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## New species of *Clavicornaltica* Scherer (Coleoptera: Chrysomelidae) from continental Asia

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### Abstract

Four new species of *Clavicornaltica* Scherer are described and illustrated, of which two are from China (*C. dali* **new species** and *C. longsheng* **new species**) and two are from Vietnam (*C. tamdao* **new species** and *C. vietnamensis* **new species**). The wing and metathorax are described and illustrated for the genus for the first time. A key to the newly described species is presented. Male genitalia of *Clavicornaltica australis* Konstantinov are illustrated for the first time.

**Key words:** Chrysomelidae, *Clavicornaltica*, new species, female genitalia, China, Vietnam

### Introduction

The genus *Clavicornaltica* Scherer was originally proposed to describe tiny humicole flea beetles with clavate antennae from Sri Lanka (Scherer 1974). Since then additional species have been described from the Philippines (Scherer 1979, Medvedev 1993, 1996), India and Nepal (Basu & Sen Gupta 1981, Medvedev 1984, Döberl 2002), Australia (Konstantinov 1995), Malaysia and Indonesia (Medvedev 1996), and Taiwan (LeSage 1997). Recent collecting activity in China and Vietnam provided four previously unknown *Clavicornaltica* species, which are described below.

*Clavicornaltica* is among the smallest flea beetles (0.8–2.2 mm) with poorly sclerotized, fragile bodies that are easily broken. This fragility prevented Scherer from dissecting any of his type specimens (Scherer 1974), so that the female and male genitalia, remained unknown until recently. Medvedev was the first to illustrate the median lobe apices for two of his species (Medvedev 1984, 1996), but the bases of the median lobe

were not shown. LeSage (1997) provided an updated description of the genus, including the entire median lobe, with base and internal sac, female genitalia, comments about eggs and ovaries, and detailed illustrations of mouthparts. Most recently, Döberl (2002) described *C. rileyi* from Kerala, India, including aedeagal and spermathecal characters.

Here we describe four additional species from continental Asia, thus bringing the number of described species to 19 and greatly expanding the known geographic range of the genus. The genus is re-diagnosed to reduce redundancy in these species descriptions. The metathorax and wing are described for the first time, and the description of the female genitalia of the genus is expanded to include these new species.

### Terminology and Methods

Dissecting techniques and terminology for most internal and external structures of these beetles follows Konstantinov (1998, 2002). Terminology for wings follows Kukalová-Peck and Lawrence (1993), and terminology for the thoracic structures follows Konstantinov (2002), Matsuda (1970), and Korotyaev et al. (2000). Specimens are deposited in the following collections: National Museum of Natural History, Smithsonian Institution, Washington, D.C., USA (USNM); Zoological Institute of Russian Academy of Sciences, St. Petersburg, Russia (ZMAS); and Institute of Zoology, Academia Sinica, Beijing, China (IZAS). Scanning electron microscopy was done on an uncoated specimen using water vapor and backscatter imaging in a Philips XL30 ESEM with a LaB 6 filament.

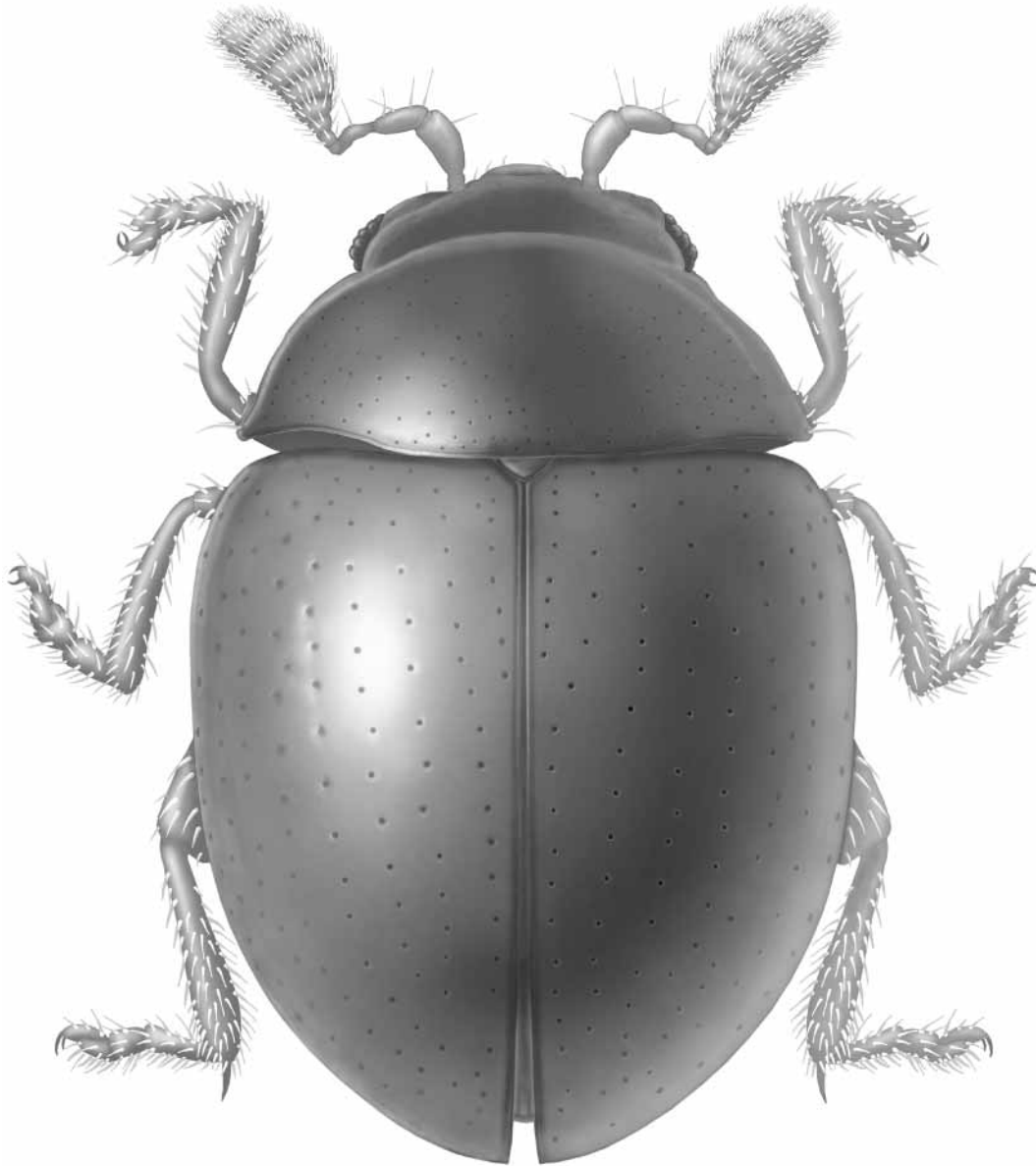
*Clavicornaltica* species are very similar externally and are nearly impossible to separate without studying genitalia. For this reason, species descriptions do not include characters that are shared between species. For those, see the generic diagnosis below.

