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SHORT COMMUNICATION

New and little known Jacobsoniidae (Coleoptera) from China

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Abstract. A second Chinese species of the beetle family Jacobsoniidae, *Sarothrias songi* sp. nov., is described from Hainan Island. The new species is compared with and separated from similar congeners, supported by illustrations of diagnostic characters. A new collection record for *S. sinicus* Bi & Chen, 2015 from Yunnan is given, and the genital structures of this species are illustrated for the first time.

Key words. Coleoptera, Jacobsoniidae, *Sarothrias*, new species, new record, China

Zoobank: http://zoobank.org/urn:lsid:zoobank.org:pub:75EF82CA-4B3F-4E11-A6E3-A990D03BAAC0

Introduction

The family Jacobsoniidae represents a small (and rarely collected) polyphagan lineage containing 23 extant and three fossil species in three genera: *Sarothrias* Grouvelle, 1918 (14 extant + 1 fossil spp.), *Saphophagus* Sharp, 1886 (1 extant sp.), and *Derolathrus* Sharp, 1908 (8 extant + 2 fossil spp.) (Háva & Löbl 2005; Peck 2010; Bi et al. 2015; Cai et al. 2016, 2018; Yamamoto et al. 2017). Members of this family are largely restricted to humid (sub) tropical areas close to the equator (Cai et al. 2018), and are found under bark, in leaf litter and decomposing logs, and sometimes fungal fruiting bodies and bat guano (Lawrence & Leschen 2010). The higher placement of Jacobsoniidae within Coleoptera has been historically controversial (e.g., Crowson 1959, 1960; Sen Gupta 1979; Lawrence & Newton 1995; Lawrence & Leschen 2010; Philips et al. 2002). However, recently published phylogenetic analyses using molecular and morphological data consistently indicated a close relationship of the group to Staphylinoidea (Lawrence et al. 2011, McKenna et al. 2015, Toussaint et al. 2017), or within the Staphylinoidea as a clade sister to Ptiliidae + Hydraenidae (Zhang et al. 2018). Continuous discoveries of an extinct species of *Derolathrus* in Eocene Baltic amber (ca. 45 Ma) (Cai et al. 2016), and two extinct species of *Sarothrias* (Cai et al. 2018) and *Derolathrus* (Yamamoto et al. 2017) in mid-Cretaceous Burmese amber (ca. 99 Ma) suggested an ancient origin and long morphological stasis of Jacobsoniidae, and proved that the family was once more widely distributed than the present.

The genus *Sarothrias*, comprising 14 modern species, can be easily distinguished from *Saphophagus* and *Derolathrus* primarily by the following: 1) surface of the body with areas of silvery secretion formed by densely packed micropapillae, 2) frontoclypeal region impressed, 3) antennomeres II–XI moniliform, with indistinct club formed by apical three antennomeres, 4) prosternal process interrupted at middle, 5) procoxal cavities contiguous, 6) ventrite 1 (sternite III) more or less fused to metathorax, with large setose impression, and 7) tarsal formula 3-3-3 (Löbl & Burckhardt 1988, Lawrence & Leschen 2010). The biology of extant *Sarothrias* remains largely unknown. Analogous to many other beetle inquiline groups (Parker 2016), the general stout body form with compact antennae, presence of spatulate setae on the antennomeres and various body parts, and setose first ventrite in *Sarothrias* are indicative of probable association with social insects (Philips et al. 2002). The Australian *Sarothrias lawrencei* has been collected with ants in Queensland by Hermes Escalona (Ślipiński pers. comm.). Noticeably, *S. cretaceus* Cai et al., 2018 from Burmese amber lacks the setose impression on first abdominal ventrite, and exhibits more loosely-assembled antennae (Cai et al. 2018). Assuming that the modern *Sarothrias* are genuinely associated with ants, then this transition of characters may be a response to the rise of ecological dominance of modern ants during the Cenozoic (LaPolla et al. 2013, Barden 2017).

A new species of *Sarothrias*, *S. sinicus* Bi & Chen, 2015, was recently described from eastern Tibet, representing the first record of the family in China (Bi et al. 2015). Here we describe another Chinese species based on a single male from Hainan Island, as well as provide a new collection record of *S. sinicus* from the Gaoligong Mountains, Yunnan, which extends the known range of this species for ca. 500 km to the southeast.

Material and methods

All material treated in this paper is deposited in the Insect Collection of the Shanghai Normal University, Shanghai, China (SNUC). Aedeagus and terminal abdominal segments were dissected and preserved in Euparal mounting medium on a plastic slide that was placed on the same pin with the specimen. In the 'material' section, the collecting data are quoted verbatim; information not included on the label is placed in parentheses.

Habitus photographs (Fig. 1) were taken using a Canon 5D Mark III camera in conjunction with a Canon MP-E 65mm f/2.8 1-5X Macro Lens, and a Canon MT-24EX Macro Twin Lite Flash was used as light source. Images of the morphological details (Figs 2–3) were made using a Canon G9 camera mounted on an Olympus CX31 microscope under either transmitted or reflected light. Zerene Stacker version 1.04 was used to produce montage images. All figures were edited and grouped in Adobe Photoshop CS5 Extended.

Fig. 1. Male habitus of *Sarothrias*. A – *S. songi* sp. nov.; B – *S. sinicus* Bi & Chen, 2015. Scale bars: 0.5 mm.

Taxonomy

Sarothrias songi sp. nov.

Chinese common name: 宋氏短跗甲

(Figs 1A, 2, 3A–D)

Type material. Holotype: ♂, 'China: Hainan, Ledong Co. (乐东县), Jianfengling N. R. (尖峰岭自然保护区), Minfeng Valley (鸣凤谷), 18°44′30″N, 108°50′29″E, 995 m, rainforest, decaying log, 23.i.2015, X.-B. Song leg.' (SNUC).

Diagnosis. Body moderate in size, slightly over 2 mm; antennomeres II–XI with spatulate setae in additional to normal sub-erected ones; anterior and posterior margins and lateral areas of pronotum covered with secretion forming broad bands; each elytron with 8 rows of striae or punctures, rows 1–3 and 7–8 impressed on their entire length; aedeagal median lobe curved in lateral view, lacking distinct constriction near base.

Description. Male (Fig. 1A). Body length 2.09 mm, elongate, convex, dark reddish brown, dorsal surface largely shiny except whitish gray secretion on parts of head, pronotum and elytra; legs (excluding tarsi) pubescent and covered with yellowish secretion except two narrow longitudinal shiny bands at both sides of femora and tibiae, tarsi reddish brown.

Head broader than long, slightly narrower than pronotum, length from anterior clypeal margin to base 0.28 mm, width across eyes 0.44 mm; clypeus (Fig. 2A) smooth, rounded anteriorly, frontoclypeal region distinctly impressed; frons (Fig. 2A) slightly broad anteriorly with sides moderately raised, sparsely punctate, secretion covering most area and extending posteriorly to form two longitudinal bands on disc; eyes rounded and moderately prominent, nearly half length of head. Venter of head (Fig. 2B) with

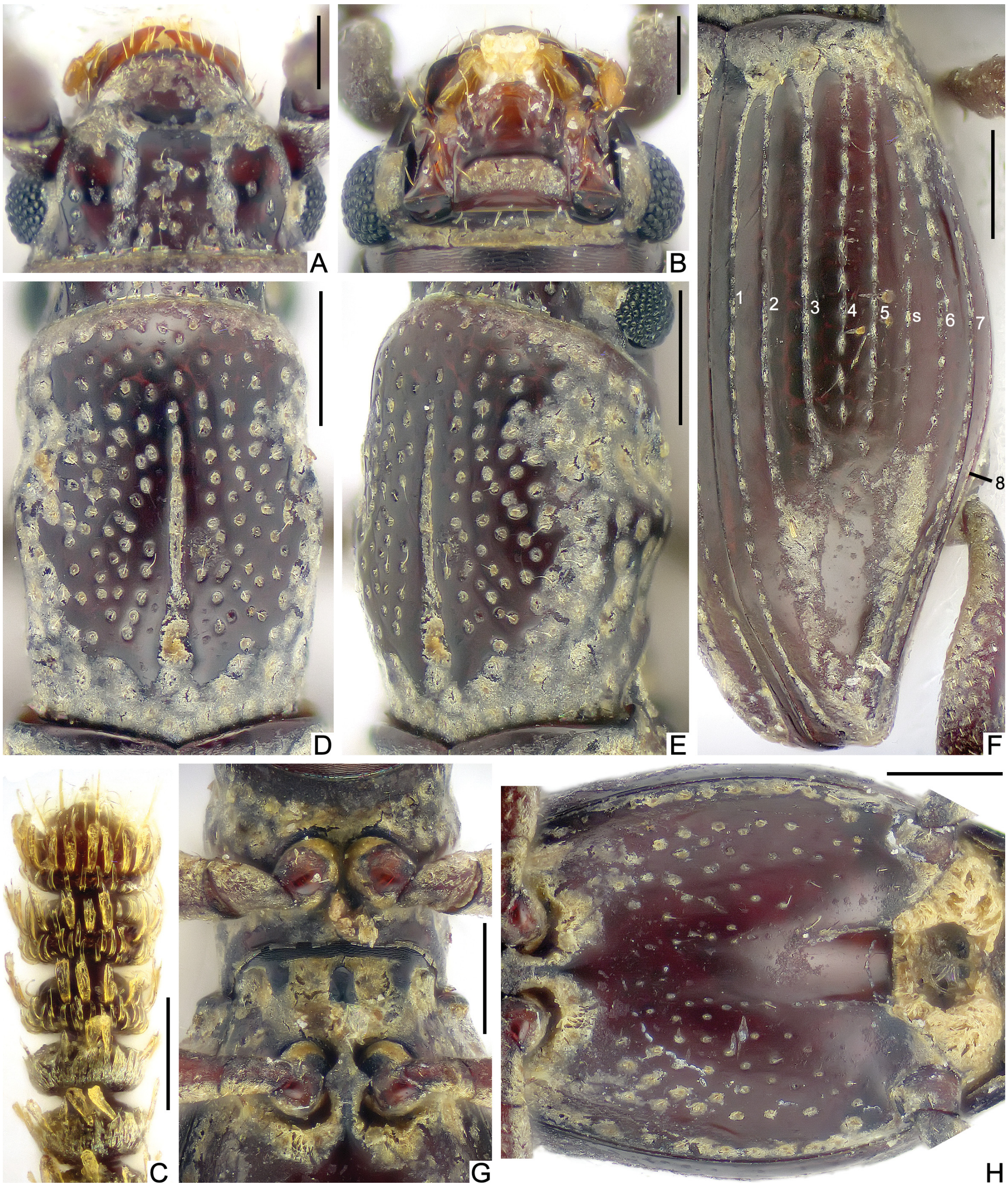

Fig. 2. Morphological details of *Sarothrias songi* sp. nov., male. A – head dorsum; B – head venter; C – antennomeres VII–XI; D–E – pronotum, in dorsal (D) and dorsolateral (E) view; F – right elytron ('1–8' indicates striae or rows of punctures extending from elytral base; 's' means supplementary series); G – prosternum and mesoventrite; H – metaventrite and sternite III. Scale bars: 0.1 mm in A–C; 0.2 mm in D–H.

secretion below eyes, on submentum, and along posterior margin. Length of antenna 0.79 mm, antennal club (Fig. 2C) three-segmented; scape elongate, antennomeres II–XI transverse, with secretion on antennomeres I–VIII, in addition to normal sub-erect setae, apex of scape and antennomeres II–XI with regularly placed spatulate setae.

Length of pronotum (Fig. 2D) along midline 0.66 mm, maximum width 0.47 mm; sides of pronotum sub-parallel, widest at middle; anterior margin rounded; disc with shallow median groove extending from anterior 3/4 to near base, slightly broadened posteriorly; punctures on disc of similar size, shape and distribution to those on head; median groove, anterior and posterior margins, and lateral area covered by secretion (Fig. 2E). Prosternum (Fig. 2G) largely covered with secretion.

Scutellum invisible. Length of elytra along suture 1.15 mm, maximum width 0.76 mm, elytral index (length/width) 1.51; elytra fusiform, widest slightly posterior to middle; basal transverse bulge well-developed, with subbasal band of secretion. Each elytron with striae or punctures forming eight rows (Fig. 2F; *1–8*) extending from base of which lateral-most row not visible in dorsal view; rows 1–3 and 7–8 impressed on their entire length, remaining rows consisting of separate punctures, either entirely or partially, row 1 parallel to suture and ending subapically, rows 2 and 3 joined near level of metacoxae, rows 4 and 5 represented by separate punctures and disappearing at apical half, space between rows 5 and 6 with one supplementary series (Fig. 2F; s) composed of separate punctures, extending from basal 1/6 to just past midlength, row 6 represented by separate punctures, extending past elytral midlength and fused with secretion apically; row 7 entirely impressed, carinate at lateral side, with secretion apically; row 8 similar to 7, slightly carinate and apically fused to secretion; sparse spatulate setae irregularly placed on apical secretion of rows 2 and 3.

Mesoventrite largely covered with secretion (Fig. 2G). Metaventrite (Fig. 2H) covered with same secretion posterior to mesocoxal cavities and between metacoxal insertions, other parts shiny, sparsely and coarsely punctate; with deep, parallel-sided median impression at apical half, impression not delimited by lateral ridges.

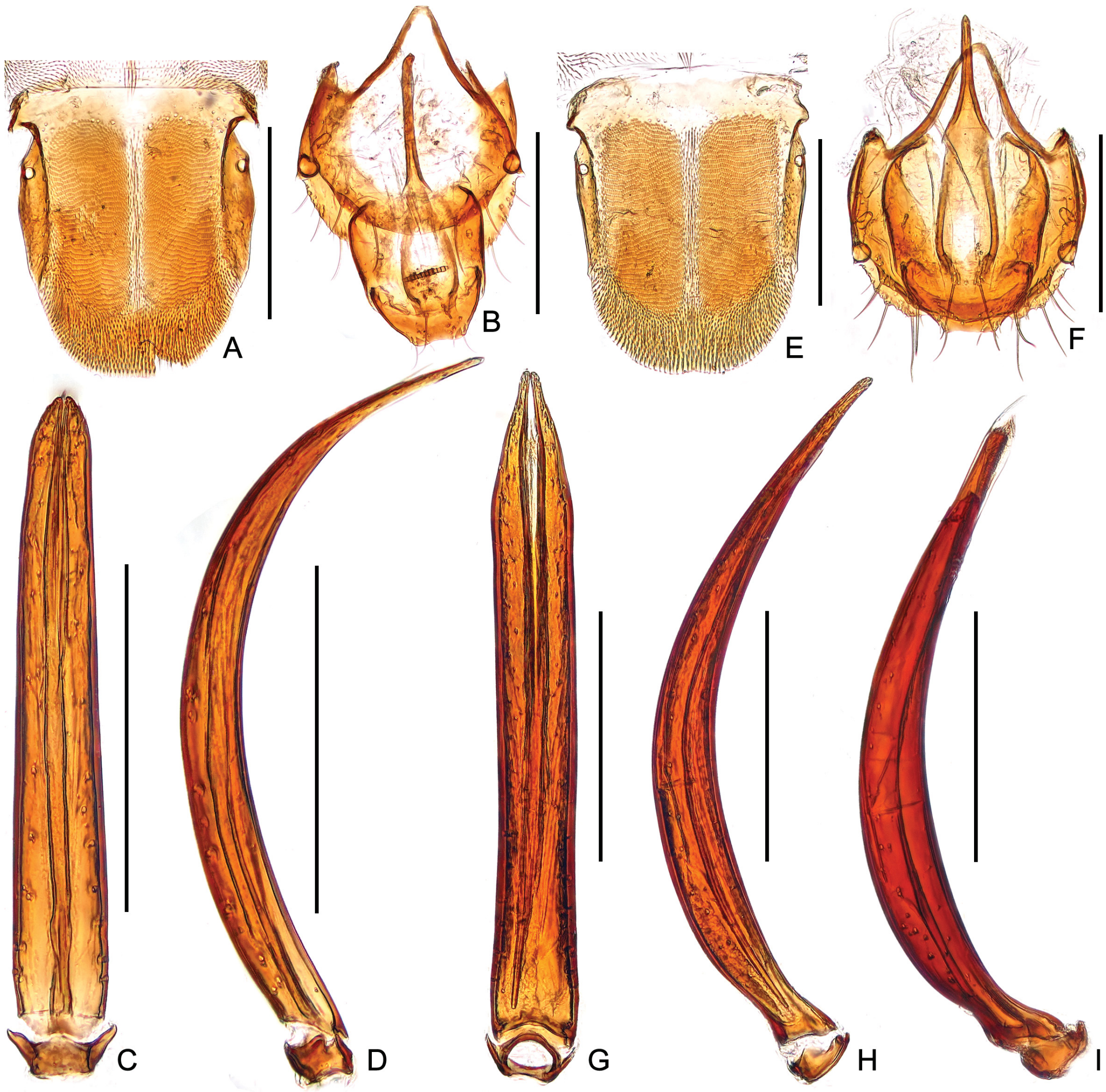

Fig. 3. Morphological details of *Sarothrias songi* sp. nov., male (A–D), and *S. sinicus* Bi & Chen, 2015, males from Yunnan (E–H) and Tibet (I). A, E – tergite VII; B, F – sternite VIII and genital segments. C–D, G–I – aedeagus, in ventral (C, G) and lateral (D, H–I) view. Note: the aedeagus of the holotype of *S. sinicus* (I) is partially broken at the apex. Scale bars: 0.2 mm.

Tergite VII (Fig. 3A) rounded at apex, with median longitudinal impression; sternite VIII and genital segments as in Fig. 3B. Length of aedeagus (Figs 3C–D) 0.42 mm, median lobe strongly sclerotized, slender, in ventral view gradually narrowing from base toward apex, in lateral view curved and slightly constricted on dorsal margin near base.

Female unknown.

Etymology. The new species is named after Xiao-Bin Song, collector of the holotype.

Comparative notes. *Sarothrias songi* is externally most similar to *S. amabilis* Ślipiński & Löbl, 1995 from West Malaysia and *S. hygrophilus* Pal, 1998 from northeastern India in sharing a similar pattern of elytral striae, rows of punctation, and secretion (i.e., rows 2 and 3 fused at posterior half with longitudinal band of secretion), and presence of an additional series of punctures between rows 5 and 6 (Pal 1998, Ślipiński & Löbl 1995). The new species can be separated from *S. amabilis* by the larger body size (2.09 mm vs. 1.75–1.78 mm), relatively shorter pronotum (length/width 1.40 vs 1.45), more secretion area at anterior margin, sides, and posterior margin of the pronotum, and generally more distinct discal rows and much longer row 5 of the elytra. From *S. hygrophilus*, the new species differs in the presence of spatulate setae on antennomere XI, and entirely impressed row 3 of the elytra, while the antennomere XI lacks any spatulate setae, and the row 3 of the elytra is interrupted before joining row 2 in *S. hygrophilus*.

The only other Chinese species, *S. sinicus* from southeastern Tibet, is much larger in size (2.44–2.45 mm), lacks spatulate setae on antennomere XI, and the posterior 4/5 of elytral rows 1 and 3 are composed of interrupted punctures (Bi & Chen 2015), thus can be readily distinguished from the new species.

Distribution. South China: Hainan.

Sarothrias sinicus Bi & Chen, 2015

Chinese common name: 中华短跗甲

(Figs 1B, 3E–I)

Sarothrias sinicus Bi & Chen, 2015: 54.

Material examined. CHINA: Xizang: 1 ♂ (holotype), 'China: Xizang, Motuo (墨脱), Baricun (巴日村), 2014.vii.27, 1850 m, leg. Wen-Xuan Bi.' (SNUC). **Yunnan:** 1 ♂, 'China: Yunnan, Lushui (泸水县), Pianma (片马), Gangfang (岗房) (ca. 26°00'N, 98°37'E), 2100 m, 2.v.2015, leg. Wen-Xuan Bi' (SNUC).

Supplementary description. Habitus of male from Yunnan as in Fig. 1B. Tergite VII (Fig. 3E) with rounded apical margin slightly incised at middle; sternite VIII and genital segments as in Fig. 3F. Aedeagus strongly sclerotized, in ventral view (Fig. 3G) tapering at the apex, in lateral view (Figs 3H–I) curved, constricted near base, evenly broadening to its maximum width at basal 1/4, and then gradually narrowing toward apex. Measurements (holotype in parentheses): body length 2.44 (2.45) mm, length of head from anterior margin of clypeus to base 0.33 (0.36) mm, width across eyes 0.46 (0.45) mm, length of antenna 0.87 (0.90) mm, length of pronotum along midline 0.72 (0.70) mm, maximum width of pronotum 0.51 (0.51) mm, length of elytra along suture 1.39 (1.39) mm, maximum width of elytra 0.81 (0.81) mm, elytral index (length/width) 1.72 (1.72), length of aedeagus 0.56 (n/a) mm.

Distribution. Southwest China: Yunnan (new provincial record), Xizang.

Comments. Since the body size, proportions of the body segments, patterns of the secretion on the head, pronotum, and elytra, and the arrangement of discal rows and punctation on the elytra are extremely similar, and there is no defining character that can be used to consistently separate the populations of Yunnan and Tibet, we treat these two populations as conspecific. The male from Yunnan has the punctures of the pronotal disc slightly smaller, and basal half of the aedeagal median lobe slightly narrower than those from Tibet. Given that there is a 500 km gap in between, this difference is interpreted as intraspecific variation.

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Digital data archive

High resolution figures in digital format are available in Zenodo research data depository: doi.org/10.5281/zenodo.1203757.

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