

**A new *Callosides* species from Ecuador
with uniquely built membranous mandibles
(Coleoptera: Hybosoridae: Anaidinae)**

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Abstract. *Callosides mafik* sp. nov. from Ecuador (Napo) is described and its diagnostic characters are illustrated. The new species clearly differs from all three previously described for the genus in having short clavate macrosetation of the dorsal surface, different configuration of tubercles of the dorsal surface and the areolate-ocellate sculpture of elytra. The membranous distal part of the mandible, a unique character within all Scarabaeoidea, is discussed.

Key words. Coleoptera, Scarabaeoidea, Hybosoridae, Anaidinae, *Callosides*, taxonomy, new species, morphology, mouth parts, mandible, Ecuador, Neotropical Region

Introduction

The genus *Callosides* Howden, 1971 was recently classified as being part of the subfamily Anaidinae of the family Hybosoridae (Scarabaeoidea) (OCAMPO 2006). The taxonomical history of the genus began with HOWDEN (1971) describing *Callosides campbelli* from cloud forest in Colombia. Since then two additional species from humid montane forest in Ecuador were described, *C. bartolozzii* Paulian & Cambefort, 1996 and *C. genieri* Howden, 2001 (PAULIAN & CAMBEFORT 1996, HOWDEN 2001). According to a phylogenetic analysis by OCAMPO (2006) the genus *Callosides* is considered a sister group to the genus *Cryptogenius* Westwood, 1845.

Almost nothing is known about the natural history of *Callosides* species (OCAMPO 2006). Adult specimens of *C. campbelli* and of *C. genieri* were sifted from leaf litter (HOWDEN 1971, 2001). HOWDEN (2001) mentioned the presence of a peculiar mandibular exoskeletal cavity in *C. genieri*, calling it a ‘mycangium’, and hypothesised that the *Callosides* members feed on fungi or fungal spores. However, GREBENNIKOV & LESCHEN (2010) pointed out that fungal spores have not been observed in these cavities, and their mycangial function is thus inconclusive.

Recently collected *Callosides* material in the Napo province, Ecuador, revealed another undescribed species whose formal description we present below.

Material and methods

Specimens were examined with an Olympus SZ61 stereomicroscope, measurements were taken with an ocular graticule. The habitus photographs were taken using a Canon MP-E 65mm/2.8 Macro lens with 5:1 optical magnification on bellows attached to a Canon EOS 550D camera. Partially focused images of the specimen were combined using Helicon Focus 3.20.2Pro software.

Specimens of the newly described species are provided with one printed red label: 'Callosides mafik sp. nov. / HOLOTYPUS [or] PARATYPUS No. x ♂ / David Král & Jiří Hájek det. 2014'. Exact label data are cited for the type material. Our remarks and addenda are found in square brackets, separate label lines are indicated by a slash (/), separate labels by double slash (//). Material is deposited in the collection of the National Museum, Prague, Czech Republic.

For most of morphological terms used in the description we follow HOWDEN (2001) and OCAMPO (2006), and for those concerning the mouth parts we follow NEL & SCHOLZ (1997).

Taxonomy

Callosides mafik sp. nov.

