

A new genus and species of Rhinocartini (Coleoptera: Attelabidae: Rhynchitinae) from Socotra Island

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Abstract. The family Attelabidae is recorded for the first time from Socotra Island, Yemen. A new genus *Socotrorhinus* gen. nov. is described and compared with similar and likely related groups from the tribe Rhinocartini. The differential diagnosis of this new genus is based primarily on the distinct shape and structure of the rostrum and elytra. *Socotrorhinus boswelliae* sp. nov. is described and its diagnostic characters are illustrated. The biology and geographical distribution of the new species, associated with frankincense trees (*Boswellia* spp., Burseraceae), is briefly described.

Key words. Coleoptera, Curculionidae, Attelabidae, Rhynchitinae, Rhinocartini, *Socotrorhinus*, new genus, new species, description, biogeography, bionomy, Yemen, Socotra

Introduction

Currently, there exist ca. 2500 described species of Attelabidae in ca. 150 genera (O'BRIEN & WIBMER 1978, OBERPRIELER et al. 2007, RIEDEL 2014). They are found in all main zoogeographic regions but are absent from New Zealand and other Pacific islands with the exception of one recorded species from New Caledonia (RIEDEL 2014). The Attelabidae are found to be a sister-group of a clade including Curculionidae-Brentidae-Caridae by all major phylogenetic studies of Curculionoidea (KUSCHEL 1995; MARVALDI & MORRONE 2000; MARVALDI et al. 2002, 2009; MCKENNA et al. 2009). KUSCHEL (1995), DALLAI et al. (1998), and MARVALDI & MORRONE (2000) presented several well defined autapomorphies. The Attelabidae are divided into two subfamilies, regarded as separate families by some authors (ALONSO-ZARAZAGA & LYAL 1999; LEGALOV 2003, 2007; ALONSO-ZARAZAGA 2011c,d), but there is good reason to

keep them together (THOMPSON 1992, KUSCHEL 1995). Currently, there exists no satisfactory phylogeny of the family on a worldwide scale, but there is morphological evidence that Rhynchitinae is paraphyletic with the respect to the Attelabinae (RIEDEL 2014), a suspicion nourished by molecular data of the Japanese fauna (KOBAYASHI et al. 2012). Literature on Attelabidae is primarily suitable for the determination of species, while phylogenetic data are scarce (RIEDEL 2014). The traditional classification published by Eduard Voss between 1922–1969 (for more details see RIEDEL 2014) needs to be corrected. LEGALOV (2003, 2004, 2005a,b, 2007) introduced many new taxa, but most of them, especially supraspecific taxa, are based on weak evidence (RIEDEL 2014). His ‘phylogenetic’ studies include many errors of primary data as well as analysis, and should be treated with great caution (ALONSO-ZARAZAGA 2011a,b). The classification described below keeps most conventional family-group taxa and is almost identical to RIEDEL (2014).

VOSS (1941) revised the tribe Rhinocartini which included two genera at the time: *Proteugnampius* Voss, 1938 and *Rhinocartus* Voss, 1922. The tribe Rhinocartini was presented as a group positioned between Auletini and Rhynchitini but similarities to the genus *Eugnampius* Schoenherr, 1839 were also noted (VOSS 1941). RIEDEL (2014) listed the tribe Rhinocartini with only two genera (as VOSS 1941) as *incertae sedis* in Rhynchitinae, and their classification is unknown. LEGALOV (2007) presented this group as a special supertribe Rhinocartitae with five recent tribes (Auletorhinini, Proteugnampitini, Rhinocartini, Sayrevilleini and Vossicartini) and one extinct Late Jurassic tribe (Paleocartini). The status of the tribe Vossicartini and the genus included in it was not commented on by RIEDEL (2014).

In this paper, we describe a new genus and species from this enigmatic tribe and provide a few details on its life history based on the observations of collectors during their field work in Socotra.

Material and methods

Specimen depositories and citations. Specimens are deposited in the following museums and private collections:

ARC	Alexander Riedel collection, Karlsruhe, Germany;
BMNH	The Natural History Museum, London, United Kingdom (Maxwell V. L. Barclay);
IRSNB	Institut Royal des Sciences Naturelles, Bruxelles, Belgium (Pol Limbourg);
JSPC	Jiří Skuhrovec collection, Prague, Czech Republic;
MNBE	Museum für Naturkunde, Berlin, Germany (Joachim Willers);
MZLU	Museum of Zoology, Lund, Sweden (Christoffer Fägerström);
NMPC	Národní muzeum, Prague, Czech Republic (Jiří Hájek);
PKSC	Petr Kresl private collection, Spůle, Czech Republic;
SMNS	Staatliches Museum für Naturkunde, Stuttgart, Germany (Wolfgang Schawaller).

