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Two new species of stag beetles (Coleoptera: Lucanidae) from western Yunnan, China

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Abstract. *Himaloaesalus gaoligongshanus* Huang and Chen, **new species** (Coleoptera: Lucanidae: Aesalinae) is described from the Gaoligongshan Mts., Yunnan, China. It is the fifth species of the genus *Himaloaesalus* Huang and Chen. This new species is similar to the Himalayan species *Himaloaesalus himalayicus* Kurosawa and *H. saburoi* Araya et al., from which it is distinguished. The male and female genitalia of all the known species of *Himaloaesalus* are illustrated. *Dorcus yongreni* Huang and Chen, **new species** (Coleoptera: Lucanidae: Lucaninae) is described from Ruili area, Yunnan, China. It belongs to the elegans group (Huang and Chen 2013). This new species is similar to the Indian species *Dorcus apatani* (Okuda and Maeda), **new combination**, originally described in *Digonophorus* Waterhouse. The male genitalia of both species are compared and illustrated.

Introduction

When preparing our third volume of “Stag Beetles of China”, some new discoveries were made, mainly by our friend, Mr. X.-D. Yang from western Yunnan, China. Two new species are described herein whilst the others will be included in our upcoming book in the next year. One of the here-described new species belongs to the recently erected genus *Himaloaesalus* Huang and Chen (Coleoptera: Lucanidae: Aesalinae), which consists of four known species (Kurosawa 1985, Araya et al. 1998, Araya and Yoshitomi 2003, Huang et al. 2009, Huang and Chen 2013). We have collected specimens of both sexes of all known species and compared their male and female genitalia. Another of the here-described new species belongs to the elegans group (Coleoptera: Lucanidae: Lucaninae) and is similar to a recently described Indian species (Okuda and Maeda 2015). We have dissected a topotypic male specimen of this Indian species for a detailed comparison with our new species. According to the morphological phylogenetic analysis done by Huang and Chen (2013), the genus *Digonophorus* Waterhouse is a synonym of *Dorcus* MacLeay, so *Digonophorus apatani* Okuda and Maeda should be named as *Dorcus apatani* **new combination**.

Materials and methods

Specimens of Aesalini were collected from decayed logs in the field as adults. Specimens of *Dorcus* were collected by a light trap at night. Specimens of adults were killed with ethyl acetate and dried.

For Aesalini, we measured the pronotum-elytra length instead of body length because the dorsal surfaces of head, pronotum, and elytra in this tribe are not in a straight line and are often variable in length when the adult is alive.

To examine the male and female genitalia, the last two abdominal segments were removed and treated with a 10% solution of potassium hydroxide and then preserved in 70% ethanol. Photographs were taken with an Olympus C-5050 camera mounted on Olympus SZX12 stereoscope.

Terminology follows Holloway (1997, 1998), Huang et al. (2011) and Huang and Chen (2013).

The type specimens are deposited in the following public and private collections:

BMNH – Natural History Museum, London, United Kingdom

CCCC – Chang-Chin Chen collection, Tianjin, China

CHH – Hao Huang collection, Shanghai, China

SHNU – Entomological Collection of Shanghai Normal University, China

Taxonomic Treatment

Himaloaesalus gaoligongshanus Huang and Chen, new species

(Fig. 1–21)

Type material. **Holotype** (Fig. 1–3, 9–11, 15–20): **YUNNAN**: ♂, Tengchong County, on road between Tengchong and Baoshan, Nankang Pass, ca. 2000m, 4.V.2012, Xiao-Dong Yang leg. (SHNU). **Paratypes**: **YUNNAN**: 1 ♂, 3 ♀♀, same data as for the holotype (1 ♀ in CHH, 1 ♂, 2 ♀♀ in CCCC); 3 ♂♂, Tengchong County, Zizhi Township, ca. 1800m, V.2014, Z. Peng leg. (all in CHH); 3 ♂♂, 3 ♀♀, Gongshan County, Dulongjiang, Xianghong village, VII.2015, X.-D. Yang leg. (1 ♂ in BMNH, 2 ♂♂, 3 ♀♀ in CCCC).