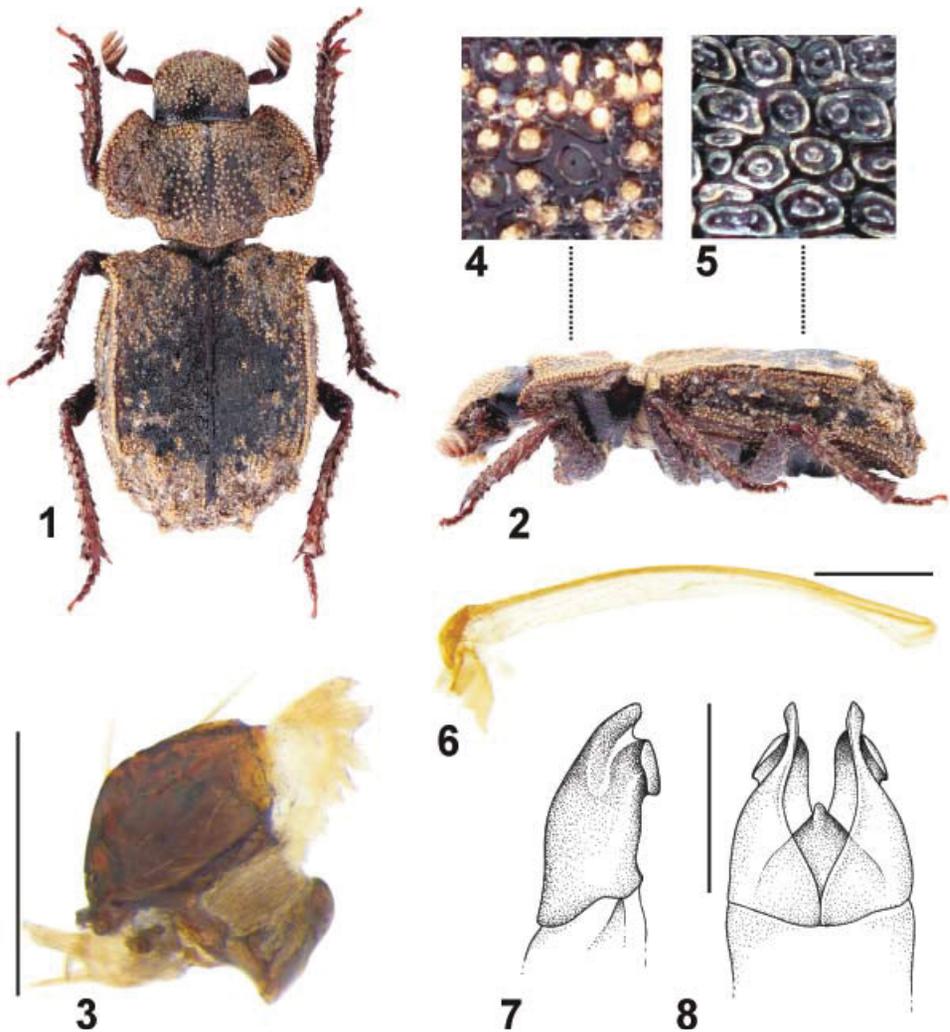
(Figs 1–8)

Type locality. Ecuador, province Napo, 1.3 km SW of Baeza, 77°53'46"W 00°28'34"S, 2050 m.

Type material. HOLOTYPE: ♂, 'ECUADOR, prov. Napo (2) / 1.3 km SW of BAEZA, 2050m / S 00°28'34" W 77°53'46" / 11.xi.2006, M. Fikáček & / J. Skuhrovec lgt. // dense bush of *Chusquea* close / to stream with few solitary trees / near pasture & moss and leaves / on slope above road (sifting) [printed]. PARATYPES: 2 ♂♂: same data as holotype.

Description of holotype. Integument dark brown to black, moderately shiny; dorsal surface remarkably areolate, in places covered with short, stout, dense, erect, clavate macrosetation (Figs 1–2).

Head with dense areolate-ocellate sculpture, meshes simple, slightly different in size and shape (circular, oval, angular), each with setigerous puncture; each puncture with short, erect, clavate macroseta; head integument through macrosetae almost invisible. Clypeus with ogival outline, almost flat, margins slightly upturned. Vertex very weakly convex dorsally, disc shallowly depressed longitudinally. Genae small, regularly rounded, distinctly separated from clypeus by short oblique clypeo-genal suture above eyes. Eyes small, visible in dorsal aspect; eye canthus absent. Antennae decamerous, with trimerous club; scapus stout, clavate, distinctly strigate longitudinally, with several long, erect macrosetae on anterior edge; antennomeres 2–5 moniliform, pedicellus larger than each of antennomeres 3–5, antennomeres 6–7 transverse, antennomere 8 not cupuliform. Labrum smooth, flat, anterior margin slightly sinuate. Epipharynx sclerotized, rounded anterior margin with fine, dense macrosetation; medial longitudinal process present; tormae with double row of long, close macrosetation. Mandibles pyramidal, not protruding beyond outline of clypeus (therefore invisible in dorsal aspect); pars basalis well sclerotised, with large conjunctive, mycangium absent; pars apicalis only partly sclerotised (this part is concave ventrally, with two long macrosetae on outer margin), mesal part



Figs 1–8. *Callosides mafik* sp. nov. 1 – habitus of holotype in dorsal view; 2 – habitus of holotype in lateral view; 3 – left mandible; 4 – detail of pronotal sculpture; 5 – detail of elytral sculpture; 6 – metathoracic wing; 7 – apical part of aedeagus in lateral view; 8 – apical part of aedeagus in dorsal view. Scale bar (Figs 3, 6–8) = 0.5 mm.

