

## ON THE TAXONOMY OF SCARABAEINE FAUNA (COLEOPTERA: SCARABAEIDAE) OF BUXA TIGER RESERVE (BTR), WEST BENGAL, INDIA

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**ABSTRACT:** The present study is devoted to the systematics of 19 scarabaeine species under 6 genera recorded from Buxa Tiger Reserve, Dooars, West Bengal. The generated data is the outcome of long term faunistic investigations of the authors. The present discourse includes detail description, illustration and distributional pattern of each of the taxa. Further, keys to genera and species are also provided.

**KEY WORDS:** Scarabaeinae, New records, Dooars, Buxa Tiger Reserve, India.

Scarabaeinae globally is supposed to include members of 13 tribes represented by over 5,000 described species in 234 genera (Ratcliffe & Jameson 2013). Indian coprine species are now considered within the tribes Scarabaeini and Coprini. The entire perception of the taxa is from Lawrence & Newton (1995). Eventhough informations on the new world species are largely available, our knowledge with the members of the old world is still scanty and is limited to the monographic works of Arrow (1931) and Balthasar (1963). A concise knowledge on total number of species described or reported from India is not available till date. However, regional works on Indian Scarabaeinae were done by Biswas (1978a,b), Biswas & Chatterjee (1985, 1995), Biswas et al. (1997), Chatterjee & Biswas (2000a,b, 2003, 2004), Saha & Raychaudhuri (2000), Chandra (1988, 2000, 2004), Chandra & Singh (2004), Chandra & Ahirwar (2005), Chandra & Uniyal (2007), Sewak (1985, 1986, 1991, 2004a,b, 2005, 2006, 2009), Sarkar et al. (2010).

Extensive survey for the scarab beetles of Dooars (for details visit: <http://en.wikipedia.org/wiki/Dooars>), north Bengal saving the hilly regions was wanting till the initiatives taken in 1993 by the Entomology Laboratory, University of Calcutta. The study was confined primarily in the reserve forests of the area. In the process a total of 76 species are recorded from Buxa Tiger Reserve (for details visit: [http://en.wikipedia.org/wiki/Buxa\\_Tiger\\_Reserve](http://en.wikipedia.org/wiki/Buxa_Tiger_Reserve)).

Present communication is on the detail taxonomy of the members belonging to Scarabaeini and Coprini. The taxa are considered sensu Ratcliffe & Jameson (2013).

Out of the 19 recorded species *Helicopriss tyrannus* (Thomson) were reported as new record from the country, while *Catharsius javanus* Lansberge, *Copris corpulentus* Gillet, *C. doriae* Harold and *C. sarpedon* Harold from the state (Sarkar et al., 2010). However, the said study did not include the taxonomy.

All the species are described and illustrated hereunder. Necessary keys for the taxa, together with their distribution are also provided.

## MATERIAL AND METHODS

Both extensive and intensive surveys were conducted during 1993 – 2005 in different beats under different ranges of Buxa Tiger Reserve. Field visits were made in every month of each calendar year during the period of survey (except 15<sup>th</sup> June to 15<sup>th</sup> September when the forest remains closed). For collection of scarabs sweep nets, bush beating and collection in inverted umbrella, hand picking techniques were used. Several pit fall traps were laid in the collection localities of the Reserve to trap ground dwelling scarabs. Dung of various animals was also examined to make collections. In the evening hours UV light trap was used to collect nocturnal scarabs. Samples after collection were killed in chloroform and preserved in 70% alcohol in glass vials. Necessary data regarding locality, date of collection, collector's name was noted in a note book in the field. They were then brought to the laboratory where stretching, pinning and labeling is done as per the guidelines laid down by Zoological Survey of India. Part of the male samples stored in 70% alcohol were kept separately in order to dissect out the genitalia. This was met out under the microscope with the help of very sharp scalpel, forceps, needles and brush. After dissection the genital capsule containing parameres was cleared in clove oil. The genital capsule was then boiled in 10% KOH for 5-10 minutes to remove muscles. After study, the male genitalia were preserved in a micro vial containing 70% alcohol along with the adult specimen.

The collected samples were studied under Sterozoom Binocular Microscopes Zeiss SV6, SV11 and Olympus SZ 30. Drawings were made with the aid of necessary accessories attached to the microscopes SV6 and SV11. Photographs were taken by a digital camera attached to the microscopes. All measurements are in millimeters, made with an eye piece graticule and each scale bar represents 1mm, if not otherwise mentioned.

All materials are in the collection of Entomology Laboratory, Department of Zoology, University of Calcutta, Kolkata, India.

## RESULTS

Systematic account of the scarabaeine beetles of BTR is presented hereunder

### Subfamily SCARABAEINAE Latreille, 1802

#### Key to tribes:

1. Elytra cut away behind shoulders; mid tibia with one terminal spur..... Scarabaeini
- Elytra not cut away behind shoulders; mid tibia with two terminal spurs.....Coprini

#### Tribe Scarabeini

#### Genus *Gymnopleurus* Illiger

*Gymnopleurus* Illiger, 1803, Mag. Ins. Vol. ii, p.199.

**Type species:** *Ateuchus flagellatus* Fabricius, 1787.

**Diagnosis:** Body short, broad and flat; opaque; antennae 9 segmented; head broad, transverse; clypeus broad, front margin medially acutely notched and toothed; pronotum transverse, sides medially angulate and convergent to front; elytra with 7 striae, 7<sup>th</sup> carinate anteriorly, sides strongly cut away behind shoulders; pygidial apex round; fore tibia tridentate with many denticles, mid and hind tibiae carinate externally and truncate at extremity, mid with 1 and hind with 2 long terminal spurs.

**Distribution:** Africa, Asia and East Europe (Arrow 1931; Ratcliffe & Jameson 2013; GBIF 2013).

***Gymnopleurus sinuatus* Olivier, var. *assamensis* Watson**

(Pl. IA, Fig. 1)

*Gymnopleurus sinuatus* var. *assamensis* Watson, 1890, Ann. Mag. Nat. Hist., (6) v, p. 411.

*Gymnopleurus sinuatus* var. *assamensis* Arrow, 1931, The fauna of British India including Ceylon and Burma (Col: Lamellicornia: Coprinae), iii, p. 63.

**Description:** Male

**Length** 16.6mm, **humeral width** 12 mm. Body short, broad and flat.

**Colour and markings (Pl. IA, Fig. 1a):** Dark coppery black with club of antenna yellow; opaque above and beneath.

**Head (Figs. 1a,b):** Broad; transverse; rugosely granular.

**Clypeus (Figs. 1a,b):** Broad; rugosely granular; front margin medially acutely notched forming sharp tooth on each side.

**Fronto-clypeal suture (Figs. 1a,b):** Marked by a transverse straight carina.

**Interocular width:**  $7.5 \times$  transverse eye diameter.

**Antenna (Fig. 1c):** 9 segmented; club  $0.63 \times$  stem.

**Pronotum (Fig. 1a):** Transverse; finely and densely punctured; front angles acutely and hind angles obtusely produced; sides medially angulate and convergent to front.

**Scutellum (Fig. 1a):** Not visible from above.

**Elytra (Fig. 1a):** Finely punctate striate, punctures remote; striae 7 on each disc, 7<sup>th</sup> carinate anteriorly; intervals flat and coriaceous; sides strongly cut away behind shoulders; margins elevated; humeral and apical angles acute; humeral hump not evident, apical hump raised.

**Pygidium (Fig. 1d):** Finely and scantily punctured; sides and apex round.

**Mesosternum (Fig. 1e):** Laterally coarsely punctured, medially smooth; front margin round.

**Fore tibia (Fig. 1f):** Tridentate with many denticles; elongate and slender; terminally with a long and apically bidentate blunt spur.

**Mid and hind tibiae (Figs. 1g,h):** Carinate externally, outer edge serrate; truncate at extremity; mid with 1 and hind with 2 long terminal spurs.

**Tarsi (Figs. 1f,g,h):** 5 segmented.

**Claws (Figs. 1f,g,h):** Equal; curved internally and separately movable.

**Parameres (Figs. 1i,j):** Short, elongate; base nearly equal to apex; sides sinuate; inner margin curved; apex blunt, inner angle acute.

**Female:** Fore tibia broad, terminal spur slender and acute.

**Material examined:** 1 male, Rajabhatkhawa, 22.v.95, coll. S. Saha; 1 male, Nimati, 22.v.97, coll. S. Saha; 1 male, South Rydak, 25.v.02, coll. S. K. Sarkar; 1 male, Rajabhatkhawa, 29.iii.02, coll. S. K. Sarkar; 1 female, Nimati, 07.vi.03, coll. S. K. Sarkar.

**Distribution:** India: Karnataka, Madhya Pradesh, Maharashtra, Tamilnadu and West Bengal (Arrow, 1931; Saha & Raychaudhuri, 2000; Chandra & Ahirwar, 2005).

**Tribe Coprini**

**Key to genera:**

1. Elytra with two lateral carina.....2
- Elytra with one lateral carina.....3
2. Sides of pronotum serrate and medially little angulate; fore tibia quadridentate.....*Heliocopriss* Burmeister
- Sides of pronotum smooth and medially round; fore tibia tridentate.....*Catharsius* Hope
3. Pronotum with a strong basal groove.....*Copris* Geoffroy
- Pronotum without basal groove.....4
4. Pronotum with two medial impressions near base.....*Onitis* Fabricius
- Pronotum without medial impressions near base.....*Onthophagus* Latreille

### Genus *Helicopris* Burmeister

*Helicopris* Hope, 1837, Col. Man., 1, p. 23.