### *Clavicornaltica* Scherer, 1974

*Clavicornaltica* Scherer, 1974: 58 (type species *Clavicornaltica besucheti* Scherer 1974: 60, by original designation; type locality Sri Lanka; type depository Natural History Museum, Geneva).

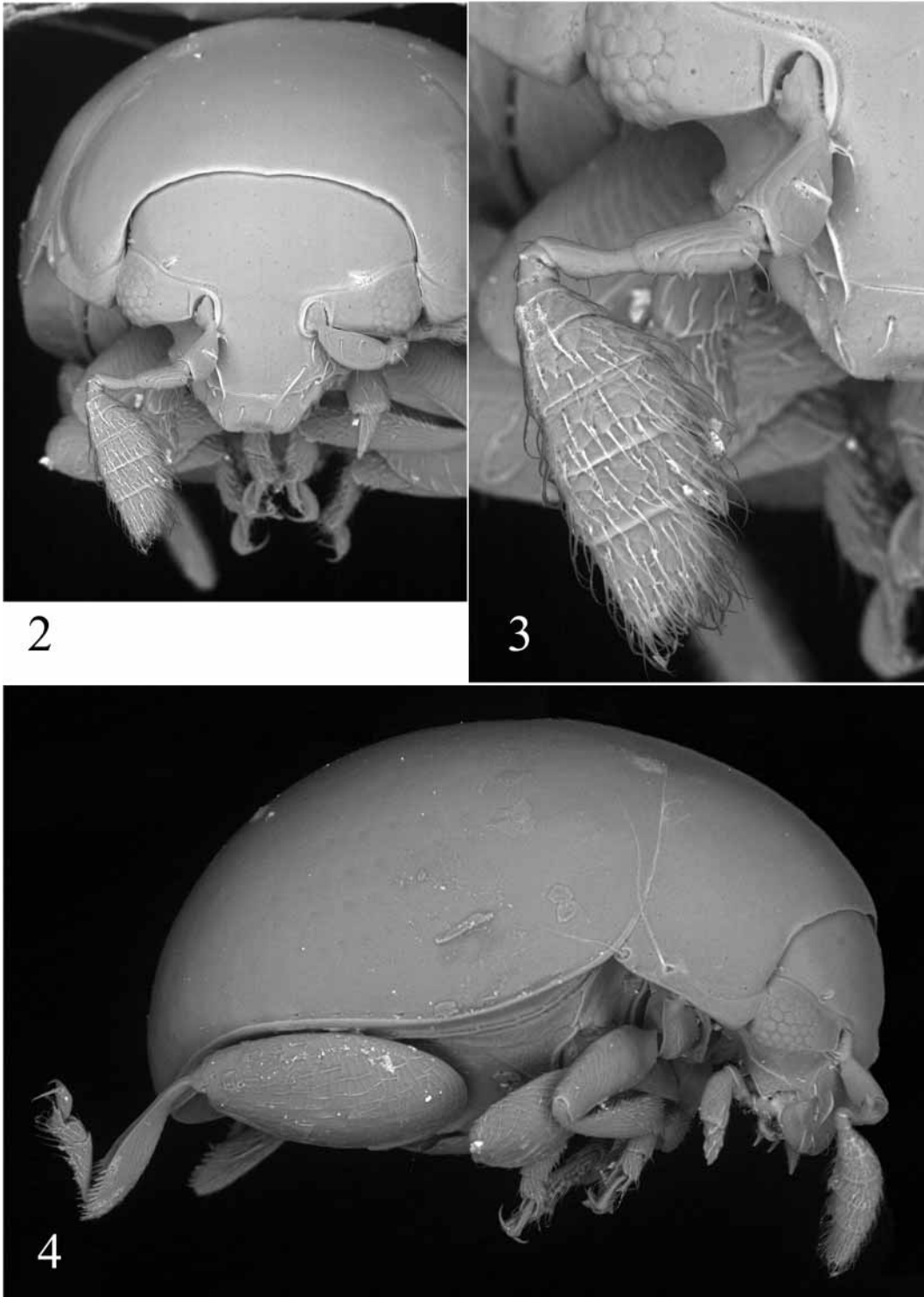
*Clavicornaltica* is easily recognizable from other flea beetle genera, most of all by its clavate antenna (Figs. 1–4), a feature that it shares only with the Caribbean endemic genus *Normaltica* Konstantinov. The antenna of *Clavicornaltica* differs from that of *Normaltica* by the antennomere 4 being the shortest. In *Normaltica*, antennomere 5 is shorter than 4. Among other diagnostic features are: body small, round and convex in lateral view (Figs. 4–8); head flat in lateral view with wide frontal ridge, lacking supracallinal sulci (Fig. 2); with well developed grooves to receive basal antennomeres (Figs. 2–4); frons very broad;

orbit wide (Fig. 2); last 4 antennomeres bearing many long setae, appearing velvety; antennomere 2 as wide (or wider) basally as apically (Fig. 3); eyes ovate, with relatively large, bulging ommatidia; maxillary palpi large, fusiform (Figs. 2, 4); pronotum wider than long, but longest at midline; anterolateral callosity of pronotum extremely long, so that setiferous pore situated well behind middle of lateral margin (Fig. 4); elytra brown, shiny,



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**FIGURE 1.** Dorsal habitus, *Clavicornaltica dali*, sp. nov.



