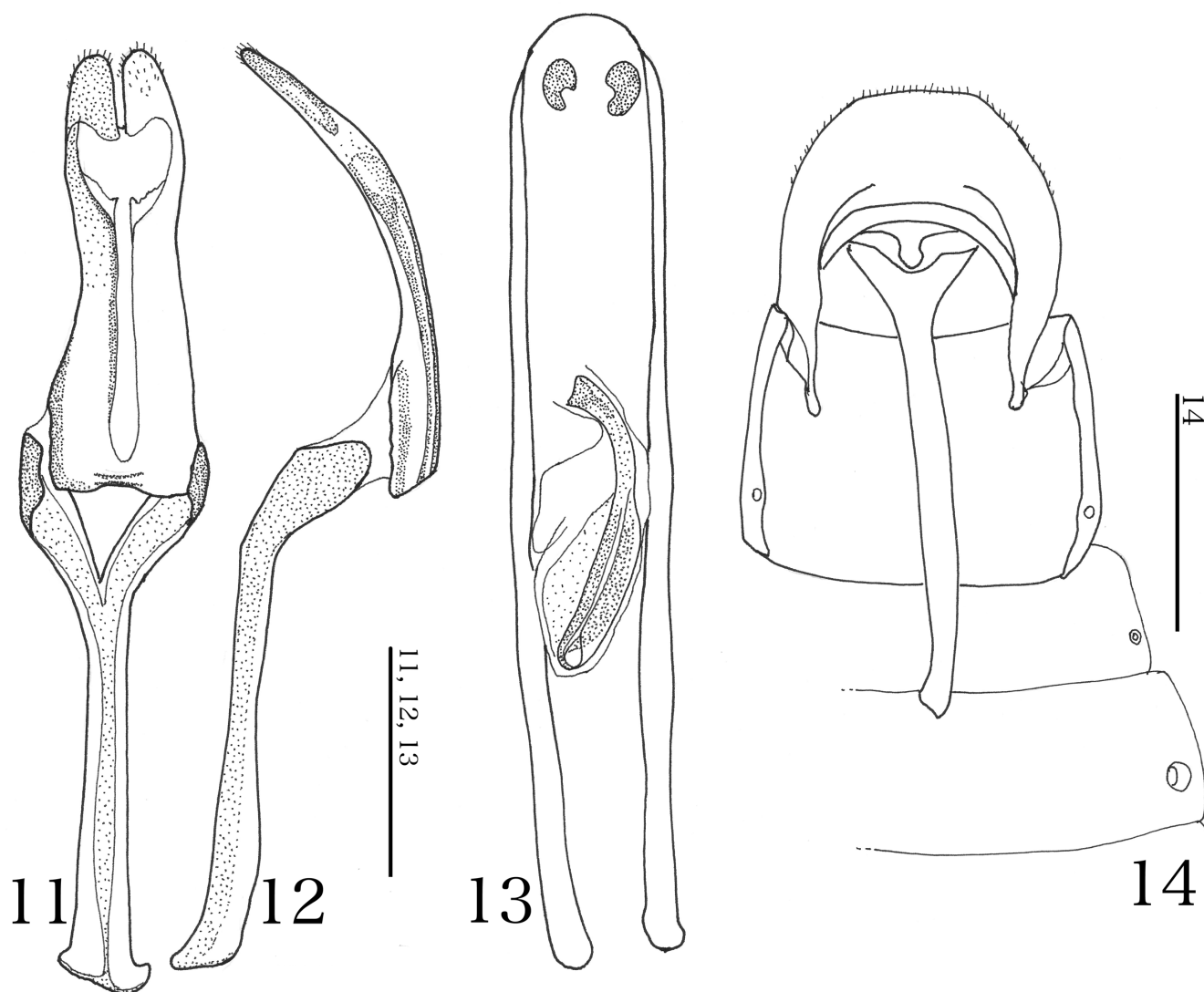


Figs. 8–10. *Systellus mentaweicus*, female (from Ulu Gombak, Selangor, Peninsular Malaysia): 8, Habitus, dorsal view; 9, ditto, ventral view; 10, head, ventral view. Scale bars = 1.0 mm.