(prostheca?) largely membranous, on scissorial (messal) edge with long microtrichia (Fig. 3). Maxilla with remarkably large membranous galea. Maxillary palps tetramerous, ultimate palpomere elongate, approximately as long as palpomeres 2–3 combined. Labium strigate ventrally, bilobed apically. Labial palps tetramerous.

Pronotum large, transverse, sides explanate laterally, with two foveae along sides – posterior fovea larger and deeper, occupying two thirds of pronotal length, anterior fovea smaller and shallower, stretching in anterior third. Pronotum thickened in narrow, distinctly serrate lateral

bead; outline of anterior corners acuteangular, lateral margins regularly broadly rounded to abruptly constricted posterior angles; disc weakly convex, with indistinct longitudinal flat depression medially; surface with closely areolate-ocellate sculpture, meshes rather small and simple on disc, larger and nearly double (with indicated second concentric contour) laterally, meshes slightly different in size and shape (circular, oval, angular), each with setigerous puncture; each puncture with short, erect, clavate macroseta (Fig. 4); pronotal integument through macrosetae almost invisible, especially laterally.

Scutellar shield minute, triangulate, smooth, moderately shiny, concealed under tuft of yellow, recumbent macrosetae.

Elytra coalescent, nonstriate. Almost flat area of disc delimited laterally by longitudinal carinae arising near basis of humeral teeth; humeral tooth considerable, triangulate, acute apically; surface laterally of longitudinal carina abruptly declivous to smooth sharp epipleural carina; epipleuron narrow reaching from humerus to elytral apex; lateral margin regularly rounded, smooth; basal outline between humeral teeth bisinuate; approximately posterior fourth of elytral length abruptly declivous. Discal flat area with two short longitudinal swellings near basis and four small tubercles arranged zig-zag on each elytron; lateral declivous area with two tubercles on each elytron; posterior declivous area (posteriorly of longitudinal carinae) with six large, distinctly prominent tubercles, three on each elytron. Elytron surface with closely areolate-ocellate sculpture, small meshes usually simple, large meshes double (from two concentric contours), distinctly different in size and shape (circular, oval, angular) (Fig. 5); setigerous punctures bearing short, erect, clavate macroseta concentrated mainly on carinae and lateral margin (closely contiguous rows), lateral and posterior tubercles (clusters), discal tubercles (each with tuft of macrosetae posteriorly of small impunctate shiny area) and to humeral area of disc (setae possibly scraped from larger area of disc).

Metathoracic wings vestigial, reduced to single narrow strut, slightly shorter than elytron length, venation absent, posterior edge membranous (Fig. 6).

Prosternum biconcave, shiny, finely strigate, with two distinct longitudinal carinae between external anterior edge of procoxa to ventral edge of anterior angle. Meso- and metaventrite small, flat, shiny, finely concentrically strigate. Coxae small, contiguous. Femora alutaceous, finely chagreened, with sparse, irregularly spaced, long, erect macrosetae and short, fusiform to clavate macrosetae in between.

Profemur with slightly grooved anterior edge. Protibia slender, alutaceous with narrow longitudinal shiny strip, with two very close apical teeth and with one large tooth and row of five or six teeth along outer margin; ventromedial edge with row of small denticles; apical spur lightly curved inward in distal half, widely truncate apically. Meso- and metatibia slender, alutaceous, their outer edge with longitudinal double row of small carinate denticles, each denticle with long, erect macroseta basally, apical edge fringed with row of short spinules equal in length. Protarsomeres moniliform, densely macrosetaceous on inner edge; meso- and metatarsomeres more elongate, densely macrosetaceous on inner edge, basimeso- and basimetatarsomere with several small denticles on inner edge. Claws simple, regularly curved, acute apically.

Abdominal ventrites moderately shiny, concentrically strigate, sparsely macrosetaceous, macrosetae narrowly fusiform, recumbent.

Male genitalia (Figs 7–8). Parameres symmetrical, shorter than phallobasis, quadrilobate, reminiscent anchor in dorsal aspect; dorsal lobes narrow, rounded apically; ventral lobes large, hooked basally, angulate apically.

Measurements. Total body length: 5.2–5.3 mm (holotype 5.3 mm); maximum body width: 2.4–2.5 mm (holotype 2.5 mm).

Variability. Both paratypes show slight individual variations in size, shape and situation of elytral tubercles and furthermore in places lacking close, clavate macrosetation of the dorsal surface, more so than in the holotype, clearly related to wearing.

Differential diagnosis. *Callosides mafik* sp. nov. clearly differs from all three known species in the following characters:

- presence of short, clavate, macrosetation of the dorsal surface (macrosetation simple or fusiform in all other species (HOWDEN 1971: Fig. 11, PAULIAN & CAMBEFORT 1995: Fig. 1);
- dorsal surface of the head and pronotum without distinct tubercles (Figs 1–2) (dorsal surface of the head and pronotum with tubercles in *C. bartolozzii* (PAULIAN & CAMBEFORT 1995: Fig. 1) and *C. genieri* (HOWDEN 2001: Fig. 1) or tubercles only on the pronotum in *C. campbelli* (HOWDEN 1971: fig. 11));
- elytral discal area with two short, longitudinal swellings near base and four small tubercles arranged zig-zag on each elytron; lateral declivous area with two tubercles on each elytron; posterior declivous area with six large, prominent tubercles, three on each elytron (Fig. 1) (configuration of elytral tubercles different (HOWDEN 1971: Fig. 11, 2001: Fig. 1; PAULIAN & CAMBEFORT 1995: Fig. 1), see also key to *Callosides* species identification in OCAMPO (2006: 70), for details);
- different shape of apical part of aedeagus, compare Figs 7–8 with HOWDEN (2001: Figs 6–11).

Etymology. The new species is dedicated to our colleague and friend Martin Fikáček (National Museum, Prague, Czech Republic), an outstanding student in water beetles and co-collector of the type material. The specific epithet presents Martin's nickname 'Mafik' resulting from his name (Martin Fikáček); noun in apposition.

Collecting circumstances. All three type specimens were sifted from leaf and moss litter in dense bush of the bamboo *Chusquea* Kunth (Poaceae) close to a stream on the slope above a road covered with a few solitary trees near pasture.

Distribution. So far known only from the type locality in the Napo province, Ecuador.

Discussion

Callosides mafik sp. nov. and *C. bartolozzii* were found ca. 55 km apart and the main difference between the two places, according to locality data, is the altitude. *Callosides mafik* sp. nov. was found somewhat 850 m higher than the other species. *Callosides bartolozzii* was sifted from litter in secondary forest (L. Bartolozzi, pers. comm. 2014), however, the precise information about the habitat is missing, thus, we are not able to compare both localities. The fauna of the hybosorid subfamily Anaidinae in Tropical Andes biodiversity hotspot seems to be very rich (see also OCAMPO 2006), which, together with brachyptery in *Callosides*, enables us to expect discovery of additional undescribed *Callosides* in the region. The aptery/brachyptery is considered to be one of diagnostic characters for *Callosides* by OCAMPO (2006). However, we consider it only as an adaptation for life in soil, and/or most probably, an adaptation for life in mountains, where flightlessness is common among insects, particularly among scarabaeids, see, e.g. geotrupid genera *Odontotrypes* Fairmaire, 1887 and *Phelotrupes* Jekel, 1866 (KRÁL et al. 2001).

HOWDEN (2001: Fig. 4) depicted for *Callosides genieri* a well sclerotised blade-like mandible, its molar part with 'mycangium', apical part without tooth, but with distal margin fringed with long setae. OCAMPO (2006) mentioned the mandible molar part with a mycangium as an apomorphy for the *Callosides-Cryptogenius* clade. However, the modified mandible in *C. mafik* sp. nov. supports the view that mandibles are among the most adaptive mouthpart structures, their shape normally being related to feeding habits (see also NEL & SCHOLTZ 1990), and its application in phylogeny is limited. Within Hybosoridae, the mandible of *Callosides* seems to be most similar to that of *Anaides* Westwood, 1845, which also has distinct conjunctive, and mesal brush (prostheca) present as membrane with setae (NEL & SCHOLTZ 1990: Fig. 50). Within Scarabaeoidea, similarly built mandibles (i.e. without teeth, with distinct conjunctive, and with mesal part with long setae), were figured for dung beetles of subfamilies Aphodiinae and Scarabaeinae (NEL & SCHOLTZ 1990). As those beetles are known to accept liquid or semi-liquid food, we assume that membranous mandible may have evolved in *Callosides* for liquid food intake as well.

Although we are not aware of membranous mandibles in Scarabaeoidea, the largely membranous apical part of the mandible is not exceptional among beetles. For example, reduced mandibles with a nearly membranous apical portion are mentioned by HANSEN (1991) for terrestrial hydrophilids of the tribe Omicrini, frequently sifted in tropical areas of the world.

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