

Abstract

Notes about the distribution and the abundance of Nepalese Lucanidae and a key for the Nepalese species of the genera *Serrognathus*, *Dorcus* and *Lucanus* are given. Because a considerable variation of the external morphological characters sometimes causes difficulties in determination, pictures of the aedeagi and in a key the use of sexual characters of males are proposed.

Zusammenfassung

Angaben zur Verbreitung und Häufigkeit der Hirschkäfer (Lucanidae) in Nepal und ein Schlüssel für die in Nepal vorkommenden Arten der Gattungen *Serrognathus*, *Dorcus* und *Lucanus* werden vorgestellt. Da sich wegen einer beträchtlichen Variabilität der äußerlichen morphologischen Merkmale der Männchen eine zuverlässige Artbestimmung oft schwierig gestaltet, werden Abbildungen der Aedeagi und ein Schlüssel, der Merkmale der männlichen Genitalien mit einbezieht, gegeben.

Key words: Coleoptera, Lucanidae, Nepal, faunistics, sexual characters, keys of determination

Introduction

Several expeditions to Nepal carried out in the last years by different museums gave the opportunity to study a variety of Lucanidae from Nepal and to present some notes about the distribution and the abundance of the species as well as the sexual characters of males in three genera of Nepalese Lucanidae.

Because several species are considerably variable in morphological characters and therefore the determination is not always easy, keys for three genera including the characters of the aedeagi should help to better succeed in determining species. Till now, the only key for Himalayan Lucanidae is the one by ARROW (1950), which doesn't use sexual morphology. BOUCHER & HUANG (1991) gave pictures of the aedeagi of several species of *Pseudolucanus* and BOUCHER (1995) presented a very useful key for four species of this subgenus, however without including all Nepalese species.

Using the data of former studies about Nepalese Lucanidae and including data of new material, notes on the vertical and horizontal distribution as well as on the species' abundance are discussed. At present, 51 species of 11 genera are known from Nepal (SPRECHER & BARTOLOZZI 2002).

Material and methods

In this study, data of material (551 specimens) belonging to the Naturhistorisches Museum Basel (Switzerland), Naturkundemuseum Erfurt, Staatliches Museum für Tierkunde Dresden, Staatliches Museum für Naturkunde Stuttgart, Institut für Zoologie der Universität Mainz (Germany) and the Natural History Museum London (England) are included. Furthermore, some data were taken from the publications of BARTOLOZZI & SFORZI (1994), ARAYA (1995), ARAYA et al. (1998) and SPRECHER & BARTOLOZZI (2002).

Faunistical notes

Vertical distribution

Figulus caviceps Boileau, 1902, *Nigidius himalayae* Gravely, 1915, *Prosopocoilus astacoides* (Hope, 1840), *P. biplagiatus* (Westwood, 1855), *P. giraffa* (Olivier, 1789), and *Dorcus antaeus* Hope, 1842 were mainly found at an altitude below 1000 m.

Most species were found between 1000 m and 3000 m. Above 1000 m and until 2000 m 20 species were observed: *Nigidius himalayae* Gravely, 1915, *Cyclommatus multidentatus* (Westwood, 1848), *Prosopocoilus astacoides* (Hope, 1840), *P. parryi* Boileau, 1913, *Macrodorcas bisignata* (Parry, 1862), *M. vernicata* (Arrow, 1938), *Serrognathus reichei* (Hope, 1842), *S. lineatopunctatus* (Hope, 1831), *S. titanus* (Boisduval, 1835), *Dorcus antaeus* Hope, 1842, *D. cylindricus* Thomson, 1862, *D. ratiocinativus* Westwood, 1871, *Neolucanus castanopterus* (Hope, 1831), *N. baladeva* (Hope, 1842), *Lucanus* (s. str.) *cantori* Hope, 1842, *L. (s. str.) lunifer* Westwood, 1839, *L. (s. str.) mearsii* Hope, 1842, *L. (s. str.) smithii* Parry, 1862, *L. (s. str.) westermanni* Hope & Westwood, 1845, and *L. (Pseudolucanus) atratus* (Hope, 1831).

Until 3000 m, 21 species were found: *Aesalus saburoi* Araya, Tanaka & Bartolozzi, 1998, *Figulus caviceps* Boileau, 1902, *Hemisodorus nepalensis* (Hope, 1831), *Serrognathus reichei* (Hope, 1842), *S. lineatopunctatus* (Hope, 1831), *S. titanus* (Boisduval 1835), *Dorcus antaeus* Hope 1842, *D. cylindricus* Thomson 1862, *D. ratiocinativus* Westwood, 1871, *D. suturalis* Westwood, 1871, *Odontolabis cuvera* Hope, 1842, *O. siva* (Hope & Westwood, 1845), *Neolucanus castanopterus* (Hope, 1831), *N. baladeva* (Hope, 1842), *Lucanus* (s. str.) *smithii* Parry, 1862, *L. (s. str.) villosus* Hope, 1831, *L. (Pseudolucanus) atratus* (Hope, 1831), *L. (P.) confusus* (Boucher, 1994), *L. (P.) groulti* (Planet, 1897), *L. (P.) kerleyi* (Boucher, 1994), *L. (P.) oberthueri* (Planet, 1896).

Finally above 3000 m, only seven species were found; three of them belong to *Pseudolucanus*. They are *Aesalus himalayicus* Kurosawa, 1985, *Hemisodorus nepalensis* (Hope, 1831), *Serrognathus lineatopunctatus* (Hope, 1831), *Dorcus ratiocinativus* Westwood, 1871, *Lucanus* (*Pseudolucanus*)

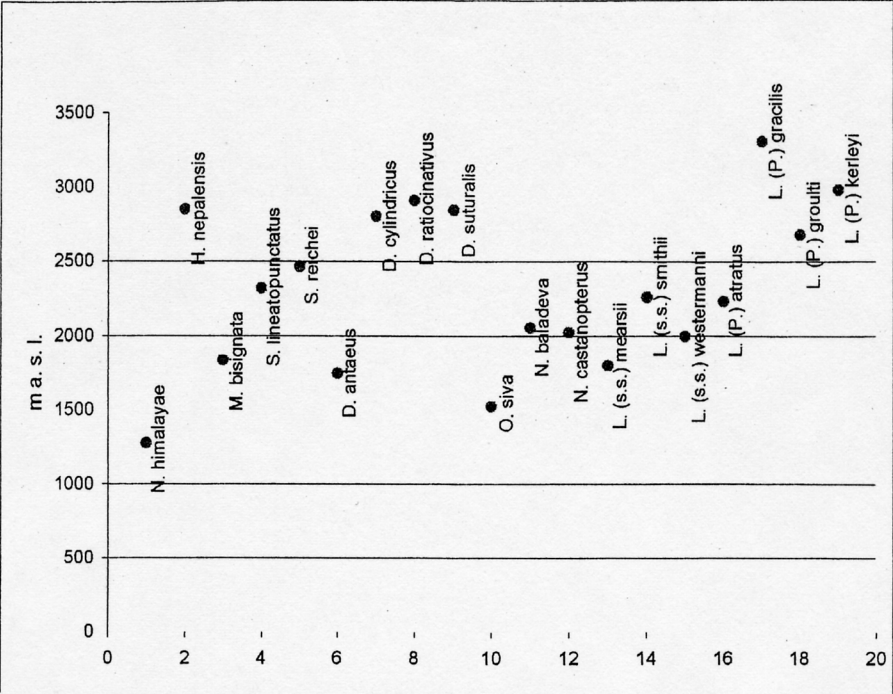


Fig. 1. Medium altitude of the places, where the species of Lucanidae were found in Nepal.

gracilis Albers, 1889, *L. (P.) kerleyi* (Boucher, 1994), *L. (P.) oberthueri* (Planet, 1896). While the genera *Nigidius* and *Prosopocoilus* seem to occur only at lower altitudes until 2000 m, all species of *Pseudolucanus* prefer higher altitudes above 2000 m. All records of *Neolucanus* and *Lucanus* s. str. are from places between 1000 m and 2000 m. Together with most species of *Pseudolucanus*, also *Aesalus himalayicus*, *Hemisodorcus nepalensis*, *Serrognathus lineatopunctatus*, and *Dorcus ratiocinativus* are mountainous species, which can be found until very high altitudes. In Nepal, the highest altitude, where actually Lucanidae were registered, is 3600 m. The medium altitude of the places, where the species were found, is shown in fig. 1.

Horizontal distribution

As an example, *Dorcus suturalis* is a species found only in West Nepal and known from places west of Nepal (Himalayas, Kashmir, Afghanistan). On the other side, a species occurring in East Asia (Assam, Darjeeling) and found only in East Nepal is *Lucanus* (s. str.) *mearsii*. Among the species of *Pseudolucanus*, two species, *P. wittmeri* (Lacroix 1984) (known from Pakistan and Nepal) and *P. groulti* (known from Northwest India and Nepal), show a more western distribution, while *P. atratus* (known from India, Sikkim, Bhutan, Nepal), *P. confusus* (known from Sikkim, Bhutan, Nepal), *P. gracilis* (known from Sikkim, Nepal) and *P. oberthueri* (known from Sikkim, Nepal) occur in more eastern zones. Some species are partly sympatric. Among the species of *Pseudolucanus* with a more western distribution, *P. groulti* seems to occur in higher altitudes than *P. wittmeri*. Among the species with a more eastern distribution, *P. gracilis* was found only above 3000 m, the others also below. Whether the species were found in West, Central or East Nepal is shown in fig. 2.

Species	Western Nepal	Central Nepal	Eastern Nepal
<i>Aesalus himalayicus</i>			
<i>Aesalus saburoi</i>			
<i>Figulus caviceps</i>			
<i>Nigidius himalayae</i>			
<i>Cyclommatus multidentatus</i>			
<i>Prosopocoilus astacoides</i>			
<i>Prosopocoilus biplagiatus</i>			
<i>Prosopocoilus giraffa</i>			
<i>Prosopocoilus parryi</i>			
<i>Hemisodorcus nepalensis</i>			
<i>Macrodercus bisignata</i>			
<i>Macrodercus vernicata</i>			
<i>Serrognathus lineatopunctatus</i>			
<i>Serrognathus reichei</i>			
<i>Serrognathus titanus</i>			
<i>Dorcus antaeus</i>			
<i>Dorcus cylindricus</i>			
<i>Dorcus ratiocinativus</i>			
<i>Dorcus suturalis</i>			
<i>Odontolabis cuvera</i>			
<i>Odontolabis siva</i>			
<i>Neolucanus baladeva</i>			
<i>Neolucanus castanopteris</i>			
<i>Lucanus</i> (s.s.) <i>cantori</i>			
<i>Lucanus</i> (s.s.) <i>lunifer</i>			
<i>Lucanus</i> (s.s.) <i>mearsii</i>			
<i>Lucanus</i> (s.s.) <i>smithii</i>			
<i>Lucanus</i> (s.s.) <i>villosus</i>			
<i>Lucanus</i> (s.s.) <i>westermanni</i>			
<i>Lucanus</i> (P.) <i>atratus</i>			
<i>Lucanus</i> (P.) <i>confusus</i>			
<i>Lucanus</i> (P.) <i>gracilis</i>			
<i>Lucanus</i> (P.) <i>groulti</i>			
<i>Lucanus</i> (P.) <i>kerleyi</i>			
<i>Lucanus</i> (P.) <i>oberthueri</i>			

Fig. 2: Distribution of the species of Lucanidae in Western, Central and Eastern Nepal.

Abundance

Serrognathus lineatopunctatus, *Neolucanus castanopterus*, and *Dorcus ratiocinativus* are the species, which were found the most. Nearly half of all specimens studied belong to these three species. Especially, *Serrognathus lineatopunctatus* seem to be very common in all parts of Nepal. *Dorcus cylindricus*, *Dorcus suturalis*, and *Lucanus (Pseudolucanus) groulti* were found with more than 20 specimens, *Nigidius himalayae*, *Serrognathus reichei*, and *Lucanus (Pseudolucanus) gracilis* with more than 15 specimens. Till now, only a single record of *Aesalus himalayicus*, *Cyclommatus multidentatus*, *Macrodorcas vernicata*, *Serrognathus titanus*, *Lucanus* (s. str.) *cantori*, and *Lucanus (Pseudolucanus) confusus* were registered in Nepal. The number of specimens of each species included in this study is shown in fig. 3.

Endemic species

Till now, *Aesalus saburoi*, *Figulus wittmeri*, *Prismognathus delislei*, *Prosopocoilus fuscocinctus*, *Hemisodorcus dierli*, *Lucanus* (s. str.) *villosus*, *Lucanus (P.) kerleyi* and probably also *Lucanus (P.) atratus* are known only from Nepal.

Widely distributed species

All Nepalese species of the genera *Serrognathus* and *Neolucanus* are widely distributed all over the Asiatic continent. *Serrognathus reichei*, *S. lineatopunctatus*, *S. titanus*, *Neolucanus castanopterus*, and *N. baladeva* are known from

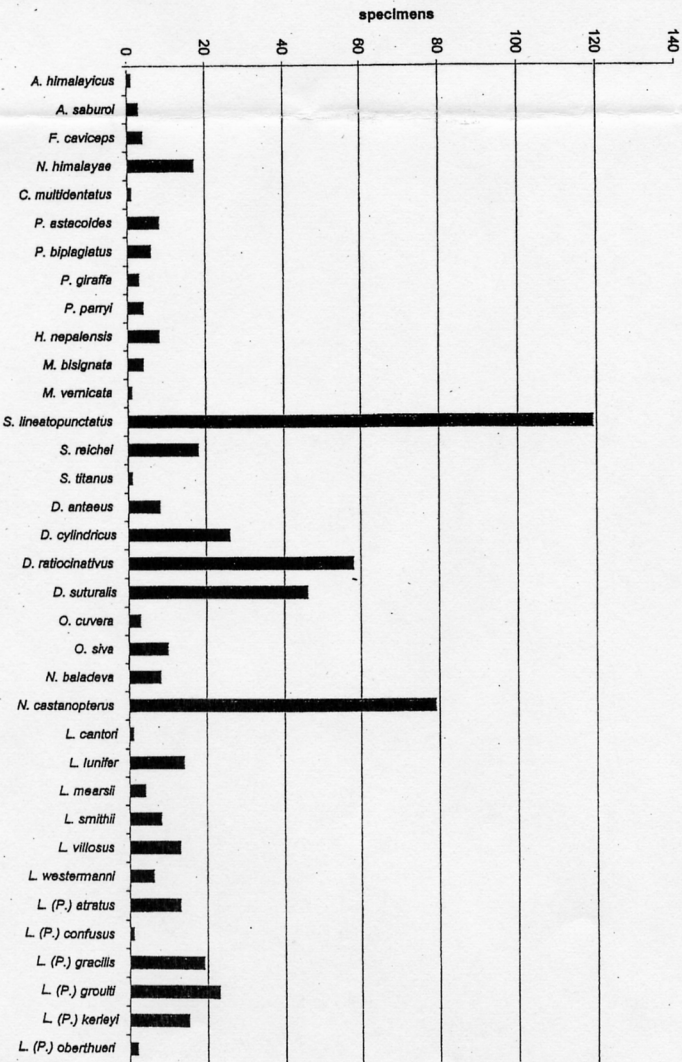


Fig. 3. Number of specimens of each species included in this study.

many regions in Asia and occur from China until Indonesia. Most of them are also very common in Nepal.

Palaearctic species

The fauna of Nepal is mainly oriental, but a few palaearctic elements are known such as *P. blanchardi tibetanus* (Tibet, Nepal), *D. suturalis* (Himalaya, Kashmir, Afghanistan) or *L. (P.) wittmeri* (Pakistan, Nepal).

A key to species for three genera of Nepalese Lucanidae (males)

Genus *Serrognathus* (fig. 4)

- 1. Seventh joint of the antenna as long as the eighth, parameres with teeth, flagellum with two short appendages..... *titanus*
- Seventh joint of the antenna not as long as the eighth, parameres without teeth..... 2
- 2. Mandibles with small teeth or none, distal part of the flagellum filiforme, gonoporus oblong..... *lineatopunctatus*
- Mandible bearing a single strong tooth close to the base in small specimens, advanced and double in larger ones, flagellum robust and large..... *reichei*

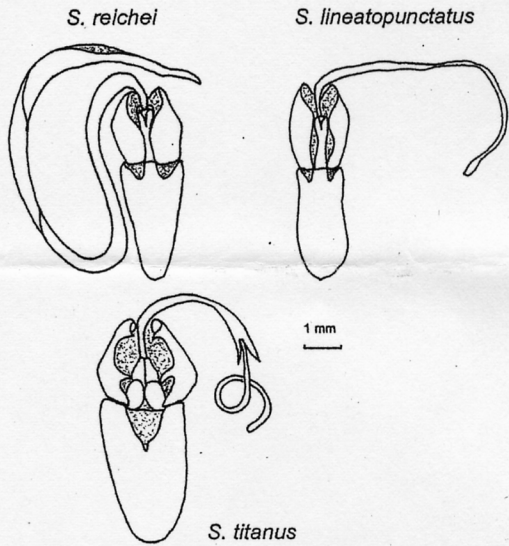


Fig. 4. Aedeagi of the three species of *Serrognathus* known in Nepal.

Genus *Dorcus* (fig. 5)

- 1. Head and pronotum smooth or very finely granular 2
- Head and pronotum rugose or strongly punctured 6
- 2. Shoulders of the elytra sharply angular 3
- Shoulders of the elytra not sharp 5
- 3. Hind tibia bearing a lateral spine..... 4
- Hind tibia without a lateral spine, flagellum with short appendages of about 1 mm length..... *curvidens*
- 4. Mandibles strongly curved, flagellum with long appendages of half of the length of the flagellum..... *antaeus*
- Mandibles slightly curved, flagellum filiforme without appendages... *submolaris*
- 5. Lateral angle of the pronotum blunt, distal part of the flagellum much longer than the appendages, gonoporus oblong *suturalis*
- Lateral angle of the pronotum acute, distal part of the flagellum not much longer than the appendages, gonoporus slender... *ratiocinativus*
- 6. Shoulders of the elytra rounded, flagellum about 5 mm long *velutinus*
- Shoulders of the elytra sharply angular, flagellum about 3 mm long... *cylindricus*

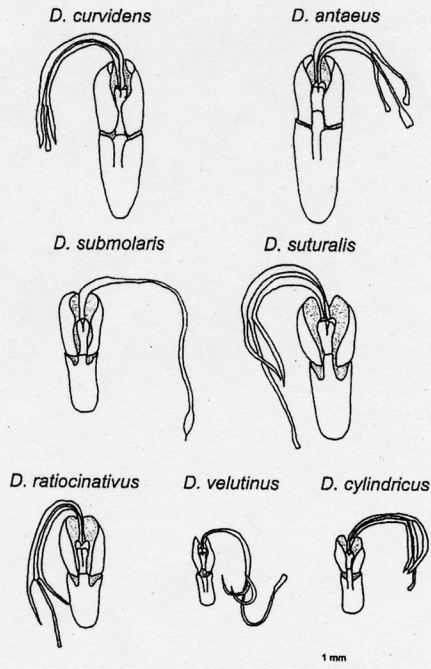


Fig. 5. Aedeagi of the seven species of *Dorcus* known in Nepal.

Genus *Lucanus*

Mandibles much longer than the head and with teeth **subg. *Lucanus* s. str.**
Mandibles short and little toothed or toothless **subg. *Pseudolucanus***

subg. *Lucanus* s. str. (fig. 6)

- 1. Clypeal process forked, body clothed with yellowish hairs, surface slightly metallic, flagellum about 8 mm long, anterior border of the gonoporus convex.....***lunifer***
 - Clypeal process not forked, at best bilobed..... **2**
- 2. Elytra with none or only very faint metallic suffusion..... **3**
 - Elytra metallic greenish or coppery shining, flagellum about 6 mm long, anterior border of the gonoporus straight.....***mearsii***
- 3. Elytra more or less hairy **4**
 - Elytra without hairs, flagellum about 8 mm long, gonoporus straight.....***westermanni***
- 4. Hind lobes of the head largely rounded..... **5**
 - Hind lobes of the head narrowly rounded, flagellum about 3 mm long, anterior border of the gonoporus **broad*****cantori***
- 5. Elytra and pronotum less finely and densely punctate, flagellum about 10 mm long, anterior border of the gonoporus convex***villosus***
 - Elytra and pronotum very finely and densely punctate, flagellum about 3 mm long, gonoporus rounded.....***smithii***

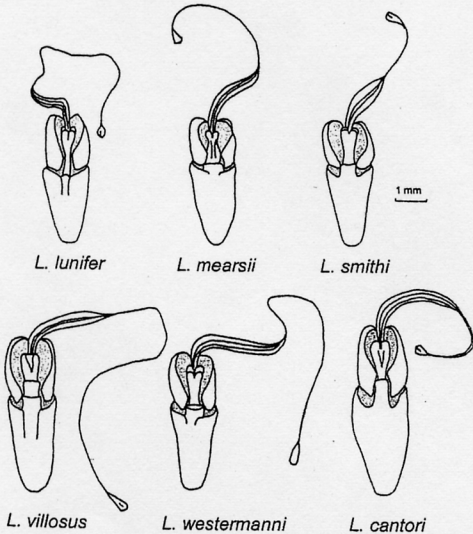


Fig. 6. Aedeagi of the six species of *Lucanus* s. str. known in Nepal.

subg. *Pseudolucanus* (fig. 7)

- 1. Antennal club more or less short and trifile **2**
 - Antennal club oblong and tetrafile **4**
- 2. Interior carena smooth without a tooth, flagellum of the aedeagus more than 20 mm long.....***oberthueri***
 - Mandibles with a tooth at the interior side, flagellum of the aedeagus much shorter..... **3**
- 3. Mandibles strongly curved and with a faint tooth, flagellum of the aedeagus large at the proximal part and getting thinner to the distal part.....***kerleyi***
 - Mandibles less curved and with a distinct tooth, flagellum on the whole length more or less of the same width.....***gracilis***
- 4. Interior carena smooth without a tooth..... **5**
 - At least one tooth at the interior side of the mandibles **6**
- 5. Epistoma trifid, proximal part of flagellum only slightly winged and little sclerotised, anterior border of the gonoporus strongly convex.....***wittmeri***
 - Epistoma concave, proximal part of flagellum largely winged and strongly sclerotised, anterior border of the gonoporus straight.....***atratus***
- 6. Mandibles strongly curved and with a faint tooth at the inner side, flagellum of the aedeagus more than 5 mm long, gonoporus triangular.....***confusus***
 - Tooth at the internal side of the mandibles robust, flagellum of the aedeagus not longer than 4 mm long, gonoporus oblong and small***groulti***

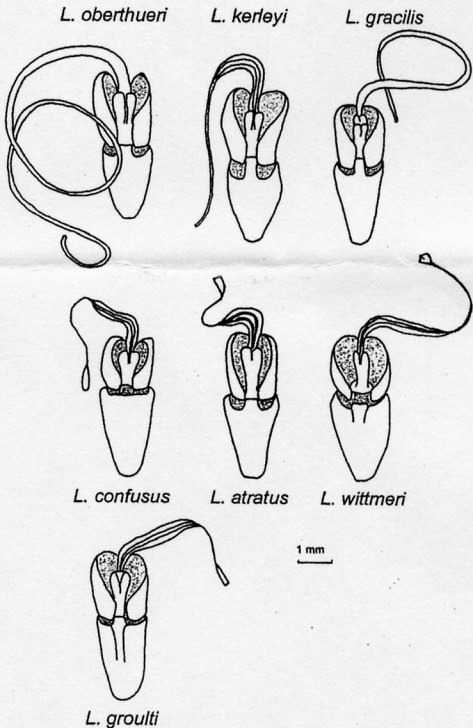


Fig. 7. Aedeagi of the seven species of *Lucanus* (*Pseudolucanus*) known in Nepal.

Discussion

As Nepal is a country more and more investigated, the number of Lucanidae known in Nepal will certainly increase in the next years. Each investigation reports new records for Nepal. Six species are only known by single specimens and it is to found that in future more species, even as a single specimen, will be discovered. For the determination of Nepalese species of Lucanidae, the comparison of the characters of the aedeagi is quite useful. Although in some cases, especially among the *Lucanus* s. str., the aedeagi are rather similar, differences in the length

of the flagellum and the shape of the gonoporus can be distinguished. As a first step, the keys for males proposed here should clear some problems of determination among species of the genera *Serrognathus*, *Dorcus*, *Lucanus* s. str., and *Lucanus* (*Pseudolucanus*). There is no doubt, that a key using characters of genitalia and including all species from Nepal would be helpful. However, till now a clear definition of the present genera does not yet exist. This means, that first a full revision of all Nepalese genera would be necessary before a complete key for all species can be proposed. Mainly the status of the genus *Serrognathus* is doubtful. Furthermore, *Serrognathus lineatopunctatus* and *Dorcus submolaris* are supposed to be synonyms, *D. submolaris* being small specimens of *S. lineatopunctatus*. A further problem is the determination of the females. The females of many species are rather similar each other and the characters used in keys are not always sufficient. As a result, doubtful determinations may occur. Thus, the use of characters of female genitalia should help to eliminate such doubts. The study of female genitalia could therefore be a future project with the aim to be able to propose a well working key for the females of Nepalese Lucanidae.

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