Label data are cited in the description, with separate lines on labels indicated by ‘/’ and separate labels by ‘//’.

Taxonomy and photographic documentation. The body length of all types was measured without the rostrum. All measurements were measured in dorsal view. Dissected male and female genitalia were studied in glycerine, and thereafter mounted on the same card as the respective specimen with water-soluble glue. Photos of genitalia were taken with an Olympus

BX40 microscope and combined in Zerene Stacker and GIMP2 software. Photos of adults were taken with a Canon EOS 550D with a macro objective MP-E 65 mm and combined using Zerene Stacker and GIMP2 software. The terminology of antennae is in accordance with curculionid literature with the numbering of antennomeres as follows: scape (I), funicle antennomeres (II–VII), club (IX–XI).

Taxonomy

Socotrorhinus gen. nov.

(Figs 1A, D–E; 2A–M)

Type species. *Socotrorhinus boswelliae* sp. nov., by present designation.

Diagnosis. Body length 2.8 to 4.2 mm (without rostrum); temples distinctly widened backwards; rostrum distinctly longer than its base width in females (ratio = 4.00–4.88), less so in males (ratio = 2.75–3.50), distinctly widened from antennal connection towards apex, in lateral view distinctly curved, bent; scrobes indistinct and shallow, not visible in dorsal view, poorly visible in lateral view as a longitudinal furrow along whole length of rostrum on its lower side; labrum indistinct, fused with clypeus; mandibles without mola; relatively slender; with edges passing each other like scissor blade; on outer side without tooth, on inner side with one blunt tooth before apex; maxilla with distinct galea and lacinia; maxillary palpi distinct, compact, four-segmented; prementum narrow, moderately sclerotized; ligula distinct; antennae inserted near base of rostrum, antennae long, slender, straight, non-geniculate; procoxal cavities relatively shallow; notosternal suture distinct, narrowly open; procoxae contiguous, subconical, prominent; prosternum in front of procoxae relatively narrow; prosternellum posterior to procoxae distinct; scutellum small, squared, not extended above elytra; elytra with distinct humeral angles; elytral striae distinctly larger and deeper than punctures on pronotum, forming 10 distinct rows; mesocoxal cavities laterally open; mesocoxae semi-globular, mesoventral process very narrow; metacoxae distinctly separated, short and wide, oriented dorsolaterad; all femora simple, edentate; tibiae apically widened; apically with spurs and without uncus on all pairs; claws thick, wide sickle-shaped; abdominal ventrites I and II fused, slightly visible small sinuosity in midlength; fused ventrites I and II distinctly longer than ventrite III–V; suture between abdominal ventrites I and II slightly visible as sinuosity; next three sutures straight and deep; apodeme of penis more than twice the length of median lobe; tegmen without fenestrae, its terminal plate elongated and tapered apically bearing a few long setae; sternite VIII in females with moderately long apodeme, without distinct lateral arms, terminated just inside plate, plate spacious and heart-formed, with apical margin bearing several distinct setae, weakly sclerotised; gonocoxites of ovipositor with long apical styli bearing setae.

Description. See the description of species.

Etymology. The name is derived from the name of Socotra Island (*Socotr[o]*-) and the component *-rhinus* (= having a nose; Latin, from Greek word *rhis* = a nose), characteristic for many attelabid genera; gender masculine.

Included taxa. Genus is described as monotypic.

Taxonomic assignment of the tribe and differential diagnosis of genus. VOSS (1931) in his tribal key of Rhynchitinae stated that the main differential character of the tribe Rhinocartini is random elytral striae (not arranged in rows). Ten years later, VOSS (1941) included the genera *Proteugnamptus* and *Rhinocartus* in the tribe Rhinocartini, despite the genus *Proteugnamptus* having elytral striae in rows. The tribe Rhinocartini sensu VOSS (1941) is presented as a group positioned between Auletini and Rhynchitini but also with some similarities to the tribe Eugnamptini. RIEDEL (2014) considered the tribe to be incertae sedis within the subfamily Rhynchitinae. LEGALOV (2003, 2007) established a supertribe Rhinocartitae and introduced many new taxa, including four new tribes (i.e. Auletorhinini, Proteugnamptini, Sayrevilleini and Vossicartini). However the definition of these tribes is rather poor and based on variable characters; e.g. the shape and the length of rostrum is highly sexually dimorphic character (see Sexual dimorphism below, Table 1). We accepted the classification by RIEDEL (2014) (see below for more details) and the main tribal differential character from the supertribal key by LEGALOV (2007) instead of the key by VOSS (1931).