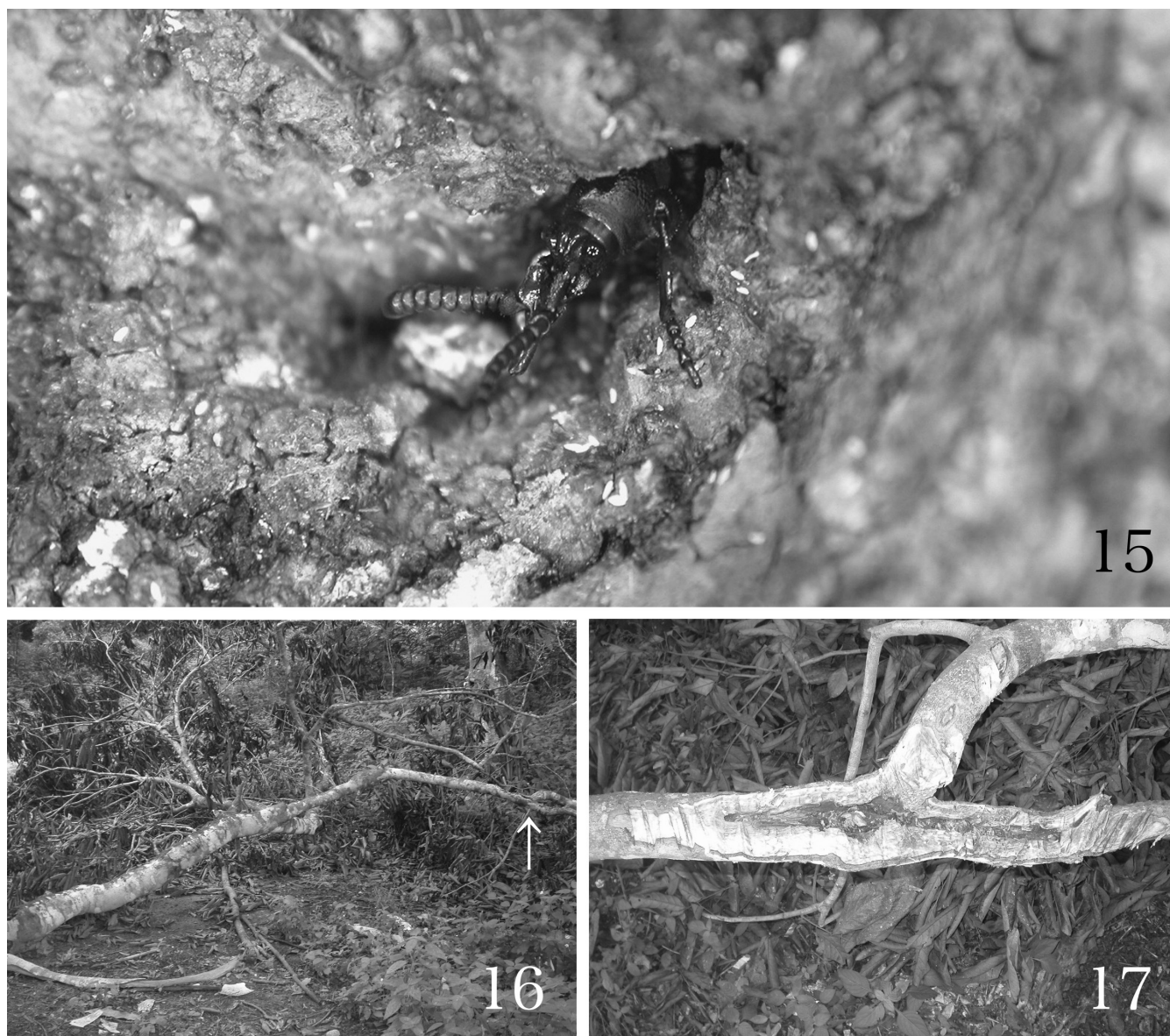
BIOLOGY

Most specimens of *Systellus mentaweicus* examined in this paper were collected in light traps. However, one of us (MM) has observed several individuals of this species in or around an ant nest at Ulu Gombak in Selangor, Peninsular Malaysia. During the night of 9 May 2005, a male was found walking on a fallen tree branch (maximum 30 cm diameter, probably fallen about two weeks earlier), with several *Camponotus* (*Tanaemyrmex*) sp. ants walking around it. The following day, at nighttime, MM found a female exposing her head from a nest entrance of the same ant on the same branch (Fig. 15). Several ants went in and out the nest entrance, seemingly without paying any attention to the beetle. The nest entrance would have been situated about 20 m above the ground, where the branch was attached to the tree trunk (Figs. 16, 17) before falling down. The next morning, MM whittled the branch to examine the ant nest, and five brentid

adults were found walking slowly around the nest, together with one queen ant, 30 worker ants and about 50 ant larvae and cocoons. When the nest was exposed to light, the ants ignored the beetles and carried their brood outside the nest very quickly. At least six beetles were living in this small colony, which measured only 30 × 3 cm in area. Though no interaction between the beetles and the host ants was observed, the high number of brentid specimens in the nest, the morphological modifications of the head, and the slow motion of the beetles together suggest that this species is integrated into the ant society, as observed for the well-studied eremoxenine *Amorphocephala coronata* (Germar, 1817) (e.g., Torossian 1966). No larvae of eremoxenines were found inside the nest. Sforzi and Bartolozzi (2004, p. 826: Appendix 4) listed all the brentid host ant associations reported in literature up until 2004. This is the first host ant record for the genus *Systellus*.