Holotype description. Length of pronotum-elytra measured from apex of pronotum to the caudal end of elytra: 6.5 mm. Ground color of the whole body on both surfaces dark reddish brown. Bristles on dorsal surface of the body dark brown. Bristles on ventral surface of the body bright yellow. **Head.** Width approximately half as wide as pronotum. Interocular width about 4 times as wide as eye. Anterior portion of head in front of eye nearly as long as eye. Intermandibular projection rounded, not angled. Canthus present and slightly projecting beyond eye. Left mandible with a subapical dorsal tooth and a subapical ventral tooth. Right mandible with a subapical dorsal tooth but without ventral tooth. Both mandibles with mola well developed and massive in inner lateral view, and each with a setose prostheca along median edge. Labrum setose, movable and nearly 2/9 times as wide as head. Galea of maxilla with setae on apex not regularly curved or brush-like. Lacinia of maxilla free and easily recognizable. Ligula bilobed and setose. Base of labial palpomere 1 concealed by mentum. Palp insertions on prementum close to each other. Antenna partially geniculate and composed of ten antennomeres. Antennal scape without longitudinal groove. Antennal club composed of the last three antennomeres and completely pubescent. Antennomere 3 elongate, nearly twice as long as wide. Mentum transverse and rounded at lateral corners, setose and coarsely punctate at surface, and with lateral margins nearly straight and convergent anteriorly. **Thorax and abdomen.** Ratio of pronotum-elytra-length to elytra-width: 1.72. Dorsal line of elytra in lateral view evenly convex. Pronotum and elytra densely punctate, with punctures irregularly distributed, not serially in longitudinal lines. Scutellum slightly longer than wide. Intercostal process of prosternum plate-like, slightly convex in lateral view, with posterior margin projecting almost as far as procoxae, lacking step-like projection posteriorly. Metasternum and abdominal ventrites without sulci. Posterior margin of the last visible abdominal ventrite rounded, but rather flat near center. Semicircular punctures along the anterior margin of the abdominal ventrites 3–5 markedly broader than those of the abdominal ventrites 1–2. **Surface structures.** Vestiture of pronotum and elytra consisting of two types of elements: scale-like bristles and irregularly branched tomenta. Bristles longitudinally ribbed, inserted anteriorly in the wall of the punctures, concentrated into clumps. Tomenta arising anteriorly in the wall of the punctures. All punctures sub-equal in size, with margins sharply defined, and with floor raised and polygonally sculptured. Puncture of bristle associated with a tubercle outside of puncture. **Legs.** Protibia markedly broadened from base to apex, with a minute inner terminal spur, an outer apical spine and 2 smaller spines on outer lateral margin, and with seta-tuft along the inner lateral margin near apex. Apical spine curved and nearly half as long as the width of protibia at apex. Mesotibia with 2 small spines externally. Metatibia with 2–3 small spines externally. Tarsus short, half as long as respective tibiae. **Male genitalia** (Fig. 15–20). Abdominal segment 9 slender and elongate; basal lobe present but rather short; paired pleurites plate-like and protruding ventrally; dorsal plate pigmented. Basal piece rather long, slightly shorter than parameres. Parameres nearly half as long as median lobe. Median lobe gently curved and gradually widened from base to apex in lateral view, generally tuber-like in dorsal view, asymmetrical and with a long sclerite originating from left side of dorsal surface. Internal sac bilobed and L-shaped.

Description of male paratypes. Length from apex of pronotum to the caudal end of elytra was 5.3–6.7 mm.. Individual variation is only found in the color of the body on both surfaces and the length of canthus. There is no variation in the male genitalia.

Description of female paratypes. Length from apex of pronotum to the caudal end of elytra was 6.3–6.9 mm.. Sexual dimorphism in external morphology is very weak. A difference is only found in the apex of the metatibia, which is more sharply pointed in male than in female. **Female genitalia** (Fig. 21). Hemisternites well sclerotized and setose near inner apex, with styli elongate, sclerotized, non-setose, and pointed outwards; bursal duct merged into bursa copulatrix; bursa copulatrix without sclerite; accessory gland originated at terminal end of bursa copulatrix; spermathecal duct rather short, arising from a point near the terminal end of bursa copulatrix; spermathecal gland long and slender, not strongly demarcated from its duct; the combined length of spermathecal gland and its duct much greater than the length of the spermatheca.