The position of the tribe Auletorhinini from LEGALOV (2007) is absolutely enigmatic. LEGALOV (2007) stated that a mandible without tooth on external edge is the main differential character of the supertribe Rhinocartitae, but later stated that representatives of the tribe Auletorhinini have a mandible with a small tooth on external edge. We accepted the classification by RIEDEL (2014), who presented the genus *Auletorhinus* VOSS, 1935 in the tribe Auletini.

The tribe Sayrevilleini sensu LEGALOV (2007) is currently considered a separate fossil subfamily Sayrevilleinae Legalov, 2003 characterized by possessing mandibles with an external cutting edge and an inner blunt edge (RIEDEL et al. 2012). This subfamily is recently placed in the family Attelabidae (s.l.), although some characters may suggest a possible relationship with the 'higher taxa in weevils' comprising Caridae, Brentidae, and Curculionidae (RIEDEL et al. 2012). The recent genera included in Sayrevilleini by LEGALOV (2007) will probably need to be transferred to another group of Rhinocartini, which is, however, beyond the scope of this paper.

The differential diagnosis of the remaining three tribes (Proteugnamptini, Rhinocartini, and Vossicartini) of Legalov's supertribe Rhinocartitae, and the new genus *Socotrorhinus* gen. nov. are presented in Table 1. Different states of characters are indicated for some taxonomic ranks, and it is almost impossible to determine the correct status, e.g., Proteugnamptini with short and wide rostrum, but its subtribe Eosalacina with thin and long rostrum; or Rhinocartini with long and narrow rostrum, but *Rhinocartus tessmanni* VOSS, 1922 with short and wide rostrum (see Table 1, Fig. 1G).

The representatives of Proteugnamptini, Rhinocartini and Vossicartini occur in Central and South Africa, including the islands of Madagascar and Réunion. The origin of *Socotrorhinus boswelliae* sp. nov. will most likely be from one of these tribes/groups. The members of the tribe Vossicartini seem to be the most similar group. However, as the current classification of the whole supertribe Rhinocartitae sensu LEGALOV (2007) is far from perfection, we are not able to postulate relationships between *Socotrorhinus* gen. nov. and the tribes/genera of the supertribe. Based on the facts mentioned above and in Table 1, we refrain from association of the new genus with any of Legalov's tribes and place it simply in tribe Rhinocartini sensu RIEDEL (2014).

Table 1. Differential diagnosis of the new genus and the tribes from the supertribe Rhinocartitae according to characters used by LEGALOV (2007).

	<i>Socotrorhinus</i> gen. nov.	Vossicartini	Proteugnampini	Rhinocartini
Antennal insertion	near base of rostrum (Figs 1D–E)	near base of rostrum (Fig. 1H)	middle of rostrum	behind middle of rostrum (Fig. 1G)
Elytral striae	in distinct rows (Fig. 1A)	in distinct rows (Fig. 1B)	in distinct rows	random, not in rows (Fig. 1C)
Rostrum	long and narrow in females (Fig. 1E), but relatively short in males (Fig. 1D)	short and wide (Fig. 1F)	short and wide, but in <i>Eosalacina</i> Legalov thin and long	short and wide (Fig. 1G); but Legalov (2007) stated long and narrow
Rostrum	bent in females (Fig. 1E), but weakly flattened in males (Fig. 1D)	strongly flattened (Fig. 1F)	weakly flattened	markedly bent (Fig. 1G)