**Type species:** *Copris pirkal* Fabricius, 1798.

**Diagnosis:** Body broadly oval and strongly convex; shiny; antennae 9 jointed; head broad, transverse, vertex with a median horn and a short tubercle on each side of it; clypeus broad and nearly semicircular, front margin straight and reflexed; pronotum transverse, sides serrate and medially angulate; elytra with 8 striae, 7<sup>th</sup> and 8<sup>th</sup> carinate anteriorly; pygidial apex round; fore tibia quadridentate, mid and hind tibiae carinate externally and digitate at extremity.

**Distribution:** Africa and Asia (Arrow 1931; Ratcliffe & Jameson 2013; GBIF 2013).

### *Helicopris tyrannus* (Thomson)

(Pl. IA, Fig. 2)

*Copris tyrannus* Thomson, 1858, Arch. Ent. ii, p.49.

*Helicopris tyrannus* Arrow, 1931, The fauna of British India including Ceylon and Burma (Col: Lamellicornia: Coprinae), iii, p. 87.

**Description: Female**

**Length** 48 mm, **humeral width** 28 mm. Body broadly oval and strongly convex.

**Colour and markings (Pl. IA, Fig. 2a):** Brownish black; shiny above; venter with patches of red hairs.

**Head (Figs. 2a,b):** Broad; transverse; strigose in front and granulate behind; vertex with a sharp, short median horn and a short tubercle on each side of it.

**Clypeus (Figs. 2a,b):** Broad; nearly semicircular; completely margined; strigose; front margin straight and reflexed.

**Fronto-clypeal suture (Figs. 2a,b):** Marked by the horn and tubercles.

**Interocular width** 6.16 × transverse eye diameter.

**Antenna (Fig. 2c):** 9 segmented; club 1.05 × stem.

**Pronotum (Fig. 2a):** Transverse; divided by a strong, sinuate and steep carina into anterior and posterior halves; anterior half coarsely and posterior half finely granular; front angles bluntly produced, hind angles obtuse; sides medially angulate; base margined and nearly round.

**Scutellum (Fig. 2a):** Not visible from above.

**Elytra (Fig. 2a):** Finely punctate striate; striae 8 on each disc, 7<sup>th</sup> and 8<sup>th</sup> carinate anteriorly; intervals convex and nearly smooth, sutural one raised; margins elevated; humeral angle not formed, apical angle acute; humeral and apical humps not evident.

**Pygidium (Fig. 2d):** Finely and scantily punctured; sides and apex round.

**Mesosternum (Fig. 2e):** Laterally coarsely punctured; medially smooth with a shallow depression near base.

**Fore tibia (Fig. 2f):** Bluntly quadridentate; terminally with a single long and blunt spur.

**Mid and hind tibiae (Figs. 2g,h):** Strongly carinate externally with few stout spines at outer edge; digitate at extremity; terminally with 2 long unequal spurs.

**Tarsi (Figs. 2f,g,h):** 5 segmented.

**Claws (Figs. 2g,h):** Equal; curved internally and separately movable.

**Material examined:** 1 female, Rajabhatkhawa, 04.vi.02, coll. S. K. Sarkar.

**Distribution:** India: Indonesia, Malaysia, Myanmar, West Bengal (Arrow, 1931; Sarkar et al., 2010).

### Genus *Catharsius* Hope

*Catharsius* Hope, 1837, Col. Man. i, p. 21.

**Type species:** *Scarabaeus molossus* Linnaeus, 1758

**Diagnosis:** Body broad, oval and strongly convex; more or less shiny; antennae 9 jointed; head transverse; clypeus broad and semicircular, front margin round or medially little notched and bilobed; base of pronotum completely margined, sides round; elytra with 8 striae, 7<sup>th</sup> and 8<sup>th</sup> carinate anteriorly; pygidial apex round; fore tibia tridentate, mid and hind tibiae carinate externally and digitate at extremity.

**Distribution:** Africa and Southern Asia (Arrow 1931; Ratcliffe & Jameson, 2013; GBIF 2013).

**Key to species:**

1. Base of pronotum medially angulate; pygidium granular.....2  
 - Base of pronotum round; pygidium minutely punctured.....*birmanensis* Lansberge
2. Head basally coriaceous; pronotum with a transverse, sinuate carina; sides of pronotum without pit.....*molossus* (Linnaeus)  
 - Head basally smooth; pronotum without transverse carina; sides of pronotum with pit.....3
3. Head granular, vertex with a transverse raised carina; mid-longitudinal depression of pronotum shallow.....*capusinus* Fabricius  
 - Head rugose, vertex with an apically bidentate short horn; mid-longitudinal depression of pronotum deep.....*javanus* Lansberge

***Catharsius birmanensis* Lansberge**

(Pl. IA, Fig. 3)

*Catharsius birmanensis* Lansberge, 1874, Col. Hefte, xii, p.11.*Catharsius birmanensis* Arrow, 1931, The fauna of British India including Ceylon and Burma (Col: Lamellicornia: Coprinae), iii, p. 97.**Description:** Male**Length** 19.6 mm, **humeral width** 11.6 mm. Body short, oval, compact and strongly convex.**Colour and markings (Pl. IA, Fig. 3a):** Pitchy black and more or less shiny; legs red.**Head (Figs. 3a,b):** Transverse; granular, basally smooth; vertex medially with an erect, long slender horn just in front of eyes, little dilated behind in its basal half and gently curved at end.**Clypeus (Figs. 3a,b):** Broad; semicircular; completely margined; weakly rugose; front margin reflexed, medially little notched and bilobed.**Fronto-clypeal suture (Figs. 3a,b):** Marked by an oblique carina on each lateral side.**Interocular width** 12.5 × transverse eye diameter.**Antenna (Fig. 3c):** 9 segmented; club 1.52 × stem.**Pronotum (Fig. 3a):** Transverse; partly granular with a short sharp conical protuberance on each side of middle at about midway of front and hind margins; surface between protuberances gently hollowed, smooth and flattened; sides gradually round; base margined and gently round.**Scutellum (Fig. 3a):** Not visible from above.**Elytra (Fig. 3a):** Punctate striate with the intervals smooth except near base; striae 8 on each disc, the 7<sup>th</sup> and 8<sup>th</sup> carinate anteriorly; suture with a membranous fringe apically; margins elevated; humeral angle not formed apical angle acute and produced; humeral and apical humps not evident.**Pygidium (Fig. 3d):** Minutely and scantily punctured; sides and apex gradually round.**Mesosternum (Fig. 3e):** Laterally minutely punctured, medially smooth with a longitudinal groove and a shallow pit near base; anteriorly bluntly and conically produced.**Fore tibia (Fig. 3f):** Bluntly tridentate, with a single long terminal spur.**Mid and hind tibiae (Figs. 3g,h):** Strongly carinate externally forming 2 sharp teeth; digitate at extremity; terminally with 2 long unequal, blunt spurs.**Tarsi (Figs. 3f,g,h):** 5 segmented.**Claws (Figs. 3f,g,h):** Equal; curved internally and separately movable.**Parameres (Figs. 3i,j):** Long; base broad; sides straight; inner margin little curved near apex; apex conical, inner angle acute.**Female:** Vertex of head bears a transverse median elevation, granules more dense.**Material examined:** 1 female, Rajabhatkhawa, 20.v.95, coll. D. Raychaudhuri; 1 female, Raimatang, 30.v.96, coll. S. Saha; 1 male, Rajabhatkhawa, 16.ix.96, coll. S. Saha; 1 male, Rajabhatkhawa, 17.iii.03, coll. S. K. Sarkar.**Distribution:** India: Sikkim, West Bengal; Bhutan; Myanmar (Arrow, 1931; Saha & Raychaudhuri, 2000).

***Catharsius molossus* (Linnaeus)**

(Pl. IB, Fig. 4)

*Scarabaeus molossus* Linnaeus, 1758, Syst. Nat. ed. x, p. 347.*Catharsius molossus* Arrow, 1931, The fauna of British India including Ceylon and Burma (Col: Lamellicornia: Coprinae), iii, p. 94.**Description: Male****Length** 23 mm, **humeral width** 13.3 mm. Body short, oval, compact and strongly convex.**Colour and markings (Pl. IA, Fig. 4):** Pitchy black and more or less opaque.**Head (Figs. 4a,b):** Transverse; granular, basally coriaceous; armed with a basally dilated, recurved, apically blunt, strong and stout horn.**Clypeus (Figs. 4a,b):** Broad; semicircular; completely margined; granular with the granules coalesce at regions to form strigosity; front margin medially little notched and bilobed.**Fronto-clypeal suture (Figs. 4a,b):** Marked by an oblique carina on each lateral side, medially concealing with the horn of head.**Interocular width** 8 × transverse eye diameter.**Antenna (Fig. 4c):** 9 segmented; club 1.7 × stem.**Pronotum (Fig. 4a):** Transverse; coarsely granular with a median longitudinal line and a transverse, strongly sinuate carina, the edges of which are projected into blunt processes, anteriorly sloping and depressed on each side; sides gradually round; base margined with the margin elevated and medially angulate.**Scutellum (Fig. 4a):** Not visible from above.**Elytra (Fig. 4a):** Coriaceous, with 8 longitudinal striae, 7<sup>th</sup> and 8<sup>th</sup> transformed into carinae; suture apically with a membranous fringe; margins elevated; humeral angle not formed, apical angle nearly right angle; humeral and apical humps not evident.**Pygidium (Fig. 4d):** Granular; sides and apex gradually round.**Mesosternum (Fig. 4e):** Both coarsely and minutely punctured; anteriorly conically produced and with a median longitudinal line.**Fore tibia (Fig. 4f):** Bluntly tridentate; terminally with a single long spur.**Mid and hind tibiae (Figs. 4g,h):** Strongly carinate externally forming 2 sharp teeth; digitate at extremity; terminally with 2 long unequal spurs.**Tarsi (Figs. 4f,g,h):** 5 segmented.**Claws (Figs. 4f,g,h):** Equal; curved internally and separately movable.**Parameres (Figs. 4i,j):** Long; base broad; sides nearly straight; inner margin sinuate; apex narrow, inner angle acute.**Female:** Horn of head short and thin.**Material examined:** 2 females, Rajabhatkhawa, 20.v.95, coll. S. Saha; 1 male, Raimatang, 30.v.96, coll. S. Saha; 1 female, Rajabhatkhawa, 16.ix.96, coll. S. Saha; 2 males 1 female, Rajabhatkhawa, 17.ix.96, coll. S. Saha; 2 males 1 female, Rajabhatkhawa, 04.vi.02, coll. S. K. Sarkar; 1 male, Rajabhatkhawa, 09.ix.02, coll. S. K. Sarkar; 1 female, Panbari, 04.iv.03, coll. S. K. Sarkar; 1 female, Jayanti, 21.iv.03, coll. S. K. Sarkar.**Distribution:** India: Andaman, Assam, Bihar, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Orissa, Sikkim, Uttarakhand, West Bengal; Sri Lanka (Arrow, 1931; Saha & Raychaudhuri, 2000; Chandra & Ahirwar, 2005).***Catharsius capusinus* Fabricius**