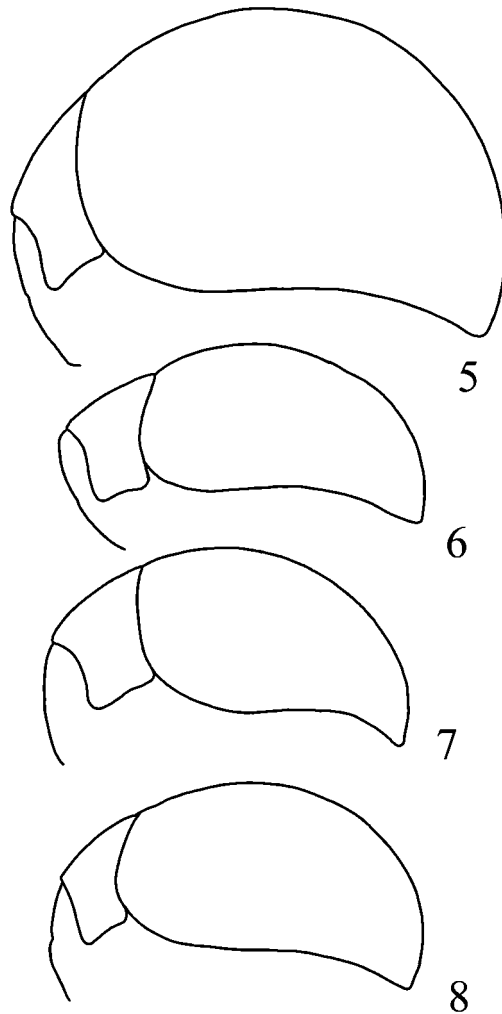
**FIGURES 2–4.** *Clavicornaltica tamdao*. 2, anterior view of head. 3, anterior view of antenna. 4, lateral habitus (note position of anterior prothoracic seta).

without calli; scutellum triangular, small, impunctate; metasternum projecting anteriorly between mesocoxae, completely covering mesosternum ventrally (Figs. 9–10); remnants of mesosternum positioned vertically relative to entire beetle body; femora dorsoventrally flat with groove to receive tibiae (Figs. 11–12); all tibiae channeled dorsally; third metatarsomere very narrow, with fourth situated at its base; metatibial spur long; abdominal sternite 1 narrow near middle, adjacent to intercoxal process and much wider laterally near margin, with longitudinal ridge widening anteriorly (Fig. 21); apical abdominal tergum with wide median groove (Figs. 26, 29), having row of setae in middle; male genitalia abruptly curved in lateral view with long basal part (except *C. rileyi*); female genitalia (Figs. 19–33) composed of full set of structures including tergite IX (Figs. 20, 22, 24); spermatheca with pump and receptacle forming angle, but not separated from each other by distinct border (Figs. 19, 23, 27); tignum narrow and long, without sclerotization posteriorly (Fig. 24, 31); vaginal palpi (Figs. 20, 24, 28) fused basally (their shape and degree of separation vary from species to species).

#### Description of previously unknown *Clavicornaltica* structures

The shape of the metanotum varies greatly between specimens depending on the development of the wings. As was noted previously (Scherer 1974 and Medvedev 1996), males of several species have fully developed wings with females being mostly wingless. However, in *C. dali* males are also flightless. In specimens with fully developed wings the metanotum (Fig. 14) contains allocrista as well developed ridges, a scutoscutellar ridge (called “b” in Konstantinov 1998) separating the scutum from the scutellum, ridge “a” and a deep scutellar groove, gradually widening anteriorly. The metanotum of *Clavicornaltica* is more complicated than that of *Paraminotella* Döberl and Konstantinov (2003). The latter lacks the connection between the scutoscutellar ridges, which are much less developed than in *Clavicornaltica*. In comparison with the metanotum of *Aphthona* Chevrolat, that of *Clavicornaltica* is simpler; it lacks ridges “d” and “c”, both present in *Aphthona* (Konstantinov 1998).

The wings of *Clavicornaltica* are surprisingly well developed (Fig. 15), although we cannot be sure if the beetles are actually able to fly. Their venation is nearly complete on the basal 1/3 of the wing, with CuA3+4, medial bar and spur, RP-mp2, Rp, sclerites, radial bar, ScP and ScA bulging. In specimens of the four species that we studied for this paper, males of *C. dali* and females of *C. longsheng* are wingless. Therefore, winglessness is not restricted to females as implied in the original description. In both Vietnamese species males have wings and females are wingless.



**FIGURES 5–8.** Lateral silhouettes of *Clavicornaltica* spp. 5, *C. lonsheng*. 6, *C. dali*. 7, *C. tamdao*. 8, *C. vietnamensis*.

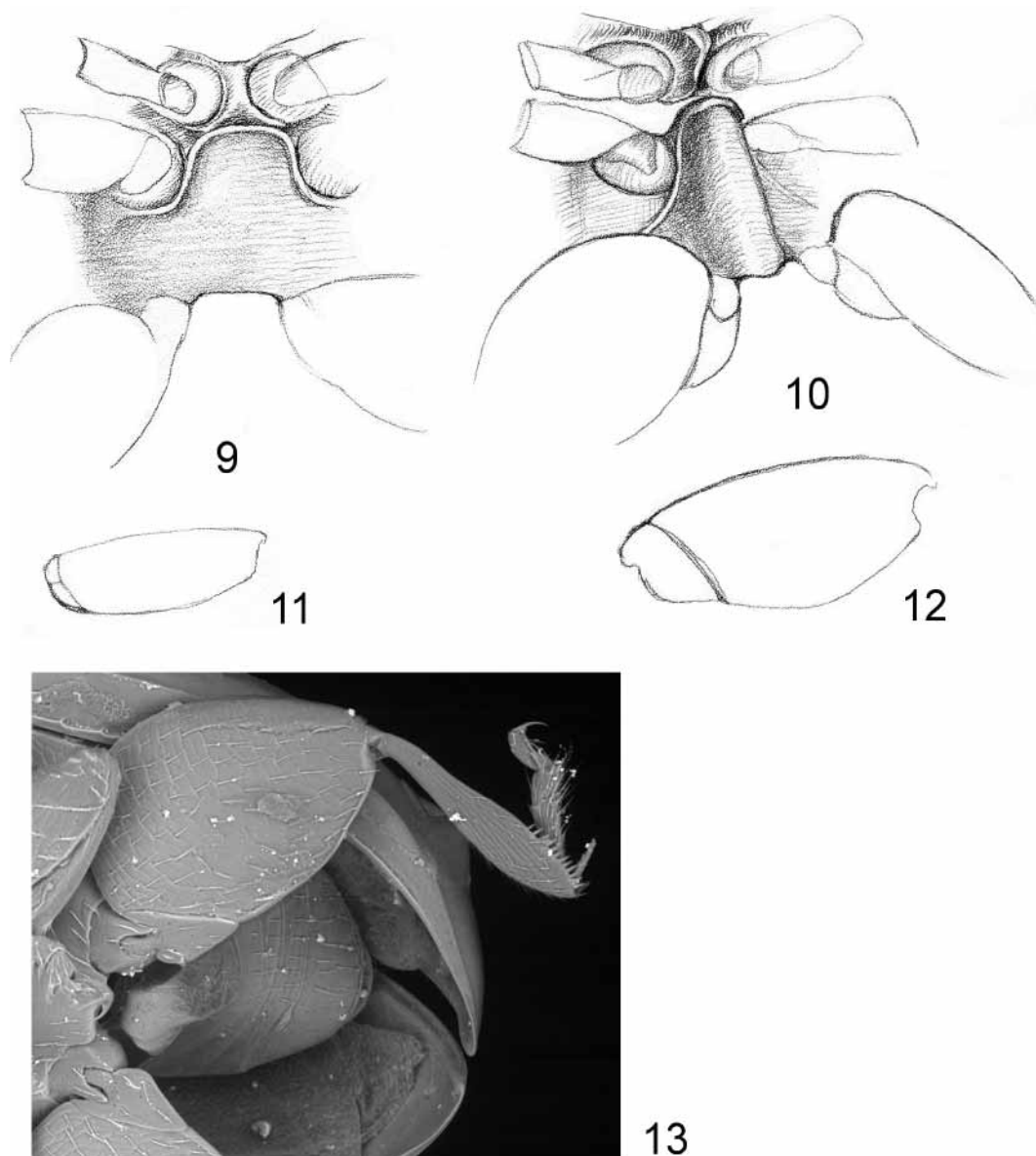
### **Descriptions of New Species**

#### ***Clavicornaltica dali* new species**

(Figs 1, 6, 9, 11, 16)

Description. Body length 1.13–1.24 mm, width 0.78–0.82 mm, light chestnut brown. Vertex relatively densely covered with large punctures. Midfrontal sulcus present. Pronotum lightly punctate (Fig. 1). Elytron less convex in lateral view (Fig. 6), bearing 9 rows of punctures, more prominent in middle (Fig. 1). Intercostal prosternal process low, not reaching beyond procoxae (Fig. 9). Metasternum with middle as flat as sides (Fig. 9).

Mesofemora slender (Fig. 11). Metafemora 1.46 times longer than wide, with maximum width near middle. Metatibia 5 times longer than wide, with maximum width near middle (in ventral view). Proportions of metatarsomeres (starting with first) as follows: 11:5:4:7. Male wingless. Median lobe of aedeagus widening towards apex (Fig. 16), lateral margin in ventral view making “step” before apex, apex with acute, well defined denticle. Ventral groove of median lobe deeper apically than basally. Basal part of aedeagus longer than apical part in lateral view. Female unknown.



**FIGURES 9-13.** Ventral views of *Clavicornaltica* legs and sternal structures. 9, meso- and metasterna of *C. dali*. 10, meso- and metasterna of *C. longsheng*. 11, 12, 13, ventral view of leg and abdomen of *C. tamdao*.

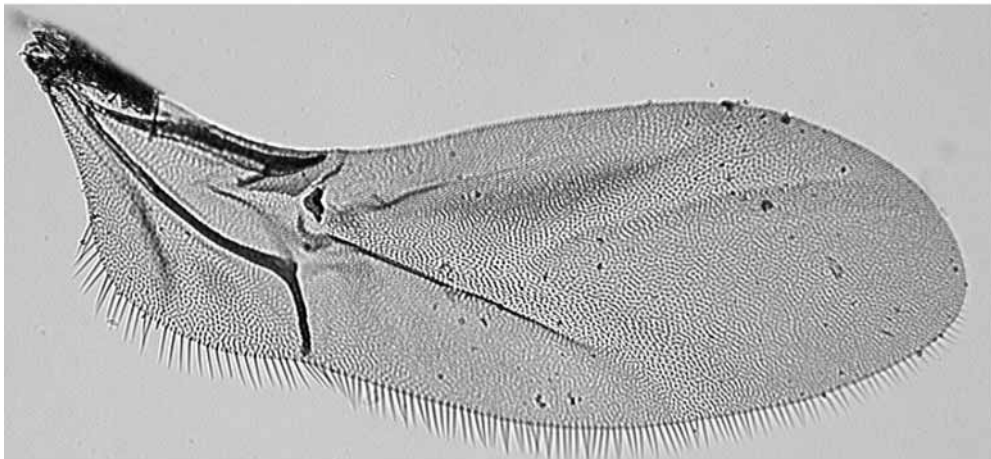
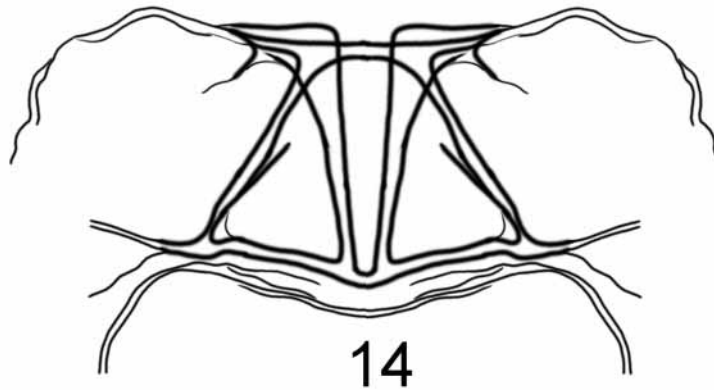


**Type material.** Holotype ♂. Labels: 1) China. Yunnan, Dali env. Cangshan Mts. 22.V.2002, moss 3300m N25°41'09" E100°06'24" leg. A. Konstantinov & M. Volkovitsh; 2) Holotype *Clavicornaltica dali* sp. nov. des. A. Konstantinov and C. Duckett (IZAS). Paratype. The same label as holotype (USNM), one more ♂ paratype with the same label, except 21.V.2002 (USNM).

**Diagnosis.** *Clavicornaltica dali* is the only *Clavicornaltica* species known so far, in which males are wingless. It can be separated from other species from China and Vietnam based on the key below.

**Etymology.** The specific epithet is a noun in apposition based on the type locality.

**Remarks.** The specimens of this species were collected in moss, under low *Rhododendron* spp. trees.

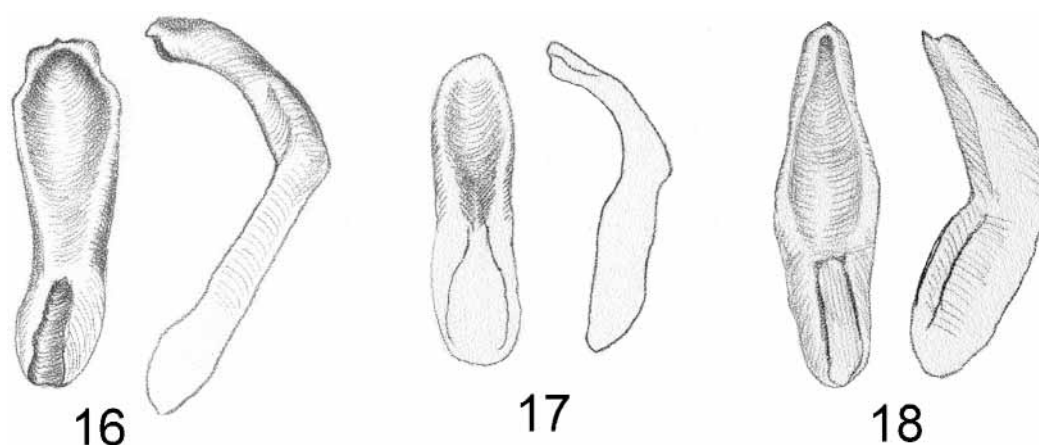


FIGURES 14–15. *Clavicornaltica tamdao*. 14. Metanotum. 15, right wing.

***Clavicornaltica tamdao* new species**

(Figs. 2–4, 7, 13–15, 17, 19–22)

Description. Body length 0.86–0.95 mm, width 0.83–0.84 mm, dark brown. Vertex relatively sparsely covered with small punctures. Midfrontal sulcus absent. Elytron less convex in lateral view (Fig.7), with 9 rows of punctures, more prominent in middle. Metafemora 1.35 times longer than wide, with maximum width basal to middle. Metatibia 6 times longer than wide, with maximum width apical to middle (in ventral view). Proportions of metatarsomeres (starting with first) as follows: 11:4:3:7. Intercostal prosternal process low, not reaching beyond procoxae. Metasternum with middle as flat as sides. Median lobe of aedeagus nearly parallel sided, apex seeming asymmetrical (Fig. 17). Females wingless. Spermatheca with very short duct and pump shorter than receptacle. Receptacle wider than pump (Fig.19). Tignum poorly sclerotized posteriorly (Fig. 20). Vaginal palpi widely separated (Figs. 20, 22).

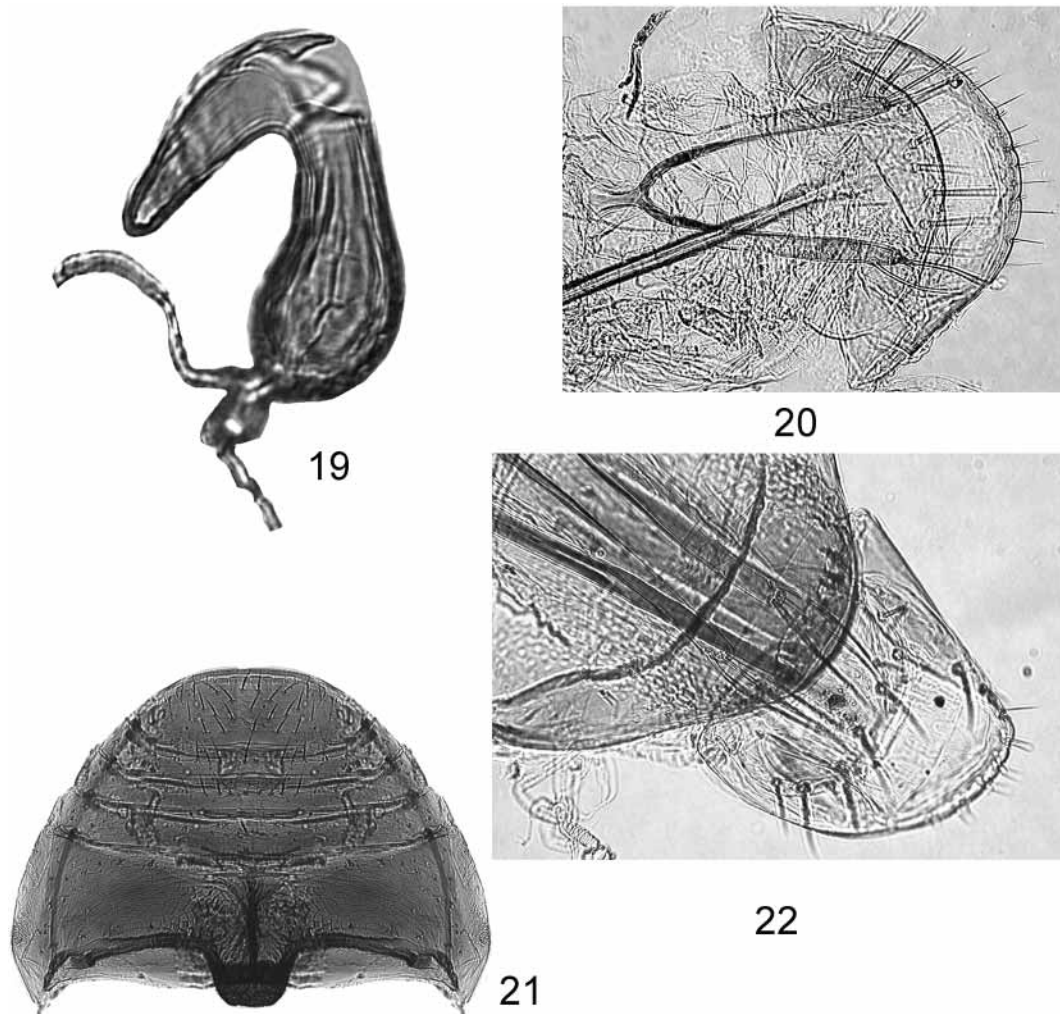


**FIGURES 16–18.** Median lobes of the aedeagi of *Clavicornaltica* species, ventral views shown at left and lateral views at right. 16, *C. dali*. 17, *C. tamdao*. 18, *C. vietnamensis*.

**Type material.** Holotype ♂. Labels: 1) N. Vietnam, Tamdao, 15–23.IX.1997, A. V. Napolov; 2) Zool. Inst. St.Petersburg; 3) Holotype *Clavicornaltica tamdao* sp. nov. des. A. Konstantinov and C. Duckett (ZMAS); Paratypes with the same label as holotype (6 ZMAS, 7 USNM).

**Diagnosis.** *Clavicornaltica tamdao* has a unique, extremely short duct of the spermatheca (Fig. 19). For other characters see the key below.

**Etymology.** The specific epithet is a noun in apposition based on the type locality.



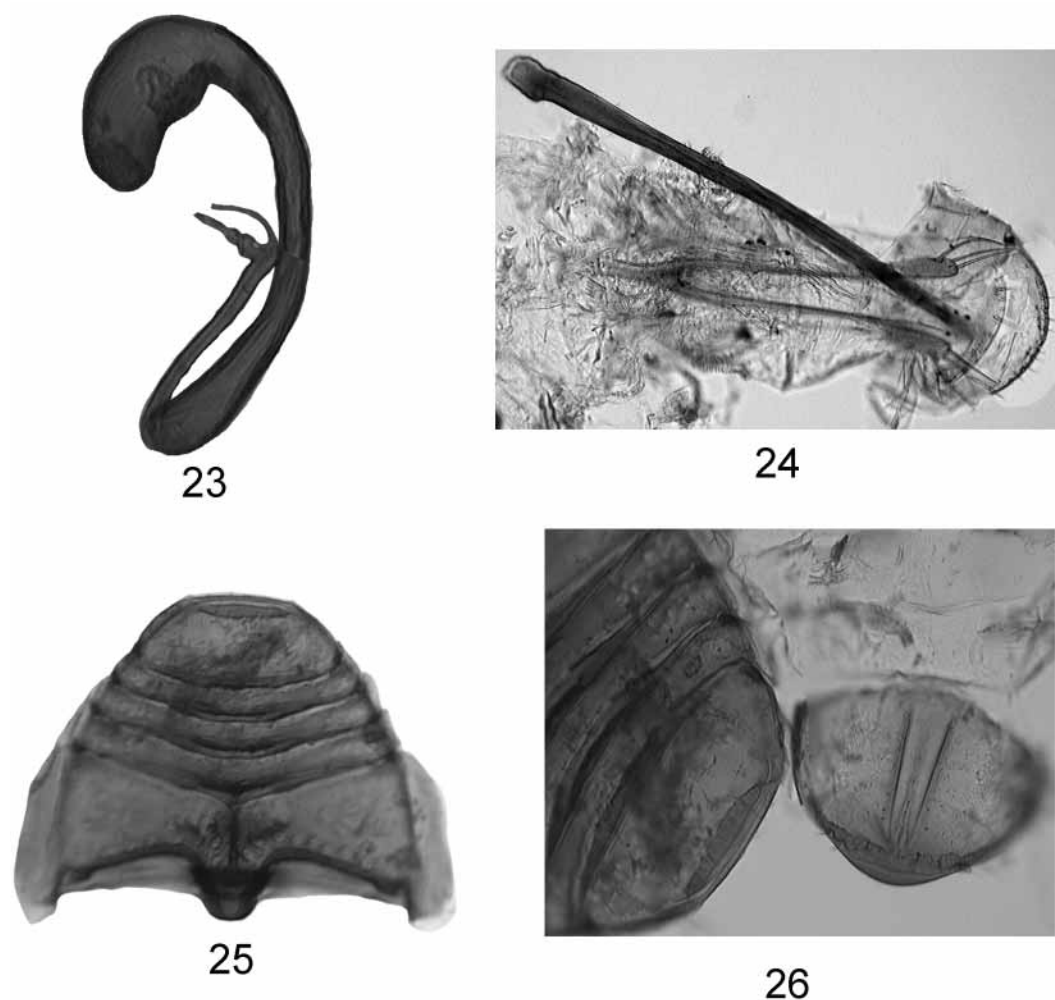
**FIGURES 19–22.** Female genitalia and abdomen, *Clavicornaltica tamdao*. 19, spermatheca. 20, ventral view of terminalia. Tignum (obliquely oriented), vaginal palpi (transversely oriented) and ventral view of tergite VIII and IX. 21, ventral view of abdomen. 22, dorsal view.

***Clavicornaltica vietnamensis* new species**

(Figs. 8, 18, 23–26)

**Description.** Body length 1.06–1.08, 0.91–0.93 width, chestnut brown. Vertex relatively sparsely covered with small punctures. Midfrontal sulcus absent. Elytron less convex in lateral view (Fig. 8), with 9 rows of punctures, more prominent in middle. Metafemora 1.40 times longer than wide, with maximum width nearly in middle. Metatibia 5.7 times longer than wide, with maximum width near middle (in ventral view). Proportions of metatarsomeres (starting with first) as follows: 11:4:3:7. Intercoxal prosternal process low, not reaching beyond procoxae. Metasternum with middle as flat as sides. Median lobe of

aedeagus narrowing apically, apex seems symmetrical (Fig. 18). Female wingless. Spermatheca with very long duct and pump more than two times shorter than receptacle (Fig. 23). Receptacle narrower than pump. Tignum wider anteriorly than posteriorly (Fig. 24). Vaginal palpi situated close to each other along most of their length (Fig. 24).



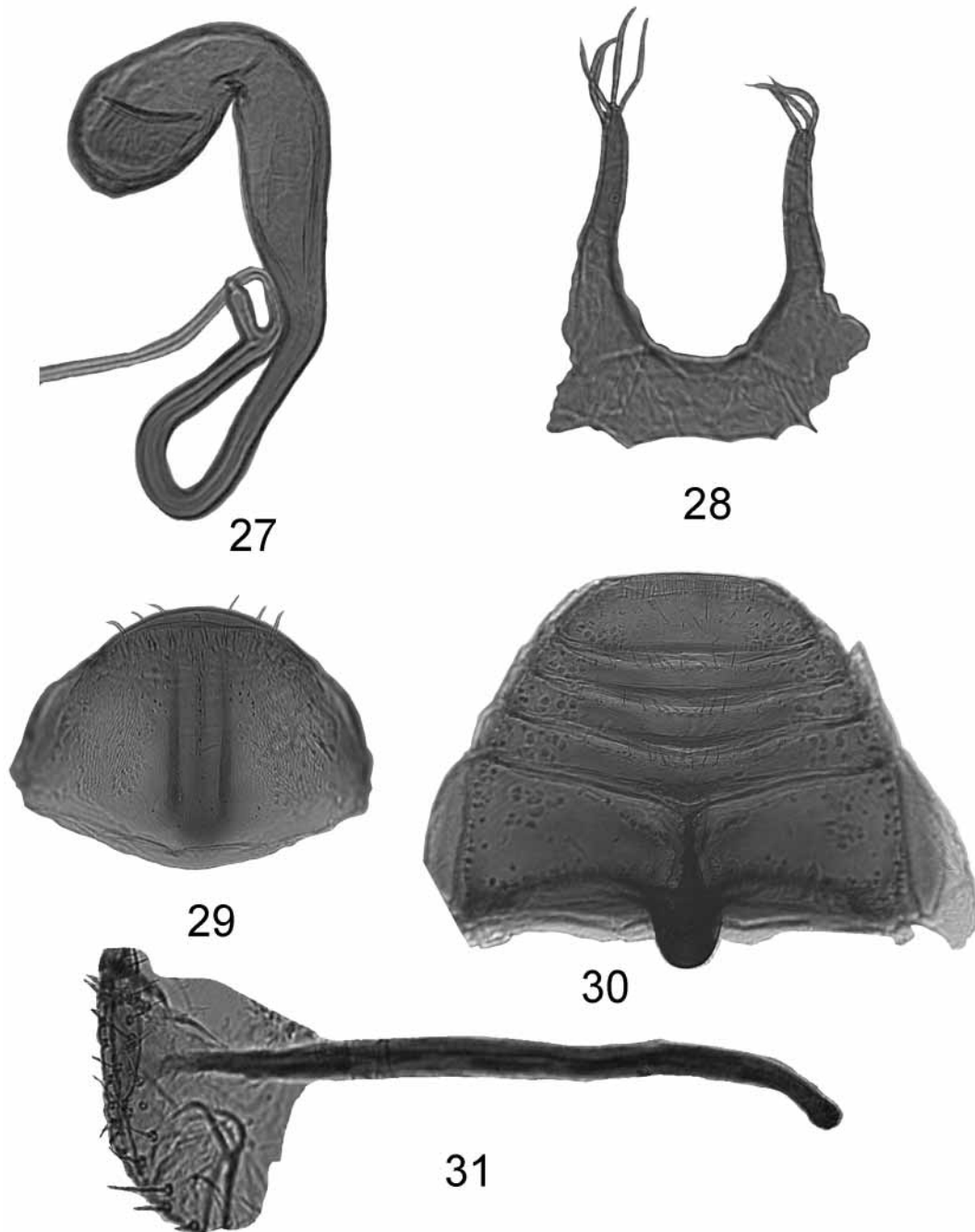
**FIGURES 23–26.** Female genitalia and abdomen, *Clavicornaltica vietnamensis*. 23, spermatheca. 24, tignum (obliquely oriented), vaginal palpi (transversely oriented) and ventral view of tergum VIII and IX. 25, ventral view of abdomen. 26, dorsal view of abdominal apex and tergum VII on the right, ventral abdomen on left.

**Type material.** Holotype ♂. Labels: 1) N. Vietnam, Tamdao, 15–23.IX.1997, A. V. Napolov; 2) Zool. Inst. St.Petersburg; 3) Holotype *Clavicornaltica vietnamensis* sp. nov. des. A. Konstantinov and C. Duckett (ZMAS); Paratype (♀) with the same label as holotype (USNM).

**Diagnosis.** *Clavicornaltica vietnamensis* can be distinguished from *C. tamdao* by its

lighter color, distinct elytral punctations and spermatheca with very long duct and pump less than half as long as receptacle.

**Etymology.** The specific epithet is a noun in apposition based on the country where the type locality is found.



**FIGURES 27–31.** Female genitalia and abdomen, *Clavicornaltica longsheng*. 27, spermatheca. 28, vaginal palpi. 29, tergum VII, dorsal view. 30, abdomen, ventral view. 31, tignum.

***Clavicornaltica longsheng* new species**

(Figs. 5, 10, 12, 27–31)

**Description.** Body length 1.45–1.48 mm, width 1.32–1.34 mm, dark brown. Vertex relatively sparsely covered with small punctures. Midfrontal sulcus absent. Pronotum impunctate. Elytron very convex in lateral view [length (from apex to connection with pronotum) to width ratio 1.41 (Fig. 5)] with 9 rows of nearly indistinct punctures. Mesofemora broad in middle (Fig. 12). Metafemora 1.32 times longer than wide, with maximum width near middle. Metatibia 5.5 times longer than wide, with maximum width apical of middle (in ventral view). Proportions of metatarsomeres (starting with first) as follows: 12:7:5:11. Intercoxal prosternal process high, reaching beyond procoxae. Metasternum with middle raised as high ridge (Fig. 10) continuing between mesocoxae. (Fig. 12). Vaginal palpi widely separated (Fig. 28), length less than 2x total width. Spermatheca with very long duct and with pump shorter and wider than receptacle (Fig. 27). Female wingless. Male unknown.

**Type material.** Holotype ♀. Labels: 1) China. NE Guangxi, 10km S Longsheng (25°48' 00" N110°00' 00" E), 1000m litter 16.VI.1995 leg. S. Kurbatov; 2) Holotype *Clavicornaltica longsheng* sp. nov. des. A. Konstantinov and C. Duckett (ZMAS). Paratypes 2 ♀ with the same labels as holotype (ZMAS, USNM).

**Diagnosis.** *Clavicornaltica longsheng* can be distinguished from all other *Clavicornaltica* species by the unique shape of the intercoxal prosternal process and metasternum (Fig. 10) and by the widely separated, short vaginal palpi (Fig. 28). See key below for more distinguishing characters.

**Etymology.** The specific epithet is a noun in apposition based on the type locality.

**Key to *Clavicornaltica* species from China and Vietnam**

- 1 Elytron very convex in lateral view [length (from apex to connection with pronotum) to width ratio 1.41 (Fig. 5)]. Intercoxal prosternal process high, reaching beyond procoxae. Metasternum with middle raised as high ridge (Fig.10) continuing between mesocoxae..... *C. longsheng* new species
- Elytron less convex in lateral view (length to width ratio 1.67 - 2.03) (Figs.6-8). Intercoxal prosternal process low, not reaching beyond procoxae. Metasternum with middle as flat as sides (Fig. 9)..... 2
- 2(1). Median lobe of aedeagus widening towards apex. Lateral sides of median lobe making “step” before apex, apex with acute, well defined denticle. Basal part of aedeagus longer than apical part in lateral view (Fig.16) ..... *C. dali* new species
- Median lobe of aedeagus parallel sided or narrowing towards apex. Lateral sides of median lobe even, not making “step” before apex, apex with dull, poorly defined denticle. Basal part of aedeagus not longer than apical in lateral view (Figs.17,18). 3

- 3(2). Median lobe of aedeagus nearly parallel sided, apex asymmetrical (Fig.17). Spermatheca with very short duct and pump shorter than receptacle (Fig.19) .....  
 ..... *C. tamdao* new species
- Median lobe of aedeagus narrowing apically, apex symmetrical (Fig.18). Spermatheca with very long duct and pump less than half as long as receptacle (Fig. 23) .....  
 ..... *C. vietnamensis* new species

## Discussion

Published illustrations of other *Clavicornaltica* species can be compared with the species described above, however, because we have not examined specimens of other species of *Clavicornaltica* (besides *C. australis* Konstantinov) while preparing this manuscript, some caution should be used. The spermatheca of *C. rileyi* is similar in receptacle shape to that of *C. tamdao*, but the length of the duct is intermediate and the gland valve is highly expanded relative to the species described above. *C. takimotoi* is very similar to *C. tamdao* in most aspects of the female genitalia, however, the shape of both the base and apex of the male median lobe is very different; the basal orifice of *C. takimotoi* is not drawn but the apex appears blunt whereas the apex of the median lobe of the aedeagus is asymmetrically rounded in *C. tamdao*.

*Clavicornaltica australis* was described based on a single specimen which was not dissected at the time of description (Konstantinov 1995). Its gender was identified as feminine. In preparing this manuscript we dissected the holotype and realized that it is a male. Based on the shape of the median lobe of the aedeagus (Fig. 32), it is quite distinct from the species described in this paper in having relatively short basal part. It is more similar to *C. tamdao* (Fig. 17) by the median lobe being nearly parallel sided, but the apex in *C. australis* is fully symmetrical.

In 1997 LeSage listed two species from Borneo and Malaysia as undescribed. The 1996 Medvedev paper was unknown to him at that time, however, and it remains to be seen if those two taxa are any of the species described by Medvedev.

In his 1996 paper Medvedev reported *C. besucheti* and *C. fortepunctata*, species originally described from Sri Lanka, as also occurring in Vietnam. Specimens identified as "cf" *C. lobeli*, *C. besucheti*, *C. fortepunctata*, and *C. pusilla* were attributed to India, Thailand and Taiwan. This identification was based on Scherers key, which uses only external characters without any reference to male or female genitalia (Scherer 1974). It seems highly improbable that leaf litter and moss living, tiny beetles, with mostly flightless females, would have such extensive ranges as to occur in Sri Lanka and in Vietnam and Thailand. Remarkable variability of *Clavicornaltica* specimens collected in a single or closely situated locations was previously interpreted as intraspecific (Medvedev 1996), however our dissections of various forms collected together revealed that these forms have unique male and female genitalia and should be treated as distinct species. This

is particularly true for the new species from Vietnam. The Chinese species also do not occur that far from each other, in mountains (although at different altitudes) which do not appear to be separated by a distinct barrier. This suggests that many more species of *Clavicornaltica* are yet to be discovered and described.

Döberl (2002) asserted that there were 15 species of *Clavicornaltica* described at that time, citing Medvedev (1996). This is correct but misleading; in 1996 Medvedev listed 12 validly published species, including one subspecies of *C. iriana*, *C. i. sarawacensis*. Five other taxa were listed as compared with, “cf”, a validly published name. Including the four species described above, there are 19 valid *Clavicornaltica* species; these are listed below.

### ***Clavicornaltica* species known to date**

<i>C. australis</i> Konstantinov 1996	Australia: Queensland
<i>C. besucheti</i> Scherer 1974	Sri Lanka
<i>C. dali</i> new species	China: Yunnan
<i>C. fortepunctata</i> Scherer 1974	Sri Lanka
<i>C. himalayensis</i> Medvedev 1984	Nepal
<i>C. iriana</i> Medvedev 1996	Indonesia
<i>C. loebli</i> Scherer 1974	Sri Lanka
<i>C. longsheng</i> new species	China: Guangxi
<i>C. malyana</i> Medvedev 1996	Malaysia
<i>C. mussardi</i> Scherer 1974	Sri Lanka
<i>C. philippinensis</i> Scherer 1979	Philippines
<i>C. pusilla</i> Scherer 1974	Sri Lanka, Tawian (Kimoto 1991)
<i>C. rileyi</i> Döberl 2002	India: Kerala
<i>C. schereri</i> Basu & Sen Gupta 1981	India: West Bengal
<i>C. takimotoi</i> Lesage 1997	Taiwan
<i>C. tamdao</i> new species	Vietnam
<i>C. tarsalis</i> Medvedev 1996	Irian Jaya
<i>C. trautneri</i> Medvedev 1993	Philippines: Leyte Island
<i>C. vietnamensis</i> new species	Vietnam

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