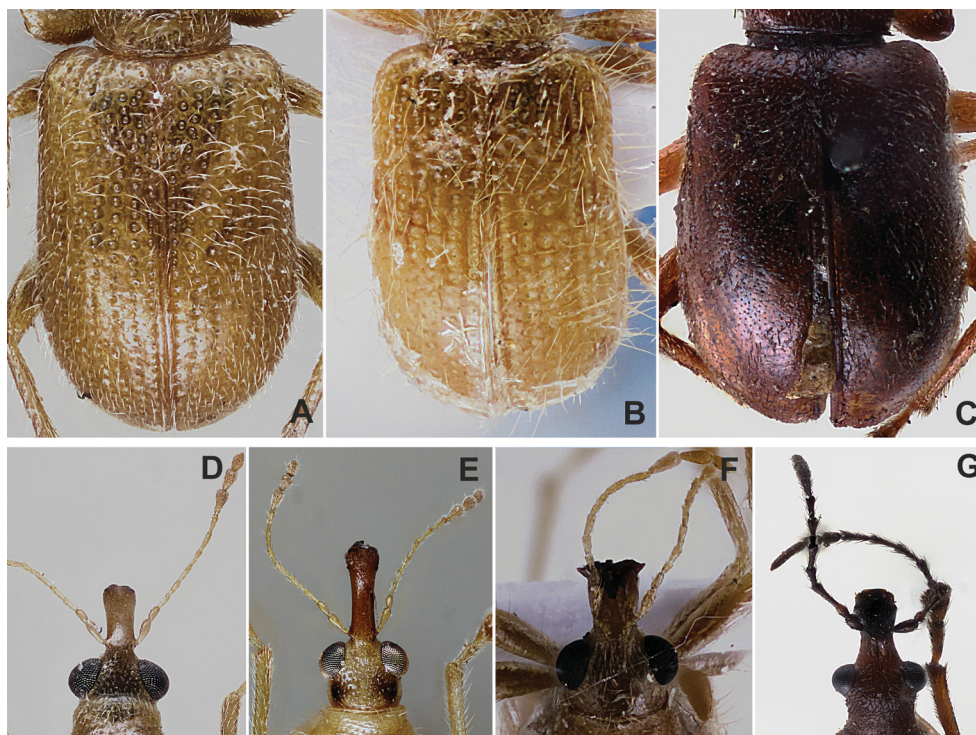


Fig. 1. Differential diagnosis of the new genus and the tribes of Rhinocartitae according to the characters used by LEGALOV (2007): *Socotrorhinus* gen. nov. (*S. boswelliae* sp. nov.): A – elytra; D – head with rostrum and antennae, male; E – head with rostrum and antennae, female; Vossicartini (*Vossicartus tanzanensis* Legalov, 2007): B – elytra; F – head with rostrum and antennae, male; Rhinocartini: (*Rhinocartus tessmanni* Voss, 1922): C – elytra; G – head with rostrum and antennae, male.

Socotrorhinus boswelliae sp. nov.

(Figs 1A, D–E; 2A–M)

Type locality. Yemen, Socotra, Aloove area, 12°20'58"N, 54°06'39"E, 270–300 m a.s.l. (see BEZDĚK et al. 2012: 34).

Material examined. HOLOTYPE: ♂, 'YEMEN, SOCOTRA Island / Zemhon area, 270–300 m / N 12°20'58", E 54°06'39" / 16.–17.6.2010 / V.Hula leg. [printed label]' (NMPC). PARATYPES: 54 ♂♂ 67 ♀♀, same data as holotype (NMPC); 2 ♂♂ 2 ♀♀ ARC; 2 ♂♂ 2 ♀♀ BMNH; 2 ♂♂ 2 ♀♀ IRSNB; 5 ♂♂ 5 ♀♀ JSPC; 1 ♂ 1 ♀ MNBE; 1 ♂ 1 ♀ MZLU; 5 ♂♂ 5 ♀♀ PKRC; 2 ♂♂ 2 ♀♀ SMNS); 'YEMEN, SOCOTRA Island / Zemhon area, 270–350 m / N 12°30'58", E 54°06'39" / 3.–4.ii.2010 / L. Purchart & J. Vybiral lgt. [printed label]' (1 ♂ NMPC); 'YEMEN, SOCOTRA ISLAND / Dixam plateau 15.+22.vi.2012 / Wadi Dirhor, open woodland / with *Boswellia ameero* trees / 12°28.0'N, 54°00.5'E, 340 m // SOCOTRA expedition 2012 / J. Bezděk, J. Hájek, V. Hula, / P. Kment, I. Malenovský, / J. Niedobová & L. Purchart leg. [printed labels]' (2 ♂♂ 12 ♀♀ NMPC); 'YEMEN, SOCOTRA ISLAND / HOMHIL protected area / open woodland with *Boswellia* & *Dracaena* trees; 10.–11.vi.2012 / 12°34.5'N, 54°18.5'E, 360–500 m // SOCOTRA expedition 2012 / J. Bezděk, J. Hájek, V. Hula, / P. Kment, I. Malenovský, / J. Niedobová & L. Purchart leg. [printed labels]' (8 ♂♂ 4 ♀♀ NMPC); 'YEMEN, Socotra Island / Aloove area, ALOOVE vill. env. / *Jatropha unicostata* shrubland; / with *Boswellia elongata* trees / 19.–20.vi.2012 / 12°31.2'N, 54°07.4'E, 221 m // SOCOTRA expedition 2012 / J. Bezděk, J. Hájek, V. Hula, / P. Kment, I. Malenovský, / J. Niedobová & L. Purchart leg. [printed labels]' (13 ♂♂ 8 ♀♀ NMPC). Specimens of the newly described species are provided with one printed red label: 'Holotype [or Paratype] / *Socotrorhinus* / *boswelliae* sp. nov. / Jiří Skuhrovec & / Petr Kresl design. 2014'.