Diagnosis/Remarks. This new species is similar to *Himaloaesalus himalayicus* Kurosawa and *H. saburoi* Araya et al., but can be distinguished by the following combination of characters: 1) intermandibular projection rounded, not angled; 2) canthus markedly longer; 3) elytra less elongate; 4) abdominal segment 9 of male with shorter basal lobe; 5) basal piece of male genitalia markedly longer; 6) bursal duct merged into bursa copulatrix, not recognizable; 7) spermathecal duct arising from a point markedly closer to the terminal end of bursa copulatrix. This new species can be easily distinguished from *Himaloaesalus satoi* (Araya and Yoshitomi) and *H. zhejiangensis* (Huang and Bi) simply by having the scale-like bristles instead of the stick-like bristles on the surface of pronotum and elytra concentrated into clumps. Unlike species of the genus *Echinoaesalus* Zelenka, the species of the genus *Himaloaesalus* Huang and Chen have no marked differences from one another in characters of mentum and prosternal process. A study of male and female genitalia is always needed to determine the species in this group.

Distribution. CHINA: Yunnan: Gaoligongshan Mountains.

Etymology. This new species is named after its type locality, a biodiversity hotspot.

***Dorcus yongreni* Huang and Chen, new species**

(Fig. 45–47, 49–50, 52, 54–55)

Type material. Holotype (Fig. 45, 54): **YUNNAN:** ♂, Ruili City, Longchuan County, 1800m, 15–17. IX.2015, Xiao-Dong Yang and Yong-Ren Chang leg. (SHNU). **Paratypes: YUNNAN:** 1 ♂, 1 ♀, same data as for the holotype (CCCC); 3 ♂♂, Ruili City, Longchuan, 1800m, IX.2016, Xiao-Dong Yang leg. (CCCC).

Holotype description. Length of body: 24.3 mm. Ground color of the whole body dark brownish red on both surfaces, appearing darker on underside than on upper side. **Head.** Nearly as long as pronotum, sub-rectangular. Dorsal surface of head depressed between eyes. Anterior canthus half as long as eye, hardly reaching the outer limit of eye. Clypeolabrum (Huang and Chen 2010) short and very transverse, slightly concave at anterior margin. Mandible 1.5 times as long as head, generally shaped as in other known species of the elegans group (Huang and Chen 2013), but with an additional subbasal tooth like in *Dorcus apatani* (Okuda and Maeda). Mentum rather straight at anterior margin. **Pronotum.** A little wider than head, rather broadly arched at anterior part, with the widest point well before the middle, and with the lateral angles sharply pointed. Protibia with clear double teeth at outer apex, and with 4–5 smaller teeth at outer lateral margin. Meso- and meta- tibiae smooth at outer margin. **Elytra.** With weakly developed longitudinal depressions. **Male genitalia** (Fig. 52, 54). Basal piece with cephalic portion abruptly contracted. Ventral plate of basal piece broad and markedly excavated at anterior margin. Median lobe well pigmented on ventral surface and not divided by a dark median line. Permanently everted internal sac (flagellum) nearly as long as the entire aedeagus, trifurcate near middle, and with the lateral branches rather short.

Description of male paratypes. Length of body varies from 17.5 mm to 28.0 mm. There is no variability in the male genitalia.

Description of female paratype (Fig. 47). Length of body: 20.5 mm. Habitus generally as in female of *Dorcus chucheni* Huang and Chen, with punctures on elytra merged longitudinally into at least 10 closely arranged striae. Pronotum similar to that of all other species of the elegans group, with lateral angles sharply pointed and with the lateral margins posterior to the angles deeply concave.