(Pl. IB, Fig. 5)

*Catharsius capusinus* Fabricius, 1781, Spec. Ins. i, p. 25.*Catharsius capusinus* Arrow, 1931, The fauna of British India including Ceylon and Burma (Col: Lamellicornia: Coprinae), iii, p. 99.**Description: Female****Length** 18.6mm, **humeral width** 10.4mm. Body short, oval, compact and strongly convex.**Colour and markings (Pl. IB, Fig. 5):** Pitchy black and more or less opaque.**Head (Figs. 5a,b):** Transverse; granular, base smooth; vertex with a transverse raised carina, medially elevated into a horn like process.**Clypeus (Figs. 5a,b):** Broad; semicircular; completely margined; granular with the granules coalesce at regions to form strigosity; front margin medially little notched and bilobed.

**Fronto-clypeal suture (Figs. 5a,b):** Marked by an oblique carina on each side, medially concealing with the carina.

**Interocular width:**  $8 \times$  transverse eye diameter.

**Antenna (Fig. 5c):** 9 segmented; club  $1.33 \times$  stem.

**Pronotum (Fig. 5a):** Transverse; medially smooth with a longitudinal shallow depression, rest granular with a tubercle at about  $1/3^{\text{rd}}$  of length from the front margin and a shallow pit on each lateral side; sides gradually round; base margined with the margin elevated and angular at middle.

**Scutellum (Fig. 5a):** Not visible from above.

**Elytra (Fig. 5a):** Punctate striate, intervals smooth; striae 8 on each disc,  $7^{\text{th}}$  and  $8^{\text{th}}$  carinate anteriorly; suture apically with a membranous fringe; margins elevated; humeral angle not formed apical angle nearly right angle; humeral and apical humps not evident.

**Pygidium (Fig. 5d):** Granular; sides and apex gradually round.

**Mesosternum (Fig. 5e):** Laterally coriaceous, rest minutely punctured; midlongitudinally grooved and a shallow pit near base; anteriorly conically produced.

**Fore tibia (Fig. 5f):** Bluntly tridentate, with a single long terminal spur.

**Mid and hind tibiae (Figs. 5g,h):** Strongly carinate externally forming 2 sharp teeth; digitate at extremity; terminally with 2 long unequal spurs.

**Tarsi (Figs. 5f,g,h):** 5 segmented.

**Claws (Figs. 5f,g,h):** Equal, curved internally & separately movable.

**Material examined:** 1 female, Rajabhatkhawa, 17.iii.03, coll. S. K. Sarkar.

**Distribution:** India: Bihar, Kerala, Orissa, Tamilnadu, West Bengal; Sri Lanka (Arrow, 1931; Sarkar et al., 2010).

### *Catharsius javanus* Lansberge

(Pl. IB, Fig. 6)

*Catharsius javanus* Lansberge, 1886, Tijds. Ent. xxix, p. 7.

*Catharsius javanus* Arrow, 1931, The fauna of British India including Ceylon and Burma (Col: Lamellicornia: Coprinae), iii, p. 96.

**Description:** Male

**Length** 17 mm, **humeral width** 10 mm. Body short, broadly oval and strongly convex.

**Colour and markings (Pl. IB, Fig. 6):** Pitchy black except red antennae and mouth organs; opaque above and shiny beneath.

**Head (Figs. 6a,b):** Transverse; rugose; vertex with a basally dilated, short and apically bidentate horn.

**Clypeus (Figs. 6a,b):** Broad; semicircular; completely margined; granular with the granules coalesce at regions to form strigosity; front margin evenly round.

**Fronto-clypeal suture (Figs. 6a,b):** Marked by an oblique carina on each lateral side, medially concealing with the horn of head.

**Interocular width:**  $4.8 \times$  transverse eye diameter.

**Antenna (Fig. 6c):** 9 segmented; club  $1.6 \times$  stem.

**Pronotum (Fig. 6a):** Transverse; medially smooth with a deep longitudinal depression, rest granular with a tubercle at about  $1/3^{\text{rd}}$  of length from the front margin and a shallow pit laterally on each side; sides gradually round; base margined with the margin elevated and angular at middle.

**Scutellum (Fig. 6a):** Not visible from above.

**Elytra (Fig. 6a):** Punctate striate, striae 8 on each disc,  $7^{\text{th}}$  and  $8^{\text{th}}$  carinate anteriorly; intervals smooth; suture apically with a membranous fringe; margins elevated; humeral angle not formed apical angle nearly right angle; humeral and apical humps not evident.

**Pygidium (Fig. 6d):** Granular, sides and apex gradually round.

**Mesosternum (Fig. 6e):** Laterally coarsely punctured, medially smooth with a longitudinal line and a shallow pit near base; anteriorly conically produced.

**Fore tibia (Fig. 6f):** Bluntly tridentate; terminally with a long spur.

**Mid and hind tibiae (Figs. 6g,h):** Strongly carinate externally forming 2 sharp teeth; digitate at extremity; terminally with 2 long unequal spurs.

**Tarsi (Figs. 6f,g,h):** 5 segmented.

**Claws (Figs. 6f,g,h):** Equal; curved internally and separately movable.

**Parameres (Figs. 6i,j):** Long; base broad; sides straight; inner margin curved; apex conical, inner angle acute.

**Material examined:** 1 male, Damanpur, 18.iv.02, coll. S. K. Sarkar.

**Distribution:** India: Assam, West Bengal; China, Indonesia, Malaysia (Arrow, 1931; Sarkar et al., 2010).

### Genus *Copris* Geoffroy

*Copris* Geoffroy, 1762, Ins. Des. Env. De Paris, p. 87.

**Type species:** *Scarabaeus lunaris* Linnaeus, 1758

**Diagnosis:** Body compact, convex or depressed; more or less shiny; antennae 9 jointed; head broad; clypeus semicircular, front margin medially little notched and bilobed; pronotum broad, medially with a longitudinal groove; elytra with 8 striae, 8<sup>th</sup> carinate anteriorly; pygidial apex round; fore tibia quadridentate, mid and hind tibiae carinate externally and digitate at extremity.

**Distribution:** Africa, Asia, Europe (Arrow, 1931; Ratcliffe & Jameson, 2013; GBIF 2013).

### Key to species:

1. Pronotum with a short conical prominence on each side of the midlongitudinal groove.....  
.....*corpulentus* Gillet  
- Pronotum without any prominence on each side of the mid-longitudinal groove.....2
2. Front margin of clypeus reflexed; front angles of pronotum truncate.....3  
- Front margin of clypeus not reflexed; front angles of pronotum produced.....*doriae* Harold
3. Pronotum with a transverse sinuate carina little behind the front margin and a shallow pit laterally on each side.....*sarpedon* Harold  
- Pronotum without any carina behind the front margin and without any pit laterally on each side.....*magicus* Harold

### *Copris corpulentus* Gillet

(Pl. IC, Fig. 7)

*Copris corpulentus* Gillet, 1910, Notes Leyd. Mus., xxxii, p. 13.

*Copris corpulentus* Arrow, 1931, The fauna of British India including Ceylon and Burma (Col: Lamellicornia: Coprinae), iii, p. 118.

**Description:** Male

**Length** 18.6 mm, **humeral width** 10.4mm. Body elongate, oval and moderately convex.

**Colour and markings (Pl. IC, Fig. 7):** Black and more or less shiny with the antennae, mouth organs red; venter with scanty bristles.

**Head (Figs. 7a,b):** Transverse; nearly smooth; medially with a sharp, pointed, basally dilated and backwardly curved horn.

**Clypeus (Figs. 7a,b):** Broad; semicircular; completely margined; minutely punctured; front margin reflexed, medially little notched and bilobed.

**Fronto-clypeal suture (Figs. 7a,b):** Marked by an oblique carina on each lateral side.

**Interocular width:** 10 × transverse eye diameter.

**Antenna (Fig. 7c):** 9 segmented; club 1.4 × stem.

**Pronotum (Fig. 7a):** Transverse; minutely and scantily punctured; medially grooved, narrow behind and broadly dilated in front; on each side of groove the top of declivity forms a short conical prominence; front margin steep; sides nearly round; front and hind angles obsolete; base margined and medially gently produced.

**Scutellum (Fig. 7a):** Not visible from above.

**Elytra (Fig. 7a):** Punctate striate; striae 8 on each disc, 8<sup>th</sup> carinate anteriorly; intervals slightly convex, minutely and scantily punctured; margins elevated; humeral angle not formed, apical angle acute; humeral and apical humps not evident.