Description (Fig. 2A). Coloration of body yellowish to pale brown, head, rostrum, scape and funicle antennomeres 1–2 and part of legs darker. Body sparsely setose with pale erect or suberect setae, rostrum subglabrous. Head with very short setae. Rostrum pale brown to reddish and brown. Antennae with short suberect setae; setae in funicle antennomeres II–VII and club approximately half of funicle segment length, in scapus and funicle antennomere I shorter. Pronotum with relatively long, anteriad directed, suberect setae. Elytral intervals with long erect setae (as long as claws). Apical third of elytra and shoulders with slightly longer setae, which are also slightly longer than claws. Scutellum glabrous. Femora yellowish to brown with pale long erect setae. Tibiae yellowish to pale brown with pale long erect setae. All tibiae bearing stout, yellowish bristles apically, slightly darker than erect setae, bristles oriented forward in the direction of tibial axis. Tarsi yellowish to pale brown with pale long erect setae. Tarsomeres I–III with sparse small projecting scales ('soles'). Claws reddish to dark brown; inner teeth dark brown to black. Abdomen yellowish to pale brown with long erect setae.

Head (Figs 1D–E, 2A–G). Eyes elliptical to oval; strongly convex and bulging; ventral apex narrower than dorsal. Temples distinctly widened backwards, shorter than longitudinal eye diameter. Head (vertex, temples and frons) dotted; punctuation deep and distinct; punctures slightly oval, almost touching each other. Rostrum distinctly longer than its basal width (ratio = 2.75–4.88, see *Sexual dimorphism*); curved in dorsal view, most at antennal base, then only slightly; bent, not flat, well visible in lateral and dorsal views; in lateral view, rostrum pointed towards apex. Rostrum shiny with very fine punctuation, punctures smaller and less deep than on head. Scrobes indistinct and shallow; not visible in dorsal view; poorly visible in lateral view as longitudinal furrow along whole length of rostrum on its lower side.

Antennae (Figs 1D–E, 2A–G). Scape club-shaped, more than twice as long as wide; funicle antennomere I oval, about half length of scape, 1.5 times longer than wide; funicle antennomeres II–VI slender, slightly widened at apex, longer than funicle antennomere I but shorter than scape; funicle antennomere VII similar in shape to funicle antennomeres II–VI, only more widened at apex; club three-segmented, basal two segments triangular, approximately 1.75 times longer than wide, apical segment broadly oval, slightly longer than wide.