Diagnosis/Remarks. This new species is very similar to *Dorcus apatani* (Okuda and Maeda) from Lower Subansiri, Arunachal Pradesh, northeastern India, but can be distinguished by the following combination of male characters (female of *Dorcus apatani* is still unknown): 1) pronotum broader anteriorly, with lateral margins not concave at anterior third; 2) mentum flat at anterior margin, not concave in the middle; 3) aedeagus with basal piece a little more elongate; 4) median lobe of male genitalia not divided by a median dark line; 5) flagellum a little longer, with lateral branches markedly longer. This new species can be easily distinguished from all the remaining species of the elegans group, recently revised by Huang and Chen (2013), because of the additional subbasal tooth on each male mandible.

Distribution. CHINA: Yunnan: Ruili area.

Etymology. This new species is named in honor of Mr. Chang Yong-Ren, a good friend who helped us to discover this new species.

Acknowledgments

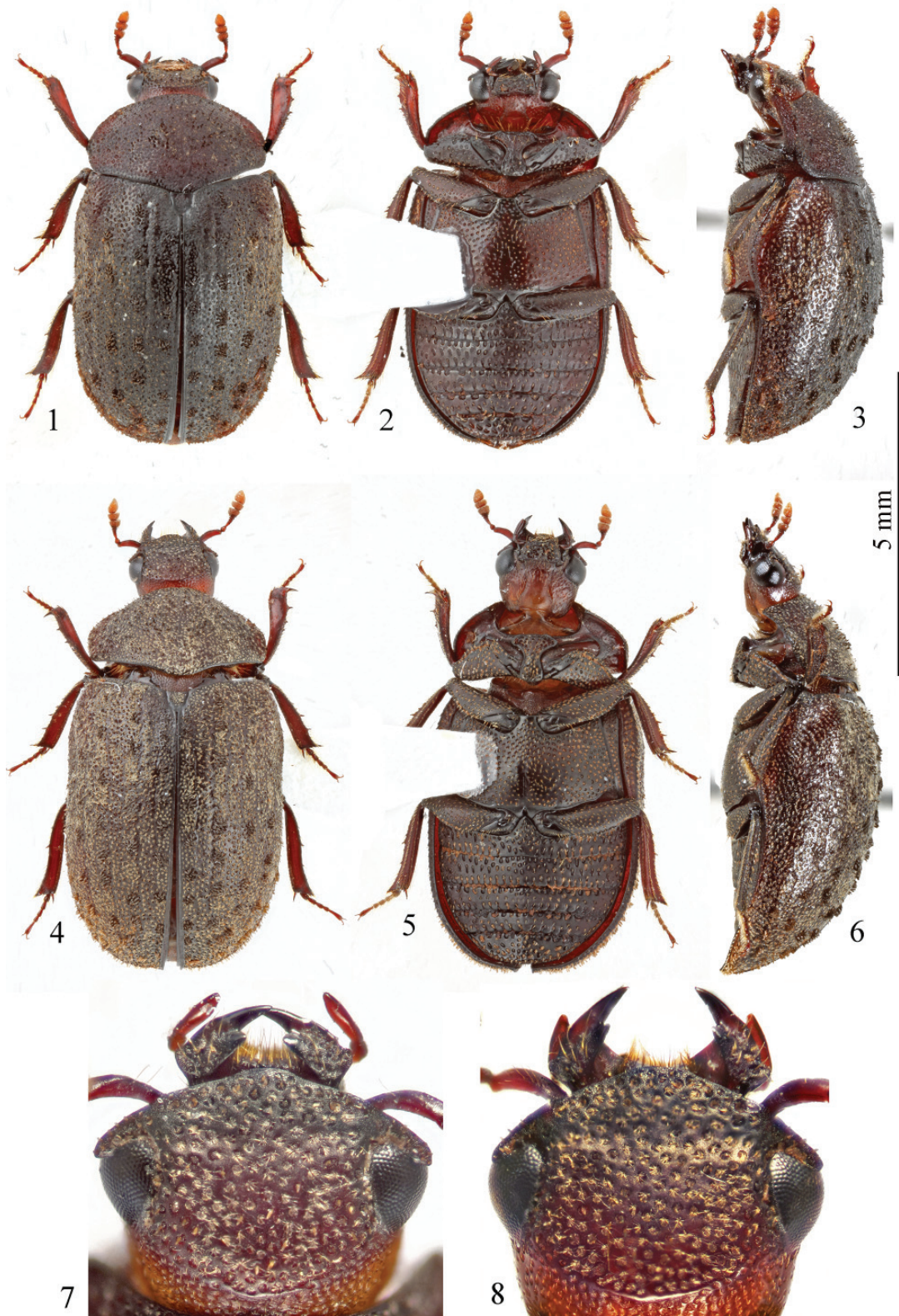
We thank Mr. Xiao-Dong Yang for collecting the type specimens of the new species, Mr. Norio Okuda (Japan) for exchanging a male specimen of *Dorcus apatani* used in this study, and Dr. M. J. Paulsen (USA) and Dr. Luca Bartolozzi (Italy) for reviewing our paper.