Figs. 11–14. *Systellus mentaweicus*, male (from Ulu Gombak, Selangor, Peninsular Malaysia): 11–13, Left to right: Tegmen and parameres, dorsal and lateral, aedeagus, dorsal; 14, caudal segments of abdomen, internal view, showing short spiculum relictus and straight spiculum gastrale. Scale bars = 0.5 mm



Figs. 15–17. Habitat of *Systellus mentaweicus* at Field Studies Centre, Ulu Gombak, Selagor, Peninsular Malaysia: 15, Female dropping its head from the host ant nest entrance; 16, fallen branch on which the host ant nest was found; 17, interior of the host ant nest.

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LITERATURE CITED

- Alonso-Zarazaga MA & Lyal CHC (1999) A World Catalogue of Families and Genera of Curculionoidea (Insecta: Coleoptera) (Excepting Scolytidae and Platypodidae). Entomopraxis, Barcelona, 315 pp.
- Damoiseau R (1979) Les Amorphocephalini (Coleoptera-Brentidae) 1.-*Amorphocephalala* Schoenherr et sa parentèle. Bulletin de l'Institut Royal des Sciences Naturelles de Belgique, Entomologie, 51: 1–35.
- Germar EF (1817) Reise nach Dalmatien und in das Gebeit von Ragusa. F.A.Brockhaus ed., Leipzig & Altenburg, XII+323 pp.
- Kleine R (1917a) *Systellus* n. g., ein neues Brenthidengenus mit neun Fühlergliedern (Col.). Entomologische Mitteilungen, 6: 174–178.
- Kleine R (1917b) Namensänderung. Entomologische Blätter, 13: 316.
- Kleine R (1918) Die Gattung *Amorphocephalus* Schoenherr und ihr Verwandtschaftskreis. Archiv für Naturgeschichte, 82 (A 12) [1916]: 52–156.
- Kleine R (1920) Neue Brenthidae (Trachelizini) in Leidens Museum. Zoologische Mededeelingen, 5: 236–247.
- Kleine R (1924) Die Myrmekophilie der Brenthidae. Zoologische Jahrbücher, Abteilung für Systematik, Geographie und Biologie der Tiere, 49: 197–228.
- Kleine R (1926) Die Brenthiden der Niederländischen Ost-Indischen Kolonien. Capita Zoologica, 2: 1–86.

- Kleine R (1927a) Bestimmungstabelle der Brenthididae. Entomologische Zeitschrift, 41: 76–80.
- Kleine R (1927b) Coleopterorum Catalogus, Pars 89, Brenthididae (editio secunda). Junk, Berlin, 94 pp.
- Kleine R (1931) Bestimmungstabelle der Brenthididae. Entomologische Zeitschrift, 44: 307–308.
- Kleine R (1937) Bestimmungstabelle der Brenthididae. Entomologische Nachrichtenblatt, 11(1): 17–29.
- Kleine R (1938a) Genera Insectorum de P. Wytsman, fascicule 207, Coleoptera Fam. Brenthididae (Revision). Tervuren, Belgium, 197 pp., 6 pls.
- Kleine R (1938b) Bestimmungstabelle der Brenthididae. Entomologische Nachrichtenblatt, 12(1): 1–16.
- Morimoto K (1982) On some Japanese Brentidae (Coleoptera). The Entomological Review of Japan, 37(1): 31–36.
- Schönfeldt von H (1908) Genera Insectorum de P. Wytsman, fascicule 65, Brenthididae, Wytsman. Bruxelles, Belgium, 87 pp., 2 pls.
- Senna A (1898) Viaggio del Dott. Elio Modigliani nelle Isole Mentawai. Nota sui Brentidi. Annali del Museo civico di Storia naturale, Genova, 19(2): 221–239.
- Sforzi A & Bartolozzi L (2004) Brentidae Billberg, 1820 (Brentinae, Cyphagoginae, Pholidochlamyinae, Taphroderinae, Trachelizinae, Ulocerinae) (Coleoptera, Curculionoidea), In: Sforzi A. & Bartolozzi L. (eds.) Brentidae of the World (Coleoptera, Curculionoidea). Monografie del Museo regionale di Scienze naturali, Torino, 39, 976 pp.
- Torossian C (1966) Recherches sur la biologie et l'éthologie des myrmécophilies: l'adoption du coléoptère *Amorphocephalus coronatus* Germar par des colonies de fourmis appartenant au genre *Camponotus*. Comptes-Rendus de la Société de Biologie de Toulouse, 159: 984–987.
- Westwood CO (1841) Descriptions of some new Coleoptera from Sumatra. Transactions of the Entomological Society of London, 1881: 487–489.