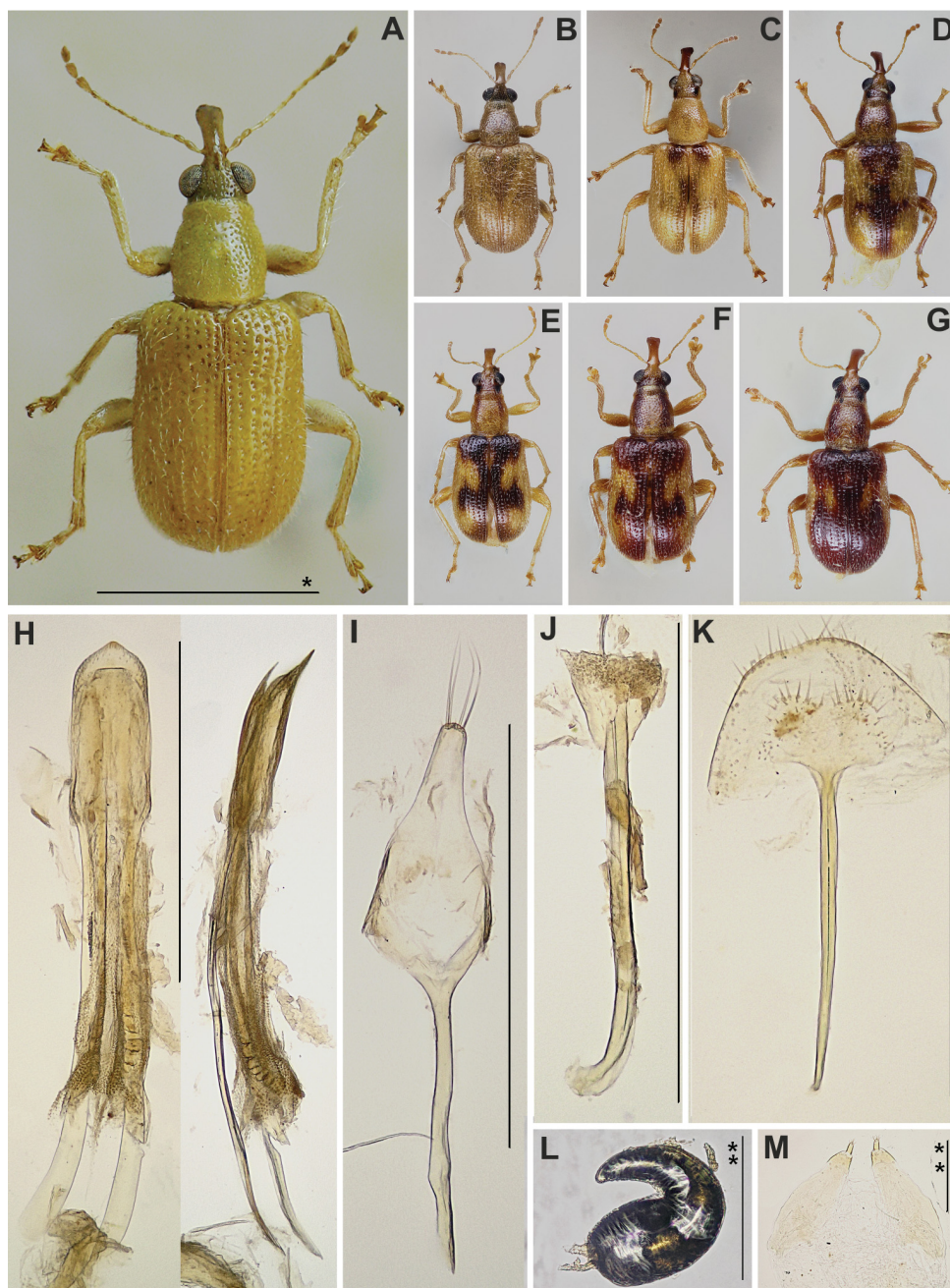


Fig. 2. *Socotrorrhinus boswelliae* sp. nov. Holotype, male (A, H–J), female (K–M): A – habitus, dorsal view; B–G – variation in coloration, dorsal view; H – aedeagus, dorsal and lateral view; I – tegmen; J – spiculum gastrale; K – female sternite VIII; L – spermatheca; M – ovipositor. Scales: 1 mm, scale with * = 2 mm, scale with ** = 0.2 mm.