**Pygidium (Fig. 7d):** Coarsely and densely punctured; sides and apex gradually round.

**Mesosternum (Fig. 7e):** Laterally minutely punctured, medially smooth with a longitudinal groove and a shallow pit near base; anteriorly bluntly and conically produced.

**Fore tibia (Fig. 7f):** Bluntly quadridentate; terminally with a single long and blunt spur.

**Mid and hind tibiae (Figs. 7g,h):** Strongly carinate externally with the hind forming 2 sharp teeth; digitate at extremity; terminally with 2 long unequal spurs.



**Tarsi (Figs. 7f,g,h):** 5 segmented.

**Claws (Figs. 7f,g,h):** Equal; curved internally and separately movable.

**Parameres (Figs. 7i,j):** Long; base broad; sides sinuate; inner margin bisinuate forming a tooth near apex; apex flat, inner angle acute.

**Material examined:** 1 male, Cheko, 20.x.03, coll. S. K. Sarkar.

**Distribution:** India: Assam, Gujarat, West Bengal; Myanmar; Vietnam (Arrow, 1931; Sewak, 2009; Sarkar et al., 2010).

### ***Copris doriae* Harold**

(Pl. IC, Fig. 8)

*Copris doriae*, Harold, 1877, Ann. Mus. Genova, x, p. 49.

*Copris doriae*, Arrow, 1931, The fauna of British India including Ceylon and Burma (Col: Lamellicornia: Coprinae), iii, p. 119.

**Description:** Male

**Length** 17.6 mm, **humeral width** 8.4 mm. Body short, oval and moderately convex.

**Colour and markings (Pl. IC, Fig. 8):** Black and shiny with the antennae, mouth organs red; venter with scanty red bristles.

**Head (Figs. 8a,b):** Broad; transverse; coarsely and densely punctured; vertex medially with a short, slender and recurved horn.

**Clypeus (Figs. 8a,b):** Broad; semicircular; completely margined; scantily but coarsely punctured; front margin notched medially and bilobed.

**Fronto-clypeal suture (Figs. 8a,b):** Marked medially by the horn.

**Interocular width:** 4.6× transverse eye diameter.

**Antenna (Fig. 8c):** 9 segmented; club 1.18 × stem.

**Pronotum (Fig. 8a):** Transverse; laterally coarsely punctured; medially nearly smooth with a longitudinal groove at posterior half, groove broadly dilated in front; front angles bluntly produced, hind angles obtuse; sides gradually round; front margin steep; base margined and gently produced at middle.

**Scutellum (Fig. 8a):** Not visible from above.

**Elytra (Fig. 8a):** Punctate striate; striae 8 on each disc, 8<sup>th</sup> carinate anteriorly; intervals slightly convex, minutely and scantily punctured; margins elevated; humeral angle not formed, apical angle acute; humeral and apical humps not evident.

**Pygidium (Fig. 8d):** Coarsely and scantily punctured; sides and apex gradually round.

**Mesosternum (Fig. 8e):** Laterally coarsely punctured; medially smooth.

**Fore tibia (Fig. 8f):** Bluntly quadridentate; terminally with a single long and blunt spur.

**Mid and hind tibiae (Figs. 8g,h):** Strongly carinate externally; digitate at extremity; terminally with 2 long unequal spurs.

**Tarsi (Figs. 8f,g,h):** 5 segmented.

**Claws (Figs. 8f,g,h):** Equal; curved internally and separately movable.

**Parameres (Figs. 8i,j):** Long; base broad; sides sinuate; inner margin nearly straight; apex conical, inner angle acute.

**Material examined:** 2 males, Rajabhatkhawa, 17.iii.03, coll. S. K. Sarkar.

**Distribution:** India: Assam, Manipur, West Bengal; Indonesia; Malaysia; Myanmar (Arrow, 1931; Sarkar et al., 2010).

### ***Copris sarpedon* Harold**

(Pl. IC, Fig. 9)

*Copris sarpedon* Harold, 1868, Col. Hefte, iv, p. 104.

*Copris sarpedon*, Arrow, 1931, The fauna of British India including Ceylon and Burma (Col: Lamellicornia: Coprinae), iii, p. 110.

**Description:** Female

**Length** 16mm, **humeral width** 8.8mm. Body short, oval and highly convex.

**Colour and markings (Pl. IC, Fig. 9):** Black and very shiny with antennae, mouth organs red; venter with scanty red bristles.

**Head (Figs. 9a,b,c):** Transverse; coarsely and moderately closely punctured; medially with a short, transverse and apically bilobed horn.

**Clypeus (Figs. 9a,b,c):** Broad; coarsely punctured; semicircular; entirely margined; front margin reflexed, medially notched and bilobed.

**Fronto-clypeal suture (Figs. 9a,b):** Marked by an oblique carina on each lateral side.

**Interocular width:**  $6 \times$  transverse eye diameter.

**Antenna (Fig. 9d):** 9 segmented; club  $1.5 \times$  stem.

**Pronotum (Fig. 9a):** Transverse; coarsely and densely punctured; midlongitudinally grooved, on each side of which the punctures are fine and sparse; laterally with a shallow median pit on each side; front margin steep with a transverse sinuate carina little behind it; front angles truncate, hind angles obsolete; sides gradually round; base margined.

**Scutellum (Fig. 9a):** Not visible from above.

**Elytra (Fig. 9a):** Punctate striate; striae 8 on each disc, 8<sup>th</sup> carinate anteriorly; intervals slightly convex and minutely punctured; margins elevated; humeral angle not formed, apical angle acute; humps not evident.

**Pygidium (Fig. 9e):** Coarsely and densely punctured; sides and apex gradually round.

**Mesosternum (Fig. 9f):** Laterally coarsely and scantily punctured, medially smooth with a longitudinal posteriorly broad groove and a shallow pit near base; anteriorly bluntly and conically produced.

**Fore tibia (Fig. 9g):** Bluntly quadridentate; terminally with a long and blunt spur.

**Mid and hind tibiae (Figs. 9h,i):** Strongly carinate externally with the hind forming 2 sharp teeth; digitate at extremity; terminally with 2 long unequal spurs.

**Tarsi (Figs. 9g,h,i):** 5 segmented.

**Claws (Figs. 9g,h,i):** Equal; curved internally and separately movable.

**Material examined:** 1 female, Sankosh, 10.vi.03, coll. S. K. Sarkar.

**Distribution:** India: Arunachal Pradesh, Assam, Punjab, Uttarakhand, Uttar Pradesh, West Bengal; Nepal; Thailand (Arrow, 1931; Sarkar et al., 2010).

### ***Copris magicus* Harold**

(Pl. ID, Fig. 10)

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

*Copris magicus* Arrow, 1931, The fauna of British India including Ceylon and Burma (Col: Lamellicornia: Coprinae), iii, p. 112.

**Description:** Female

**Length** 15.4 mm, **humeral width** 8.2 mm. Body short, oval and strongly convex.

**Colour and markings (Pl. ID, Fig. 10):** Black and very shiny with antennae, mouth organs red; venter with scanty red bristles.

**Head (Figs. 10a,b):** Transverse; coarsely and moderately closely punctured; medially with a short, transverse and apically bilobed process.

**Clypeus (Figs. 10a,b):** Broad; rugose; semicircular; entirely margined; front margin reflexed, medially notched and bilobed.

**Fronto-clypeal suture (Figs. 10a,b):** Marked by an oblique carina on each lateral side.

**Interocular width:**  $6 \times$  transverse eye diameter.

**Antenna (Fig. 10c):** 9 segmented; club  $1.33 \times$  stem.

**Pronotum (Fig. 10a):** Transverse; coarsely punctured; mid-longitudinally grooved; front angles broadly truncate, hind angles obsolete; sides straight in front and strongly rounded behind; base margined and gently produced medially.

**Scutellum (Fig. 10a):** Not visible from above.

**Elytra (Fig. 10a):** Punctate striate; striae 8 on each disc, 8<sup>th</sup> carinate anteriorly; intervals convex and finely punctured; margins elevated; humeral angle not formed apical angle acute; humeral and apical humps not evident.

**Pygidium (Fig. 10d):** Coarsely and densely punctured; sides and apex gradually round.

**Mesosternum (Fig. 10e):** Nearly smooth; medially smooth with a longitudinal groove and a deep pit near front margin; anteriorly bluntly and conically produced.

**Fore tibia (Fig. 10f):** Bluntly quadridentate; terminally with a long, gently curved and blunt spur.

**Mid and hind tibiae (Figs. 10g,h):** Strongly carinate externally with the hind forming 2 sharp teeth; digitate at extremity; terminally with 2 long unequal spurs.

**Tarsi (Figs. 10f,g,h):** 5 segmented.

**Claws (Figs. 10f,g,h):** Equal; curved internally and separately movable.

**Material examined:** 1 female, South Rydak, 20.v.97, coll. S. Saha; 1 female, South Rydak, 22.iii.05, coll. S. K. Sarkar.

**Distribution:** India: Assam, Manipur, Nagaland, Sikkim, West Bengal; China; Myanmar; Vietnam (Arrow, 1931; Saha & Raychaudhuri, 2000; Sarkar et al., 2010).

### Genus *Onitis* Fabricius

*Onitis* Fabricius, 1798, Ent. Syst., Suppl., p. 2.

**Type species:** *Scarabaeus inuus* Herbst, 1789

**Diagnosis:** Body elongate, more or less flat and shiny; antennae 9 jointed; head small and not very broad; clypeus elliptical and separated from ocular lobes by a carinate suture, front margin round; pronotum broad, base medially with a shallow pit on each side and angularly produced; elytra punctate striate in channels, striae 7 on each disc; pygidium flat, apex round; fore tibia quadridentate, mid and hind tibiae carinate externally and digitate at extremity.

**Distribution:** Africa, Asia and Europe (Arrow, 1931; Ratcliffe & Jameson, 2013; GBIF 2013).

### Key to species:

1. Head granular; pronotum with a median transverse depression on each side of middle.....  
.....*subopacus* Lansberge
- Head rugulose; pronotum with a median transverse depression on each side of middle.....  
.....*virens* Lansberge

### *Onitis subopacus* Lansberge

(Pl. ID, Fig. 11)

*Onitis subopacus* Lansberge, 1875, Ann. Soc. Ent. Belg. iviii, p. 133.

*Onitis subopacus* Arrow, 1931, The fauna of British India including Ceylon and Burma (Col: Lamellicornia: Coprinae), iii, p. 395.

**Description:** Male

**Length** 19.4 mm, **humeral width** 8.4 mm. Body elongate, oval and flat.

**Colour and markings (Pl. ID, Fig. 11):** Black and shiny, with feeble metallic lustre.

**Head (Figs. 11a,b):** Elongate; granular; vertex medially with a short conical tubercle and a transverse carina above and a tubercle on each side of it.

**Clypeus (Figs. 11a,b):** Elliptical; transversely rugulose; entirely margined.

**Fronto-clypeal suture (Figs. 11a,b):** Marked by a medially interrupted transverse carina.

**Interocular width:**  $7.33 \times$  transverse eye diameter.

**Antenna (Fig. 11c):** 9 segmented; club  $2.1 \times$  stem.

**Pronotum (Fig. 11a):** Transverse; coarsely and densely punctured; mid-longitudinally with a narrow, incomplete line; front and hind angles obtuse; disc with a median transverse depression on each side of middle; sides medially roughly angulate; base medially with a shallow pit on each side and angularly produced.

**Scutellum (Fig. 11a):** Not visible from above.

**Elytra (Fig. 11a):** Punctate striate in channels; striae 7 on each disc; intervals nearly smooth; margins elevated; humeral and apical angles acute and little produced; humeral and apical humps not evident.

**Pygidium (Fig. 11d):** Flat; nearly smooth; apex round.

**Mesosternum (Fig. 11e):** Nearly smooth; broad; front margin sinuate.

**Fore tibia (Fig. 11f):** Long; quadridentate; strongly curved towards the end; terminally with a long, gently curved and blunt spur.

**Mid and hind tibiae (Figs. 11g,h):** Strongly carinate externally forming 4 sharp teeth; digitate at extremity; terminally with 2 long unequal spurs.

**Tarsi (Figs 11f,g,h):** 5 segmented.

**Claws (Figs. 11f,g,h):** Equal; curved internally and separately movable.

**Parameres (Figs. 11i,j):** Long and narrow; sides inwardly curved near base; inner margin little curved near apex; apex conical, inner angle acute.

**Female:** Fore tibia short; mid and hind tibiae without tooth.

**Material examined:** 1 female, Ghoramara, 17.v.02, coll. S. K. Sarkar; 1 male, Cheko, 17.vi.02, coll. S. K. Sarkar; 1 male, Poro, 17.vii.02, coll. D. Dutta; 1 female, Rajabhatkhawa, 26.ix.02, coll. S. K. Sarkar; 1 female, Jayanti, 17.iii.03, coll. S. K. Sarkar.

**Distribution:** India: Andhra Pradesh, Assam, Bihar, Kashmir, Madhya Pradesh, Uttarakhand, West Bengal; Malaysia; Myanmar; Sri Lanka; Thailand (Arrow, 1931; Sarkar et al., 2010).

### ***Onitis virens* Lansberge**

(Pl. ID, Fig. 12)

*Onitis virens* Lansberge, 1875, Ann. Soc. Ent. Belg. iviii, p. 135.

*Onitis virens* Arrow, 1931, The fauna of British India including Ceylon and Burma (Col: Lamellicornia: Coprinae), iii, p. 396.

**Description:** Male

**Length** 21 mm, **humeral width** 10 mm. Body elongate, oval and flat.

**Colour and markings (Pl. ID, Fig. 12):** Black with feeble metallic lusture; shiny except dull elytra.

**Head (Figs. 12a,b):** Elongate; transversely moderately rugulose; vertex medially with a short, conical tubercle and a transverse carina above it on each side.

**Clypeus (Figs. 12a,b):** Elliptical; transversely rugulose; entirely margined.

**Fronto-clypeal suture (Figs. 12a,b):** Marked by a medially interrupted transverse carina.

**Interocular width:**  $8.2 \times$  transverse eye diameter.

**Antenna (Fig. 12c):** 9 segmented; club  $2.4 \times$  stem.

**Pronotum (Fig. 12a):** Transverse; coarsely and densely punctured; mid-longitudinally with a narrow, incomplete line in front and a narrow groove behind; front angles obtuse and hind angles obsolete; sides medially roughly angulate; base medially with a shallow pit on each side and angularly produced.

**Scutellum (Fig. 12a):** Not visible from above.

**Elytra (Fig. 12a):** Punctate striate in channels; striae 7 on each disc; intervals minutely punctured, sutural one elevated; margins elevated; humeral and apical angles acute and little produced; humeral and apical humps not evident.

**Pygidium (Fig. 12d):** Flat; finely and scantily punctured; apex round.

**Mesosternum (Fig. 12e):** Nearly smooth; broad; front margin sinuate.

**Fore tibia (Fig. 12f):** Long; quadridentate; strongly curved towards the end; terminally with a long, gently curved and blunt spur.

**Mid and hind tibiae (Figs. 12g,h):** Strongly carinate externally forming 4 sharp teeth; digitate at extremity; terminally with 2 long unequal spurs.

**Tarsi (Figs. 12f,g,h):** 5 segmented.

**Claws (Figs. 12f,g,h):** Equal; curved internally and separately movable.

**Parameres (Fig. 12i,j):** Long and narrow; sides inwardly curved; inner margin little curved near apex; apex conical, inner angle acute.

**Female:** Fore tibia short; mid and hind tibiae without tooth.

**Material examined:** 1 male 1 female, Rajabhatkhawa, 09.v.94, coll. B. Kundu; 1 female, Rajabhatkhawa, 19.v.95, coll. S. Saha; 1 female, Rajabhatkhawa, 22.v.95, coll. S. Saha; 1 female, South Bholka, 09.v.97, coll. S. Saha; 1 female, Rajabhatkhawa, 29.iii.02, coll. S. K. Sarkar; 1 male, Rajabhatkhawa, 17.iii.03, coll. S. K. Sarkar; 1 female, Jayanti, 29.iv.03, coll. S. K. Sarkar.

**Distribution:** India: Assam, Bihar, Kerala, Madhya Pradesh, Maharashtra, Tamilnadu, Uttarakhand, West Bengal; China; Myanmar; Vietnam (Arrow, 1931; Saha & Raychaudhuri, 2000).

### **Genus *Onthophagus* Latreille**

*Onthophagus* Latreille, 1802, Hist. Nat. Crust. et Ins. iii, p. 141.

**Type species:** *Scarabaeus taurus* Schreber, 1759

**Diagnosis:** Body short, oval and usually convex; dull or shiny; antennae 9 or 8 jointed; head short; clypeus fused with the ocular lobes, front margin round or bilobed; pronotum transverse, sides medially angulate, front angles acutely or bluntly produced, hind angles obsolete; elytra punctate striate, striae 8 on each disc, 8<sup>th</sup> carinate; pygidium with a

transverse ridge parallel to base; fore tibia tridentate, mid and hind tibiae carinate externally and truncate at extremity.

**Distribution:** World-wide (Arrow, 1931; Ratcliffe & Jameson, 2013; GBIF 2013).

### Key to species:

1. Front margin of clypeus medially bilobed.....2  
- Front margin of clypeus not bilobed.....5
2. Base of pronotum medially angulate.....3  
- Base of pronotum medially round.....4
3. Clypeus entirely margined; antenna 9 segmented; forehead medially provided with an acute horn .....*bonasus* Fabricius  
- Clypeus not entirely margined; antenna 8 segmented; forehead not provided with horn.....*falcifer* Harold
4. Forehead medially with an elevated process; fore tibial teeth sharp; sides of pronotum feebly sinuate.....*dama* Fabricius  
- Forehead without any elevated process; fore tibial teeth blunt; sides of pronotum round.....*tragus* Fabricius
5. Vertex of head bears a median tubercle; clypeus transversely rugose; fronto-clypeal suture marked by a curved carina.....6  
- Vertex of head bears a pair of horn; clypeus coarsely punctured; fronto-clypeal suture marked by a feeble straight carina.....*triceratops* Arrow
6. Front margin of clypeus straight and excised; fore tibia quadridentate.....*armatus* Blanchard  
- Front margin of clypeus round; fore tibia tridentate.....*bison* Boucomont

### *Onthophagus bonasus* Fabricius

(Pl. IE, Fig. 13)

*Onthophagus bonasus* Fabricius, 1775, Syst. Ent., p. 23.

*Onthophagus bonasus* Arrow, 1931, The fauna of British India including Ceylon and Burma (Col: Lamellicornia: Coprinae), iii, p. 231.

**Description:** Female

**Length** 13 mm, **humeral width** 8 mm. Body short, broadly oval, compact and strongly convex.

**Colour and markings (Pl. IE, Fig. 13):** Testaceous brown with head, pronotum except the sides and base, elytral suture and venter dark green, hairy and suffused with a metallic lustre.

**Head (Figs. 13a,b):** Transverse; moderately rugose near base and sparsely granular near front; forehead medially with a short, acute and erect horn; vertex bears a pair of backwardly directed horns, bases of which little flattened and granulate, and each with a slight basal tooth at the inner edge.

**Clypeus (Figs. 13a,b):** Semicircular; rugose; entirely margined; front margin strongly reflexed, medially feebly raised and bilobed.

**Fronto-clypeal suture (Figs. 13a,b):** Marked by a medially curved carina.

**Interocular width:**  $6.86 \times$  transverse eye diameter.

**Antenna (Fig. 13c):** 9 segmented; club  $0.8 \times$  stem.

**Pronotum (Fig. 13a):** Transverse; medially granulate with a feeble longitudinal groove; rest nearly smooth; front angles acutely produced, hind angles obsolete; sides feebly sinuate near hind angles; margins raised; base medially angulate.

**Scutellum (Fig. 13a):** Not visible from above.

**Elytra (Fig. 13a):** Punctate striate; intervals with few minute and setigerous punctures; margins elevated; humeral angle not formed, apical angle acute; humps not evident.

**Pygidium (Fig. 13d):** Minutely and setigerously punctured and bears an angulate basal carina; sides and apex gradually round.

**Mesosternum (Fig. 13e):** Nearly smooth; mid-longitudinally grooved and a deep pit near front margin; anteriorly produced into a long and downwardly curved median process.

**Fore tibia (Fig. 13f):** Long; bluntly quadridentate; terminally with a short and blunt spur.

**Mid and hind tibiae (Figs. 13g,h):** Strongly carinate externally with the mid forming 4 and hind forming 2 sharp teeth; truncate at extremity; terminally with 2 long unequal spurs.

**Tarsi (Figs. 13f,g,h):** 5 segmented.

**Claws (Figs. 13f,g,h):** Equal; curved internally and separately movable.

**Material examined:** 1 female, South Bholka, 09.v.97, coll. S. Saha; 1 female, Rajabhatkhawa, 29.iii.02, coll. S. K. Sarkar.

**Distribution:** India: Gujarat, Karnataka, Madhya Pradesh, Maharashtra, Punjab, Tamilnadu, Uttarakhand, West Bengal; Cambodia; Myanmar; Pakistan; Sri Lanka; Thailand; Vietnam (Arrow, 1931; Saha & Raychaudhuri, 2000; Chandra & Ahirwar, 2005; Sewak, 2009).

### ***Onthophagus falcifer* Harold**

(Pl. IE, Fig. 14)

*Onthophagus falcifer* Harold, 1880, Deutsche Ent. Zeits. Xxiv, p. 31.

*Onthophagus falcifer* Arrow, 1931, The fauna of British India including Ceylon and Burma (Col: Lamellicornia: Coprinae), iii, p. 270.

**Description:** Male

**Length** 11.25 mm, **humeral width** 5.37 mm. Body short, oval, and moderately convex.

**Colour and markings (Pl. IE, Fig. 14):** Black; dorsum opaque except pronotum, venter shiny.

**Head (Figs. 14a,b):** Transverse, broad; coarsely punctured near base and rugose in front; vertex bears a pair of curved, divergent and backwardly inclined horns.

**Clypeus (Figs. 14a,b):** Semicircular; coarsely punctured; front margin medially feebly raised and bilobed.

**Fronto-clypeal suture (Figs. 14a,b):** Marked laterally by an oblique carina on each side.

**Interocular width:** 6× transverse eye diameter.

**Antenna (Fig. 14c):** 8 segmented; club 0.9 × stem.

**Pronotum (Fig. 14a):** Transverse; very coarsely and confluent punctured except at sides; front angles bluntly produced, hind angles round; sides feebly sinuate near hind angles; margins raised; base medially sharply angulate.

**Scutellum (Fig. 14a):** Not visible from above.

**Elytra (Fig. 14a):** Punctate striate, striae 7 on each disc, 7<sup>th</sup> carinate anteriorly; intervals flat and coriaceous; margins elevated; humeral and apical angles acute; humps not evident.

**Pygidium (Fig. 14d):** Rugose.

**Mesosternum (Fig. 14e):** Medially finely and laterally coarsely punctured.

**Fore tibia (Fig. 14f):** Bluntly quadridentate, third smallest; terminally with a short and blunt spur.

**Mid and hind tibiae (Figs. 14g,h):** Carinate externally; truncate at extremity; terminally with 2 long unequal spurs.

**Tarsi (Figs. 14f,g,h):** 5 segmented.

**Claws (Figs. 14f,g,h):** Equal; curved internally and separately movable.

**Parameres (Figs. 14i,j):** Short; base broad; sides nearly straight, little projected near base and apex; inner margin angulate; apex conical, inner angle acute.

**Female:** Vertex of head with a transverse carina.

**Material examined:** 1 male, Rajabhatkhawa, 18.v.95, coll. S. Saha; 1 female, Rajabhatkhawa, 21.v.95, coll. S. Saha; 1 male, Rajabhatkhawa, 22.v.95, coll. B. Kundu; 1 male 2 females, Raimatang, 30.v.96, coll. S. Saha; 4 males 2 females, Rajabhatkhawa, 16.ix.96, coll. S. Saha; 1 female, Rajabhatkhawa, 19.v.97, coll. S. Saha; 1 female, Ghoramara, 09.v.02, coll. S. K. Sarkar; 1 male, Rajabhatkhawa, 29.iii.02, coll. S. K. Sarkar; 1 female, Damanpur, 10.iv.02, coll. S. K. Sarkar; 1 female, Rajabhatkhawa, 04.iv.03, coll. S. K. Sarkar; 2 females, Rajabhatkhawa, 03.v.03, coll. S. K. Sarkar.

**Distribution:** India: Sikkim, West Bengal (Arrow, 1931; Saha & Raychaudhuri, 2000).

***Onthophagus dama* Fabricius**

(Pl. IE, Fig. 15)

*Onthophagus dama* Fabricius, 1798, Ent. Syst. Suppl., p. 32.*Onthophagus dama* Arrow, 1931, The fauna of British India including Ceylon and Burma (Col: Lamellicornia: Coprinae), iii, p. 280.**Description:** Male**Length** 9.22 mm, **humeral width** 4.77 mm. Body short, oval, compact and convex.**Colour and markings (Pl. IE, Fig. 15):** Black with head, pronotum, elytral suture and venter greenish black; shiny, elytra opaque.**Head (Figs. 15a,b):** Transverse; coarsely punctured near base and front; forehead medially with a short, basally dilated, elevated process; vertex bears a pair of erect, outwardly curved, basally flat and dilated horns.**Clypeus (Figs. 15a,b):** Semicircular; minutely punctured; front margin medially feebly raised and bilobed.**Fronto-clypeal suture (Figs. 15a,b):** Marked laterally by oblique carina on each side and medially by the elevated process.**Interocular width:**  $6.75 \times$  transverse eye diameter.**Antenna (Fig. 15c):** 9 segmented; club  $1.07 \times$  stem.**Pronotum (Fig. 15a):** Transverse; minutely and densely punctured; front angles bluntly produced, hind angles obsolete; sides feebly sinuate; margins raised; base round.**Scutellum (Fig. 15a):** Not visible from above.**Elytra (Fig. 15a):** Punctate striate, striae 7 on each disc, 7<sup>th</sup> carinate anteriorly; intervals flat with few minute and setigerous punctures; margins elevated; humeral angle not formed, apical angle acute; humps not evident.**Pygidium (Fig. 15d):** Both coarsely and minutely punctured; sides and apex gradually round.**Mesosternum (Fig. 15e):** Nearly smooth.**Fore tibia (Fig. 15f):** Sharply quadridentate, third smallest; terminally with a short and blunt spur.**Mid and hind tibiae (Figs. 15g,h):** Carinate externally; truncate at extremity; terminally with 2 long unequal spurs.**Tarsi (Figs. 15f,g,h):** 5 segmented.**Claws (Figs. 15f,g,h):** Equal; curved internally and separately movable.**Parameres (Figs. 15i,j):** Short; base broad; sides straight and acutely toothed near base and apex; inner margin angulate; apex conical, inner angle obsolete.**Female:** Clypeus transversely rugose; vertex of head bears a flattened and truncate tubercle.**Material examined:** 1 male, Rajabhatkhawa, 22.v.95, coll. S. Saha; 4 females 1 male, Raimatang, 30.v.96, coll. S. Saha; 2 males, Raimatang, 19.v.97, coll. S. Saha; 1 male 2 females, Rajabhatkhawa, 29.iii.02, coll. S. K. Sarkar; 2 females, Damanpur, 10.iv.02, coll. S. K. Sarkar; 2 males, Damanpur, 18.iv.02, coll. C. Ray; 2 males 2 females, Hatipota, 19.iv.02, coll. S. K. Sarkar; 3 females 1 male, Newlands, 10.v.02, coll. S. K. Sarkar; 2 females 1 male, Cheko, 07.vi.02, coll. S. K. Sarkar; 2 males, Rajabhatkhawa, 31.x.02, coll. S. K. Sarkar; 1 female, South Rydak, 09.iii.03, coll. S. K. Sarkar; 1 male 1 female, Nimati, 13.iii.03, coll. D. Dutta; 2 females 1 male, Rajabhatkhawa, 17.iii.03, coll. S. K. Sarkar; 1 male 2 females, Poro, 18.iii.03, coll. S. K. Sarkar; 1 male, Poro, 28.iii.03, coll. S. K. Sarkar.**Distribution:** India: Bihar, Karnataka, Madhya Pradesh, Maharashtra, Sikkim, Tamilnadu, Uttarakhand, West Bengal; Nepal; Bhutan; Sri Lanka (Arrow, 1931; Saha & Raychaudhuri, 2000).***Onthophagus tragus* Fabricius**

(Pl. IF, Fig. 16)

*Onthophagus tragus* Fabricius, 1792, Ent. Syst. i, p. 56.*Onthophagus tragus* Arrow, 1931, The fauna of British India including Ceylon and Burma (Col: Lamellicornia: Coprinae), iii, p. 303.**Description:** Male**Length** 11.25 mm, **humeral width** 5.37 mm. Body short, broadly oval and moderately convex.

**Colour and markings (Pl. IF, Fig. 16):** Black, with mouth organs and antennae yellow; smooth and shiny.

**Head (Figs. 16a,b):** Transverse and broad; finely and sparsely punctured; vertex bears a pair of long, straight, slightly compressed and backwardly inclined horns, outer edge of which toothed near tip.

**Clypeus (Figs. 16a,b):** Semicircular; finely punctured; front margin medially feebly raised and bilobed.

**Fronto-clypeal suture (Figs. 16a,b):** Marked by a curved carina.

**Interocular width:**  $6 \times$  transverse eye diameter.

**Antenna (Fig. 16c):** 9 segmented; club  $0.9 \times$  stem.

**Pronotum (Fig. 16a):** Transverse; finely but distinctly punctured; front angles bluntly produced, hind angles round; sides round; margins raised; base gently round.

**Scutellum (Fig. 16a):** Not visible from above.

**Elytra (Fig. 16a):** Punctate striate, striae 7 on each disc, 7<sup>th</sup> carinate anteriorly; intervals flat and minutely punctured; margins elevated; humeral angle acute, apical angle nearly right angle; humps not evident.

**Pygidium (Fig. 16d):** Finely and scantily punctured.

**Mesosternum (Fig. 16e):** Coarsely but scantily punctured.

**Fore tibia (Fig. 16f):** Bluntly quadridentate, third smallest; terminally with a short and blunt spur.

**Mid and hind tibiae (Figs. 16g,h):** Carinate externally; truncate at extremity; terminally with 2 long unequal spurs.

**Tarsi (Figs. 16f,g,h):** 5 segmented.

**Claws (Figs. 16f,g,h):** Equal; curved internally and separately movable.

**Parameres (Figs. 16i,j):** Moderately long; base broad; sides sinuate and acutely toothed near apex; inner margin sinuate; apex conical, inner angle obsolete.

**Female:** Clypeus rugose; vertex of head bears a blunt median tubercle.

**Material examined:** 1 female, Rajabhatkhawa, 11.v.94, coll. B. Kundu; 1 female, Rajabhatkhawa, 19.v.95, coll. B. Kundu; 2 females, Rajabhatkhawa 16.ix.96, coll. S. Saha; 2 females, South Bholka, 19.v.97, coll. S. Saha; 2 males, Damanpur, 10.iv.02, coll. S. K. Sarkar; 1 male 1 female, Poro, 17.vii.02, coll. S. K. Sarkar; 1 male, Ghoramara, 30.iv.02, coll. S. K. Sarkar; 1 female, Jayanti, 03.iii.03, coll. S. K. Sarkar; 1 male 1 female, South Rydak, 09.iii.03, coll. S. K. Sarkar; 1 male 2 females, Poro, 28.iii.03, coll. S. K. Sarkar; 1 male, Rajabhatkhawa, 07.vi.03, coll. C. Ray.

**Distribution:** India: Maharashtra, West Bengal; China; Indonesia; Myanmar; Vietnam (Arrow, 1931; Saha & Raychaudhuri, 2000).

### ***Onthophagus triceratops* Arrow**

(Pl. IF, Fig. 17)

*Onthophagus triceratops* Arrow, 1913, Rec. Ind. Mus. Viii, p. 195.

*Onthophagus triceratops* Arrow, 1931, The fauna of British India including Ceylon and Burma (Col: Lamellicornia: Coprinae), iii, p. 301.

**Description:** Male

**Length** 8.6 mm, **humeral width** 4.9 mm. Body short, broadly oval and moderately convex.

**Colour and markings (Pl. IF, Fig. 17):** Black metallic, with mouth organs, antennae and tarsi reddish; smooth and shiny.

**Head (Figs. 17a,b):** Transverse, broad and angularly dilated in front of eyes; moderately coarsely and densely punctured; vertex bears a pair of basally broad and flat, inwardly strongly curved and convergent horns.

**Clypeus (Figs. 17a,b):** Gradually narrow anteriorly; moderately coarsely and densely punctured; front margin medially nearly straight and strongly reflexed.

**Fronto-clypeal suture (Figs. 17a,b):** Marked by a feeble straight carina.

**Interocular width:**  $5.71 \times$  transverse eye diameter.

**Antenna (Fig. 17c):** 9 segmented; club  $1.25 \times$  stem.

**Pronotum (Fig. 17a):** Transverse; finely and densely punctured; front margin medially narrowly raised; front angles bluntly produced, hind angles round; sides nearly straight and feebly sinuate near hind angles; margins raised; base medially bluntly angulate.

**Scutellum (Fig. 17a):** Not visible from above.



**Elytra (Fig. 17a):** Punctate striate, striae 7 on each disc, 7<sup>th</sup> carinate anteriorly; intervals flat and minutely punctured; margins elevated; humeral and apical angles acute; humps not evident.

**Pygidium (Fig. 17d):** Finely and irregularly punctured.

**Mesosternum (Fig. 17e):** Medially finely and laterally coarsely punctured.

**Fore tibia (Fig. 17f):** Bluntly quadridentate, third smallest; terminally with a short and blunt spur.

**Mid and hind tibiae (Figs. 30g,h):** Carinate externally; truncate at extremity; terminally with 2 long unequal spurs.

**Tarsi (Figs. 17f,g,h):** 5 segmented.

**Claws (Figs. 17f,g,h):** Equal; curved internally and separately movable.

**Parameres (Figs. 17i,j):** Short; base nearly equal to apex; sides straight and acutely toothed near apex; inner margin curved from base to upto 2/3<sup>rd</sup> of length; apex flat, inner angle nearly right angle.

**Material examined:** 2 males, Rajabhatkhawa, 22.v.95, coll. S. Saha; 1 male, Nimati, 21.v.97, coll. S. Saha.

**Distribution:** India: Assam, Gujarat, West Bengal (Arrow, 1931; Saha & Raychaudhuri, 2000; Sewak, 2009).

### ***Onthophagus armatus* Blanchard**

(Pl. IF, Fig. 18)

*Onthophagus armatus* Blanchard, 1853, Voy. Au Pole Sud. p. 98.

*Onthophagus armatus* Arrow, 1931, The fauna of British India including Ceylon and Burma (Col: Lamellicornia: Coprinae), iii, p. 293.

**Description:** Female

**Length** 10.25 mm, **humeral width** 5.5 mm. Body broadly oval, compact and moderately convex.

**Colour and markings (Pl. IF, Fig. 18):** Black, with mouth organs and antennae yellow, tarsi reddish; smooth and shiny.

**Head (Figs. 18a,b):** Transverse, large and broad; coarsely and densely punctured near base and rugose in front; vertex bears a strongly elevated carinate tubercle.

**Clypeus (Figs. 18a,b):** Semicircular; transversely rugose; front margin medially straight and feebly excised.

**Fronto-clypeal suture (Figs. 18a,b):** Marked by a curved carina.

**Interocular width:** 3.66 × transverse eye diameter.

**Antenna (Fig. 18c):** 9 segmented; club 1.13 × stem.

**Pronotum (Fig. 18a):** Transverse; finely and moderately closely punctured; front margin medially narrowly raised; front angles bluntly produced, hind angles round; sides nearly straight and feebly sinuate near hind angles; margins raised; base medially bluntly angulate.

**Scutellum (Fig. 18a):** Not visible from above.

**Elytra (Fig. 18a):** Punctate striate, striae 7 on each disc, 7<sup>th</sup> carinate anteriorly; intervals flat and minutely punctured; margins elevated; humeral and apical angles acute; humps not evident.

**Pygidium (Fig. 18d):** Finely and moderately closely punctured.

**Mesosternum (Fig. 18e):** Medially finely and laterally coarsely punctured.

**Fore tibia (Fig. 18f):** Bluntly quadridentate, third smallest; terminally with a short and blunt spur.

**Mid and hind tibiae (Figs. 18g,h):** Carinate externally; truncate at extremity; terminally with 2 long unequal spurs.

**Tarsi (Figs. 18f,g,h):** 5 segmented.

**Claws (Figs. 18f,g,h):** Equal; curved internally and separately movable.

**Material examined:** 2 females, Jayanti, 16.ix.96, coll. S. Saha.

**Distribution:** India: Assam, West Bengal; Indonesia; Myanmar; Philippines (Arrow, 1931; Saha & Raychaudhuri, 2000).

### ***Onthophagus bison* Boucomont**

(Pl. IF, Fig. 19)

*Onthophagus bison* Boucomont, 1919, Ann. Soc. Ent. France, xxiii, p. 309.

*Onthophagus bison* Arrow, 1931, The fauna of British India including Ceylon and Burma (Col: Lamellicornia: Coprinae), iii, p. 302.

**Description:** Female

**Length** 6.64 mm, **humeral width** 3.93 mm. Body short, broadly oval and convex.

**Colour and markings (Pl. IF, Fig. 19):** Black, with mouth organs yellow and venter reddish; smooth and shiny.

**Head (Figs. 19a,b):** Transverse; short and broad; coarsely and densely punctured; vertex bears a short conical tubercle.

**Clypeus (Figs. 19a,b):** Semicircular; transversely rugose; front margin round.

**Fronto-clypeal suture (Figs. 19a,b):** Marked by a curved carina.

**Interocular width:** 7.4 × transverse eye diameter.

**Antenna (Fig. 19c):** 8 segmented; club 1.22 × stem.

**Pronotum (Fig. 19a):** Transverse; closely and coarsely punctured; front angles bluntly produced, hind angles obsolete; sides feebly sinuate near hind angles; margins raised; base medially angulate.

**Scutellum (Fig. 19a):** Not visible from above.

**Elytra (Fig. 19a):** Punctate striate, striae 7 on each disc, 7<sup>th</sup> carinate anteriorly; intervals flat and finely punctured; margins elevated; humeral and apical angles acute; humps not evident.

**Pygidium (Fig. 19d):** Coarsely punctured.

**Mesosternum (Fig. 19e):** Medially smooth, laterally finely punctured.

**Fore tibia (Fig. 19f):** Bluntly tridentate; terminally with a short and blunt spur.

**Mid and hind tibiae (Figs. 19g,h):** Carinate externally; truncate at extremity; terminally with 2 long unequal spurs.

**Tarsi (Figs. 19f,g,h):** 5 segmented.

**Claws (Figs. 19f,g,h):** Equal; curved internally and separately movable.

**Material examined:** 1 female, South Bholka, 19.v.97, coll. S. Saha.

**Distribution:** India: West Bengal; Myanmar (Arrow, 1931; Saha & Raychaudhuri, 2000).

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## LITERATURES CITED

- Arrow, G. J. 1931. The fauna of British India including Ceylon & Burma. Part –III, Coleoptera: Lamellicornia (Coprinae). Taylor & Francis, London, 3: 1-382.
- Balthasar, V. 1963. Monographie der Scarabaeidae und Aphodiidae der Palaearktischen und Orientalischen Region (Coleoptera: Lamellicornia), Verlag der Tscheschoslowakischen Akademie der Wissenschaften, Prague: 1: 1-39, Pls, 1-24, figs. 1-137; 2: 1-627, Pls. 1-16, figs. 1-226.
- Biswas, S. 1978a. Studies on the scarab beetles (Coleoptera: Scarabaeidae) of North-East India: A new species and notes on other Indian species of subgenus *Strandius*, genus *Onthophagus*. Journal of Bombay Natural History Society, 75 (3): 911-913.
- Biswas, S. 1978b. Studies on the scarab beetles (Coleoptera: Scarabaeidae) of North-East India. Part-II: Three new species and two new records from India. Journal of Bombay Natural History Society, 76: 339-344.
- Biswas, S. & Chatterjee, S. K. 1985. Insecta: Coleoptera: Scarabaeidae: Coprinae. Records of Zoological Survey of India, 82 (1-4): 147-177.
- Biswas, S. & Chatterjee, S. K. 1995. Insecta: Coleoptera: Scarabaeidae: Cetoniinae: Dynastinae: Rutelinae. Zoological Survey of India, State Fauna Series: Fauna of West Bengal, 3 (3A): 363-447.
- Biswas, S., Mukhopadhyaya, P., Saha, S. K., Basu, R. C., Chatterjee, S. K., Chakraborty, S. K., Biswas, D. N., Haldar, S. K., Ghosh, S. K. & Chakraborty, S. 1997. Insecta: Coleoptera: Scarabaeidae: Coprinae. Zoological Survey of India: Fauna of Delhi, State Fauna Series, 3 (3A): 325-353.
- Chandra, K. 1988. Taxonomic studies on Pleurostict Scarabaeidae (Coleoptera) of north-west India. Y.E.S Quarterly. U.S.A. 5 (1): 20-27.
- Chandra, K. 2000. Inventory of scarabaeid beetles (Coleoptera) from Madhya Pradesh, India. Zoo's Print Journal, 15 (11): 359-362.
- Chandra, K. 2004. Insecta Coleoptera: Scarabaeidae – Fauna of Western Himalaya (part-2). Himachal Pradesh. Zoological Survey of India, 141-155 pp.

- Chandra, K. & Ahirwar, S. C.** 2005. Scarabaeid beetles of Bandhavgarh National Park, Madhya Pradesh. Zoo's Print Journal, 20 (8): 1961-1964.
- Chandra, K. & Singh, R. K.** 2004. On a collection of Scarabaeid beetles from Pachmari Biosphere Reserve, Madhya Pradesh. Records of Zoological Survey of India, 102 (3-4): 43-46.
- Chandra, K. & Uniyal, V. P.** 2007. On a collection of Pleurostict Scarabaeidae (Coleoptera) from the Great Himalayan National Park, Himachal Pradesh, India. Zoo's Print Journal, 22 (9): 2821-2823.
- Chatterjee, S. K. & Biswas, S.** 2000a. Insecta: Coleoptera: Scarabaeidae: Coprinae. Zoological Survey of India, Fauna of Tripura, State Fauna Series, 7 (3): 87-98.
- Chatterjee, S. K. & Biswas, S.** 2000b. Insecta: Coleoptera: Scarabaeidae: Coprinae. Zoological Survey of India, Fauna of Meghalaya, State Fauna Series, 4 (5): 513-526.
- Chatterjee, S. K. & Biswas, S.** 2003. Insecta: Coleoptera: Scarabaeidae: Coprinae. Zoological Survey of India, Fauna of Sikkim, State Fauna Series, 9 (3): 85-65.
- Chatterjee, S. K. & Biswas, S.** 2004. Insecta: Coleoptera: Scarabaeidae. Zoological Survey of India, Fauna of Manipur, State Fauna Series, 10: 371-384.
- GBIF.** 2013. Global Biodiversity Information Facility. Available from: <http://data.gbif.org/species/browse/resource/1/taxon/5840/classification/Family:Scarabaeidae%20Latreille,1802/> (Accessed on 12.11.2013).
- Lawrence, J. F. & Newton, A. F. JR.** 1995. Families and subfamilies of Coleoptera (with selected genera, notes, and references and data on family-group names), In Pakaluk, J. and Slipinski, S. A. (eds.), Biology, Phylogeny, and Classification of Coleoptera. Papers Celebrating the 80th Birthday of Roy A. Crowson. Muzeum i Instytut Zoologii PAN, Warszawa, Poland. 779-1006.
- Ratcliffe, B. C. & Jameson, M. L.** 2013. Generic guide to New World Scarab Beetles. Available from: [http://www.museum.unl.edu/research/entomology/Guide/Scarabaeoidea/Scarabaeidae/Scarabaeidae-Overview/Scarabaeidae-Overview/ScarabaeidaeO.html/Generated on 19.03.2001/Last modified on 19.09.2005/](http://www.museum.unl.edu/research/entomology/Guide/Scarabaeoidea/Scarabaeidae/Scarabaeidae-Overview/Scarabaeidae-Overview/ScarabaeidaeO.html/Generated%20on%2019.03.2001/Last%20modified%20on%2019.09.2005/) (Accessed on 13.11.2013).
- Saha, S. & Raychaudhuri, D.** 2000. Scavenger beetles (Scarabaeidae : Coprinae ) of Buxa Tiger Reserve, Jalpaiguri, West Bengal. Insect Environment, 6 (1): 43-44.
- Sarkar, S. K., Saha, S. & Raychaudhuri, D.** 2010. Further additions to the scarab beetles of Buxa Tiger Reserve, Jalpaiguri, West Bengal. Bionotes, 12 (4): 131-132.
- Sewak, R.** 1985. On a collection of Dung beetles (Coleoptera: Scarabaeidae: Coprinae) from Gujarat, India. Oikasay, 2 (2): 33-35.
- Sewak, R.** 1986. On a collection of Dung beetles (Coleoptera: Scarabaeidae: Coprinae) from Rajasthan, India. Oikasay, 3 (1): 11-15.
- Sewak, R.** 1991. Dung beetles (Coleoptera: Scarabaeidae: Coprinae) from five districts on western Uttar Pradesh. Oikasay, 8 (1 and 2): 25-27.
- Sewak, R.** 2004a. Insecta: Coleoptera: Scarabaeidae: Coprinae (Dung beetles). Zoological Survey of India, Fauna of Gujarat, State Fauna Series, 8 (Part-2): 105-125.
- Sewak, R.** 2004b. Dung beetles (Coleoptera: Scarabaeidae: Coprinae) of India with especial reference to Arunachal Pradesh Uttar Pradesh and Rajasthan. In Advancements in Inset Biodiversity Ed. Rajeev K. Gupta, Agrobios, Jodhpur, 249-297.
- Sewak, R.** 2005. Dung beetles (Coleoptera: Scarabaeidae: Coprinae) of Thar Desert of Rajasthan. Changing Faunal Ecology in the Thar Desert. Ed. Tyagi, B. K. and Baqri, Q. H..
- Sewak, R.** 2006. Coleoptera: Scarabaeidae: Coprinae (Dung beetles), Zoological Survey of India, Fauna of Arunachal Pradesh, State Fauna Series, 13 (2): 191-224.
- Sewak, R.** 2009. Dung beetles (Coleoptera: Scarabaeidae: Coprinae). Records of the Zoological Survey of India, Occasional Paper, Zoological Survey of India, Kolkata, 295: 1-48.

**PLATE - I A**



Male Dorsal habitus Female Dorsal habitus Genital capsule Parameres

*Gymnopleurus sinuatus* Olivier var. *assamensis* Watson



Female Dorsal habitus

*Hellocopris tyrannus* (Thomson)



Male Dorsal habitus Female Dorsal habitus Genital capsule Parameres

*Cutharus birmanensis* Lansberge

**PLATE - I B**



Male Dorsal habitus



Female Dorsal habitus



Genital capsule



Parameres

*Catharsius molossus* (Linnaeus)



Female Dorsal habitus

*Catharsius capusinus* Fabricius



Male Dorsal habitus



Genital capsule

*Catharsius juvenis* Lansberge



Parameres

**PLATE - I C**



Male Dorsal habitus



Genital capsule

*Copris corpulentus* Gillet



Parameres



Male Dorsal habitus



Genital capsule

*Copris doriae* