



STUDY OF EXTERNAL MALE GENITALIA OF TEN SPECIES OF INDIAN DUNG BEETLES (COLEOPTERA: SCARABAEIDAE: SCARABAEINAE)

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ABSTRACT

External male genitalia of ten species of dung beetles (Coleoptera: Scarabaeidae: Scarabaeinae) were diagnosed and studied for the first time so as to confirm the species identity.

KEY WORDS: External male genitalia, Scarabaeinae and India.

INTRODUCTION

Beetles under subfamily Scarabaeinae of family Scarabaeidae (Coleoptera) are commonly called as dung or coprophagous beetles. The world fauna of dung beetles include about 5000 species belonging to 234 genera under 12 tribes (Gill, 2001). Species specificity of male genitalia is well documented pattern in a nature (Eberhard, 1985), which is especially prevalent in insects. In many insects whose external morphology is almost similar, differences in male genitalia are often the only reliable species diagnostic characters thus occupying a special place in insect systematic. Though a well documented taxonomic work on the oriental dung beetle fauna had been carried out by Arrow (1931) and Balthasar (1963a & b) but the morphology of external male genitalia in species recognition for all the species was not included. Thus keeping in mind the taxonomic relevance of the external male genitalia as an important differentiating character, the external male genitalia of ten species were diagnosed, studied and photographed.

MATERIALS AND METHODS

The specimens for the study were collected by the scientific teams of Zoological Survey of India, Jabalpur using light trap and preserved dry pinned. Dung beetle genitalia consist of two sclerotized parts: the phallobase and the moveable parameres, both surrounding the enfolded endophallus. For extracting the genitalia, the abdomen of male specimen was detached from the body and the external male genitalia was extracted out and then cleaned and softened in a dish of hot water. It was further cleaned in a hot water solution of 10% potassium hydroxide (KOH). All parts of male genitalia were washed in 95% ethanol and after examination stored in a glass vial containing 70% alcohol. All photos were made with the help of a digital camera attached to a binocular microscope (Leica M205 A).

RESULT AND DISCUSSION

Based on the available specimens, the external male genitalia of ten dung beetle species viz. *Copris (Copris) carinicus*, *Copris (Copris) magicus*, *Copris (Copris) sacontala*, *Onthophagus (Digitonthophagus) kuluensis*, *Onthophagus (Strandius) gagates*, *Onthophagus (Strandius) hingstoni*, *Liatongus (Liatongus) gagatinus*, *Liatongus (Liatongus) phanaeoides*, *Liatongus (Liatongus) vertagus*, and *Liatongus (Paraliatongus) rhadamistus* were diagnosed and their morphological characteristics were studied.

1. *Copris (Copris) carinicus* Gillet, 1910

1910. *Copris carinicus* Gillet, *Notes Leyden Mus.* xxxii: 8.
1931. *Copris carinicus*, Arrow, *Faun. Brit. India*, (Lamellicornia: Coprinae), 3: 109.

1963. *Copris (Copris) carinicus*, Balthasar, *Mon. der Scarabaeidae und Aphodiidae der Palaeark. und Orientalis. Region* (Coleoptera: Lamellicornia), Coprinae, I: 347.

Specimens examined: Achanakmar-Amarkantak Biosphere Reserve, Bilaspur, Chhapparwa, 14.vi.2004 (1♂) (I-7059), coll. A. Singh & Party.

External male genitalia: (FIGURE-I: A) Phallobase almost equal in length as parameres. Parameres triangular in shape, broad at base slightly curved with the tips blunt. Distribution: India: Assam, Chhattisgarh, Madhya Pradesh, Manipur and Meghalaya. Elsewhere: Myanmar.

2. *Copris (Copris) sacontala* Redtenbacher, 1848

1848. *Copris sacontala* Redtenbacher, *Hugel's Kaschmir*, iv, 2: 519.

1931. *Copris sacontala*, Arrow, *Faun. Brit. India*, (Lamellicornia: Coprinae), 3: 104.

1963. *Copris (Copris) sacontala*, Balthasar, *Monographie der Scarabaeidae und Aphodiidae der Palaearktischen und Orientalischen Region* (Coleoptera: Lamellicornia), 1: 339.

Specimens examined: Arunachal Pradesh, Tawang, Thrillum, 03.x.2009 (2♂) (I-9354), coll. K. Chandra.

External male genitalia: (FIGURE -I: B). Phallobase almost equal in length as parameres. Parameres broad at base with apex blunt slightly curved inwardly. In dorsal view a triangular excavation present on each paramere.

Distribution: India: Arunachal Pradesh, Punjab and Uttar Pradesh.

3. *Copris (Copris) magicus* Harold, 1881

1881. *Copris magicus* Harold, *Mitth. Munch. Ent. Ver.* V: 88.

1931. *Copris magicus*, Arrow, *Faun. Brit. India*, (Lamellicornia: Coprinae), 3: 112.

1963. *Copris (Copris) magicus*, Balthasar, *Mon. der Scarabaeidae und Aphodiidae der Palaeark. und Orientalis. Region* (Coleoptera : Lamellicornia), Coprinae, I: 351.

Specimens examined: Arunachal Pradesh, Tawang, Lumla, 02.x.2009 (1♂), Lumla, 04.x.2009 (2♂), Zemmithang, 10.x.2009 (1♂), coll. K. Chandra.

External male genitalia: (FIGURE -I: C). Phallobase a little longer than parameres. Parameres broad at base slightly curving anteriorly and blunt at tips and slightly bulges out at the middle.

Distribution: India: Arunachal Pradesh, Assam, Meghalaya, Manipur and Sikkim. Elsewhere: China, Laos, Siam, Tonkin, and Yunnan.

4. *Onthophagus (Digitonthophagus) kuluensis* Bates, 1891

1891. *Onthophagus kuluensis* Bates, *Entomologist Suppl.* XI V: 12

1931. *Onthophagus kuluensis*, Arrow, *Faun. Brit. India*, (Lamellicornia: Coprinae), 3: 292.

1963. *Onthophagus (Digitonthophagus) kuluensis*, Balthasar, *Mon. der Scarabaeidae und Aphodiidae der Palaeark. und Orientalis. Region* (Coleoptera : Lamellicornia), Coprinae, II: 382.

Specimens examined: Arunachal Pradesh, Tawang, Lumla, 01.x.2009 (1♂) (I-9338), 03.x.2009 (1♂), 11.x.2009 (1♂) (I-9404), Coll. K. Chandra.

External male genitalia: (FIGURE-I: D) Phallobase, a little longer than parameres. Parameres broad at base, slightly tapered distally and curved ventrally with tips blunt with curved membranous plate on dorsal side.

Distribution: India: Arunachal Pradesh, Himachal Pradesh, Punjab, Kashmir and Uttarakhand.

5. *Onthophagus (Strandius) gagates* Hope, 1831

1831. *Onthophagus gagates* Hope, *apud Gray Zool. Misc.*: 22.

1931. *Onthophagus gagates*, Arrow, *Faun. Brit. India*, (Lamellicornia: Coprinae), 3: 277.

1963. *Onthophagus (Strandius) gagates*, Balthasar, *Mon. der Scarabaeidae und Aphodiidae der Palaeark. und Orientalis. Region* (Coleoptera : Lamellicornia), Coprinae, II: 363.

Specimens examined: Arunachal Pradesh, Tawang, Sela, 05.x.2009 (1♂), coll. K. Chandra (I-9373).

External male genitalia: (FIGURE -I: E) Phallobase almost thrice in length as parameres. Parameres broad at

base strongly and regularly tapered distally slightly curved ventrally with pointed tips. Membranous plate on dorsal side conical in middle.

Distribution: India: Arunachal Pradesh, Assam, Himachal Pradesh, Manipur, Punjab and Uttaranchal.

6. *Onthophagus (Strandius) hingstoni* Arrow, 1931

1931. *Onthophagus hingstoni* Arrow, *Faun. Brit. India*, (Lamellicornia: Coprinae), 3: 278.

1963. *Onthophagus (Strandius) hingstoni*, Balthasar, *Mon. der Scarabaeidae und Aphodiidae der Palaeark. und Orientalis. Region* (Coleoptera : Lamellicornia), Coprinae, II: 382.

Specimens examined: Arunachal Pradesh, Tawang, Zemmithang, 09.x.2009 (1♂), coll. K. Chandra (A-16262). External male genitalia: (FIGURE-I: F) Phallobase thrice in length as parameres. Parameres very broad at base acutely pointed distally and the pointed part forming right angle with the middle of the parameres.

Distribution: India: Arunachal Pradesh and Sikkim.

7. *Liatongus (Liatongus) gagatinus* (Hope, 1831)

1831. *Onthophagus gagatinus* Hope, *apud Gray, Zool. Misc.* 22.

1931. *Liatongus gagatinus*, Arrow, *Faun. Brit. India*, (Lamellicornia: Coprinae), 3: 365.

1963. *Liatongus (Liatongus) gagatinus*, Balthasar, *Mon. der Scarabaeidae und Aphodiidae der Palaeark. und Orientalis. Region* (Coleoptera : Lamellicornia), Coprinae, II: 104.

Specimens examined: Arunachal Pradesh, Tawang, Thrillum, 03.x.2009 (1♂), coll. K. Chandra.

External male genitalia: (FIGURE-II: G) Phallobase twice in length as parameres. Parameres a little broader at base and slightly tapered distally, excised a basal half on dorsal side with tips little pointed.

Distribution: India: Arunachal Pradesh, Assam, Meghalaya, Nagaland, Sikkim, Uttaranchal and West Bengal. Elsewhere: Myanmar and Nepal.

8. *Liatongus (Liatongus) phanaeoides* (Westwood, 1840)

1840. *Onthophagus phanaeoides* Westwood, *Royle's Himalaya Ent.* : 55 Tf. 9, Fig. 3.

1931. *Liatongus phanaeoides*, Arrow, *Faun. Brit. India*, (Lamellicornia: Coprinae), 3: 364.

1963. *Liatongus (Liatongus) phanaeoides*, Balthasar, *Mon. der Scarabaeidae und Aphodiidae der Palaeark. und Orientalis. Region* (Coleoptera : Lamellicornia), Coprinae, II: 92.

Specimens examined: Arunachal Pradesh, Tawang, Lumla guest house, 04.x.2009 (1♂) (I-9362), 03.x.2009 (1♂) (A-13518), coll. K. Chandra.

External male genitalia: (FIGURE-II: H) Phallobase more than twice in length as parameres. Parameres broad at base and tapered distally with apex rounded.

Distribution: India: Arunachal Pradesh, Himachal Pradesh, Uttar Pradesh and West Bengal. Elsewhere: Indo-China, South-China, Japan, Myanmar, and Pakistan.

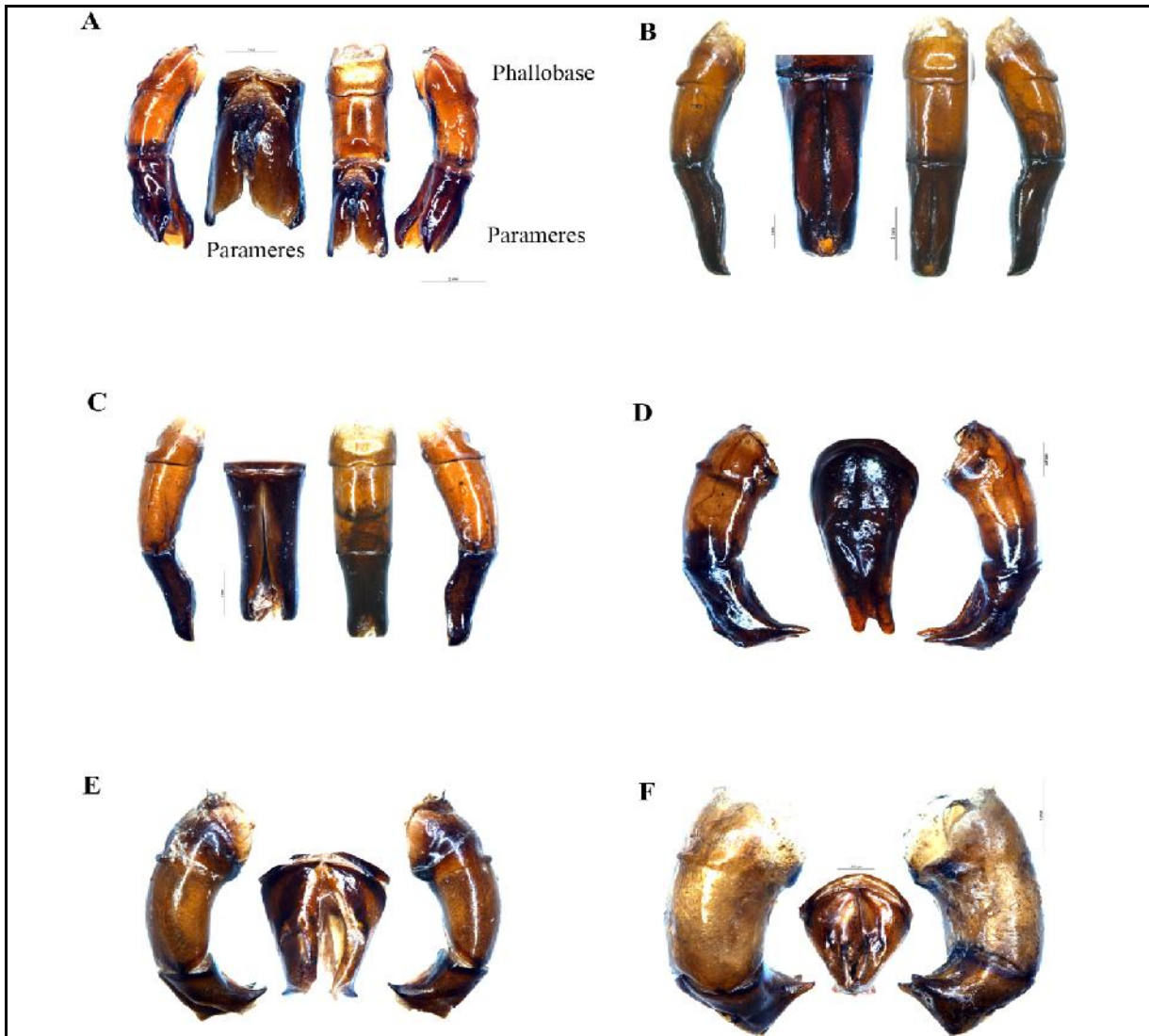


FIGURE I: A. *Copris (Copris) carinicus* Gillet, B. *Copris (Copris) sacontala* Redtenbacher, C. *Copris (Copris) magicus* Harold, D. *Onthophagus (Digitonthophagus) kuluensis* Bates, E. *Onthophagus (Strandius) gagates* Hope, F. *Onthophagus (Strandius) hingstoni* Arrow.

9. *Liatongus (Liatongus) vertagus* (Fabricius, 1798)
 1798. *Copris vertagus* Fabricius, *Ent. Syst. Suppl.* : 30.
 1931. *Liatongus vertagus*, Arrow, *Faun. Brit. India*, (Lamellicornia: Coprinae), **3**: 371.
 1963. *Liatongus (Liatongus) vertagus*, Balthasar, *Mon. der Scarabaeidae und Aphodiidae der Palaeark. und Orientalis. Region* (Coleoptera: Lamellicornia), Coprinae, II: 96.
 Specimens examined: Arunachal Pradesh, Tawang, 02.x.2009 (1♂) (A-13521), coll. K. Chandra.
 External male genitalia: (FIGURE-II: I) Phallobase longer than parameres. Parameres broad at base and broadly rounded at apex with an apical process placed at right angle ventrally, anterior edge of process blunt.
 Distribution: India: Arunachal Pradesh, Assam and Manipur. Elsewhere: Indo-China, South-China, and Myanmar.

10. *Liatongus (Paraliatongus) rhadamistus* (Fabricius, 1775)
 1775. *Scarabaeus rhadamistus* Fabricius, *Syst. Ent.*, : 22.
 1931. *Liatongus rhadamistus*, Arrow, *Faun. Brit. India*, (Lamellicornia: Coprinae), **3**: 374.
 1963. *Liatongus (Paraliatongus) rhadamistus*, Balthasar, *Mon. der Scarabaeidae und Aphodiidae der Palaeark. und Orientalis. Region* (Coleoptera: Lamellicornia), Coprinae, II: 105.
 Specimens examined: Madhya Pradesh, Pachmarhi Biosphere Reserve, Hoshangabad, Tokapur, 26.ii.2003 (1♂), coll. M. L. Koshta.
 External male genitalia: (FIGURE-II: J) Phallobase a quite longer than parameres. Parameres broad at base and with its distal portion slightly pointed.
 Distribution: India: Madhya Pradesh, Maharashtra and Tamil Nadu. Elsewhere: Sri Lanka.



FIGURE-II: G. *Liatongus (Liatongus) gagatinus* (Hope), H. *Liatongus (Liatongus) phanaeoides* (Westwood), I. *Liatongus (Liatongus) vertagus* (Fabricius), J. *Liatongus (Paraliationgus) rhadamistus* (Fabricius).

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