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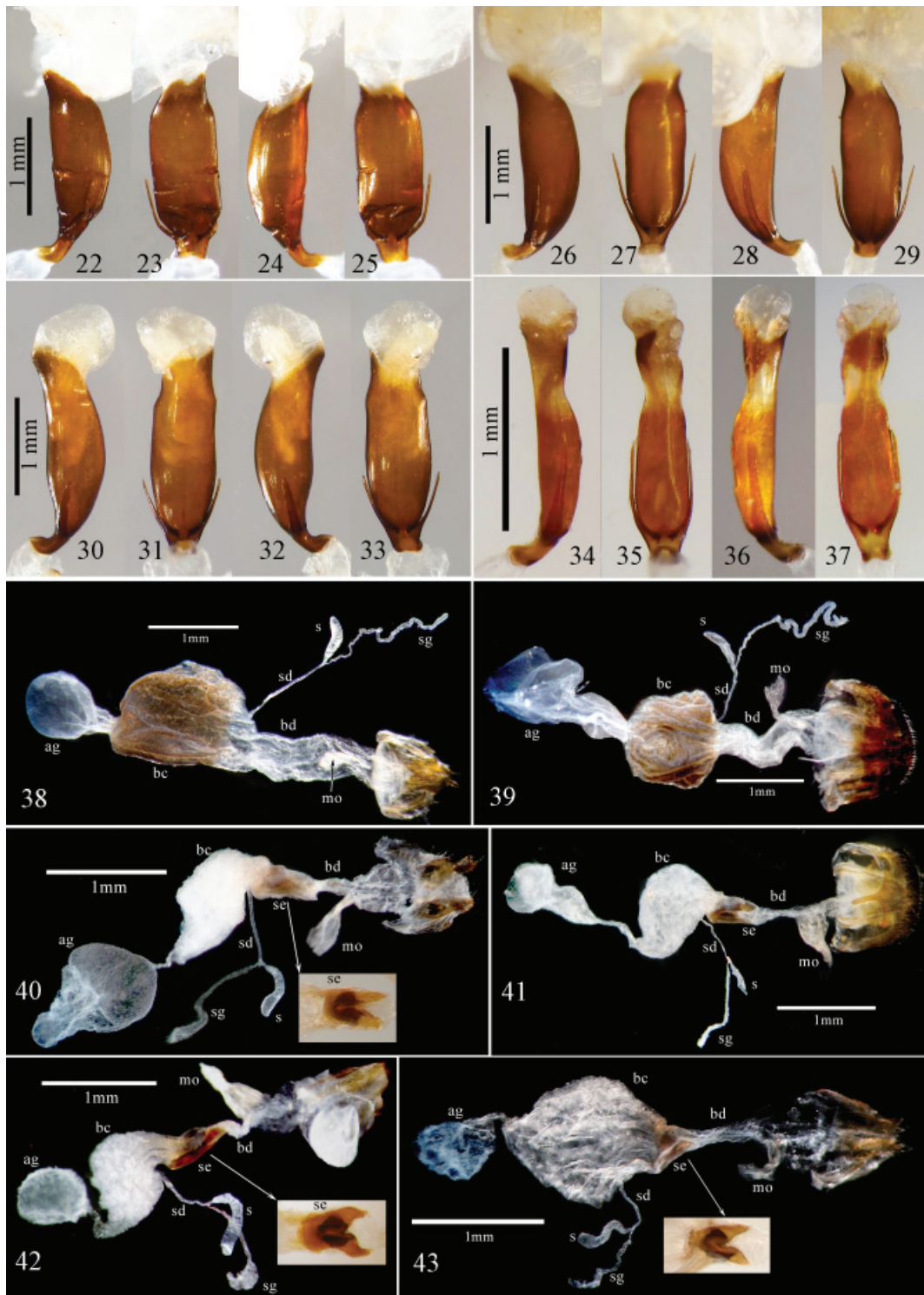
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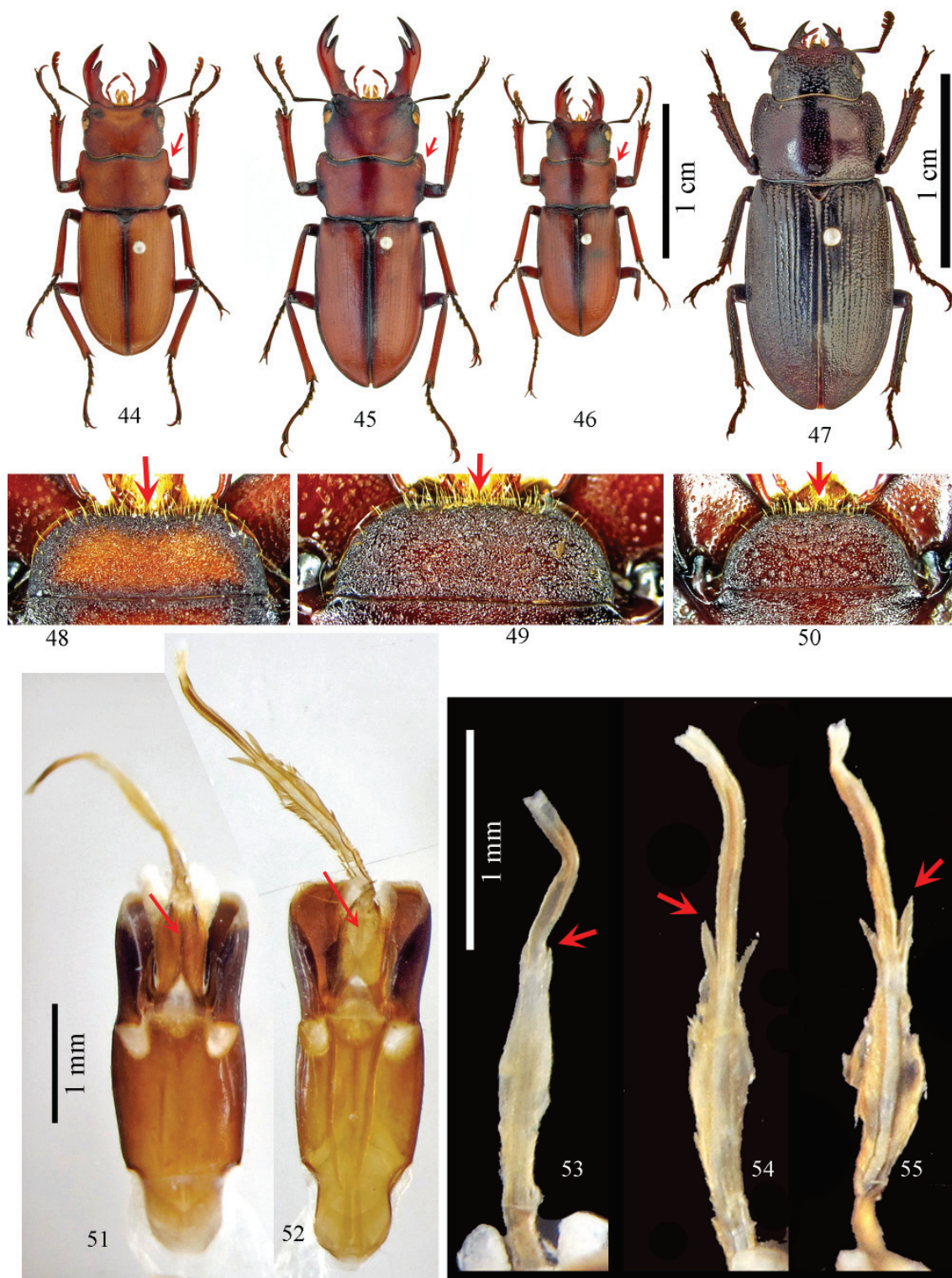
Figures 1–6. Habitus illustrations of *Himaloaesalus gaoligongshanus* n. sp. under same scale. **1–3)** Holotype, male. **4–6)** Paratype, female. **1, 4)** Dorsal view. **2, 5)** Ventral view; **3, 6)** Lateral view. **Figures 7–8.** Head illustrations of *Himaloaesalus gaoligongshanus* n. sp. in dorsal view. **7)** Paratype, male. **8)** Paratype female.



Figures 9–14. Characters of *Himaloaesalus gaoligongshanus* n. sp.. **9–11)** Holotype, male. **12–14)** Paratype, female. **9, 12)** Prosternal process in full face. **10, 13)** Mentum. **11, 14)** Antenna. **Figures 15–20.** Male genitalia of *Himaloaesalus gaoligongshanus* n. sp. taken from holotype under same scale. **15)** Abdominal segment 9 in ventral view. **16)** Aedeagus in left lateral view. **17)** Aedeagus in dorsal view. **18)** Aedeagus in right lateral view. **19–20)** Aedeagus in ventral view on different ground. **Figure 21.** Female genitalia of *Himaloaesalus gaoligongshanus* n. sp. taken from paratype (Fig. 4–6). Abbreviations: mo, median oviduct; bc, bursa copulatrix; sd, spermathecal duct; s, spermatheca; sg, spermathecal gland; ag, accessory gland.



Figures 22–37. Aedeagi of *Himaloaesalus* species in left lateral, dorsal, right lateral and ventral views. **22–25)** *H. saburoi*, specimen from Zhangmu, Tibet. **26–29)** *H. saburoi*, specimen from Zhangmu, Tibet. **30–33)** *H. himalayicus*, specimen from Yadong, Tibet. **34–37)** *H. satoi*, specimen from Daweishan, SE Yunnan. **Figures 38–43.** Female genitalia of *Himaloaesalus* species. **38)** *H. himalayicus*, specimen from Yadong, C Tibet. **39)** *H. saburoi*, specimen from Zhangmu, Tibet. **40)** *H. zhejiangensis*, specimen from Wuyishan, Fujian. **41–43)** *H. satoi*. **41)** Specimen from Fanjingshan, Guizhou. **42)** Specimen from Daozhen, Guizhou. **43)** Specimen from Daweishan, SE Yunnan. Abbreviations: mo, median oviduct; bc, bursa copulatrix; sd, spermathecal duct; s, spermatheca; sg, spermathecal gland; ag, accessory gland; se, sclerite at entrance of bursa copulatrix.



Figures 44–46. Habitus illustrations of males under same scale. **44)** *Dorcus apatani* from NE India. **45)** *Dorcus yongreni* n. sp., holotype. **46)** *Dorcus yongreni* n. sp., paratype. **Figure 47.** Habitus illustration of *Dorcus yongreni* n. sp., paratype, female. **Figures 48–50.** Mentum of male. **48)** *Dorcus apatani* from NE India. **49–50)** *Dorcus yongreni* n. sp. **Figures 51–52.** Aedeagus in ventral view under same scale. **51)** *Dorcus apatani* from NE India. **52)** *Dorcus yongreni* n. sp., holotype. **Figures 53–55.** Flagellum flattened in full-face view under same scale. **53)** *Dorcus apatani* from NE India. **54–55)** *Dorcus yongreni* n. sp. Red arrows indicating the differences between the two species.