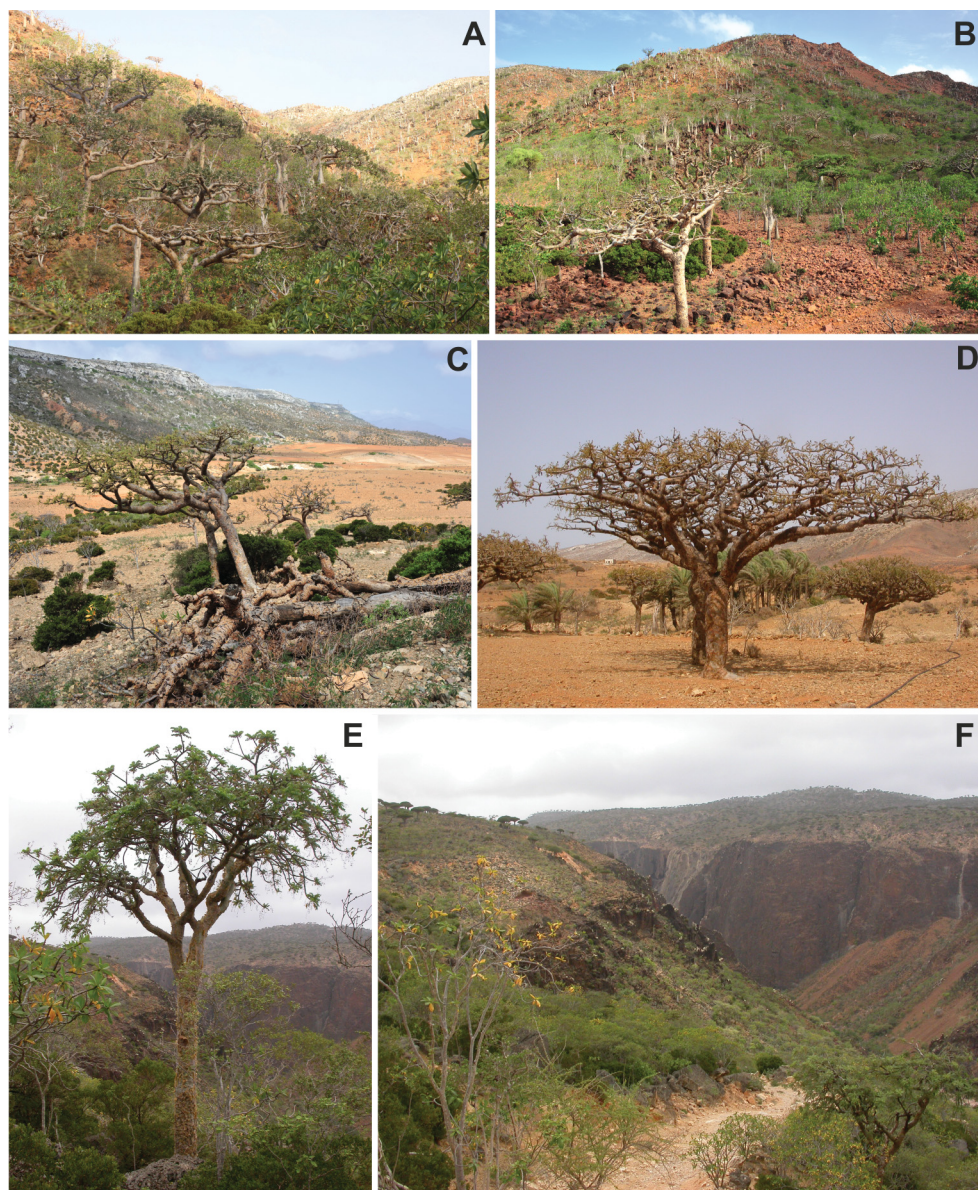


Fig. 3. Habitats of *Socotrorhinus boswelliae* sp. nov.: A–B – *Jatropha unicastata* shrubland of Aloove area with *Boswellia elongata* trees; C – open woodland with *Boswellia elongata* and *Dracaena cinnabarina* trees in Homhil protected area; D – *Boswellia elongata* tree in Homhil protected area; E – *Boswellia ameero* tree in open woodland in Wadi Dirhor area; F – open woodland in Wadi Dirhor area. (Photos by Jiří Hájek (A–C) & Petr Kment (D–F)).

Pronotum (Figs 2A–G) slightly narrower than its length (ratio = 1.1–1.4), widest near middle; anterior margin nearly straight in dorsal view; behind anterior margin slightly but distinctly choked; sides slightly rounded; posterior margin 1.4 times longer than anterior margin; only slightly bent, almost flat in lateral view; shiny, distinct punctures more coarse than on vertex; punctures sparser in middle part.

Elytra (Figs 1A, 2A–G) almost rectangular, distinctly longer than wide (ratio = 1.35–1.61, see Sexual dimorphism), with base distinctly wider than the widest part of pronotum, with distinct humeral angle; basal margin slightly bent; almost parallel-sided; apically broadly rounded. Elytral striae form 10 distinct rows; one shortened line of 5–6 elytral striae inserted between first and second rows, beginning near scutellum and reaching about basal fifth of elytra; disordered short line inserted between seventh and eighth rows in middle of elytra. Elytral intervals slightly prominent, as wide as or slightly narrower than striae.

Legs. Femora slightly inflated in middle. Meso- and metatibiae straight, protibiae slightly curved outwards. All tarsi similar; tarsomere I elongated, about 3 times longer than its width, slightly widened at apex; tarsomere II distinctly triangular, as long as wide; tarsomere III triangular, distinctly bilobed almost to base; tarsomere V as long as tarsomere I, slightly widened at apex. Claws thick, wide sickle-shaped; at inner margin before apex split up and forming two teeth: narrower, sharp and longer tooth on outer edge, and wider, shorter one on inner edge.

Abdomen. Abdominal ventrites decreasing in length; abdominal ventrites I and II fused, slightly visible small sinuosity in midlength; ventrites I and II thrice longer than ventrite III, and as long as ventrites III–V together. Suture between abdominal ventrites I and II still slightly visible as sinuosity; sutures between other ventrites straight, deeply incised.

Sexual dimorphism. Rostrum distinctly longer than its base width in females (ratio = 4.00–4.88, median 4.5; Fig. 2F), less so in males (ratio = 2.75–3.50, median 3.30; Fig. 2E), and males have more flattened rostrum than females (Figs 2E–F). Females are larger with more oval elytra (elytral length to width ratio = 1.40) than males (ratio = 1.50). Protibiae incurved in males and nearly straight in females. Abdominal ventrite I with distinct depression in males but not in females. Abdominal ventrite V with shallow medial impression in males. No differences in ratios of pronotal length and width.

Male genitalia. Penis (Fig. 2H) in dorsal view gradually slightly narrowed from base to basal 1/4, then parallel-sided. Ventral plate triangularly narrowed towards top. Apodemes of penis more than twice as long as median lobe. Penis slightly curved (Fig. 2H) in basal third in lateral view. Tegmen (Fig. 2I) stick-shaped up to midlength; tegmen without fenestrae, tegminal plate elongated and tapered apically, with 2 long setae. Spiculum gastrale (Fig. 2J) stick-shaped, slightly curved and of half length of penis; basal plate triangular.

Female genitalia. Apodeme of sternite VIII relatively long, without distinct lateral arms; plate starting near apical fifth of apodeme (Fig. 2K); plate spacious and cordiform, with apical margin bearing several distinct setae, weakly sclerotised. Ovipositor short and wide, tapered apicad (Fig. 2M); styli relatively long, cylindrical and well sclerotized, apex with 4–7 erect setae. Spermatheca C-shaped with short and stout cornu; apex of cornu sharp; nodulus and ramus short, ramus slightly wider and as long as nodulus (Fig. 2L).

Intraspecific variation. Body length: 2.8 to 4.2 mm (length of the holotype 3.5 mm). Coloration of the head, pronotum and elytra from yellowish to pale brown. Specimens from the locality Wadi Dirhor, associated with *Boswellia ameero* trees show greatest color variation. The variation in coloration compared to the standard (see Description, Fig. 2A) is as follows (Figs 2B–G): (1) temples behind eyes reddish brown to dark brown; (2) pronotum with reddish brown to dark brown longitudinal lateral stripes of different widths; and (3) elytra reddish brown to dark brown in various patterns: from (a) differently colored small dots on basal fifth of interval I and II (Fig. 2C); through (b) differently colored intervals I–IV from base to basal third, then narrowed only to interval I–II and continuing to elytral apex with the exception of apical third where narrow projection expands to sides up to interval V (Fig. 2D); and finally (c) differently colored almost entire elytra except interval VIII–IX, partly VII (from basal third to apical third) and short spot in interval III to IV from basal third to half of elytra (Fig. 2G). Coloration patterns on elytra (a–c) are the only connecting link between the known coloration states (see Figs 2A–G).

Differential diagnosis. See the same chapter in generic description.

Etymology. The name refers to the frankincense tree genus, *Boswellia* (Burseraceae), which is the most likely host plant of this attelabid.

Bionomics. Adults are macropterous, and all specimens from the series collected in early spring (June) 2010 were collected at light. In early spring (June) 2012, several specimens were collected also on the twigs and young leaves of *Boswellia elongata* Balf.f. (localities Aloove area, Figs 3A–B and Homhil, Figs 3C–D) and *B. ameero* Balf.f. (locality Wadi Dirhor; Figs 3E–F). Both tree species had only fresh young leaves on twigs and also fresh fruits. *Boswellia* species flower from January to April, and then have fruits in May–June which ripen during summer (P. Maděra, pers. comm.).

Distribution. Socotra Island (Yemen).

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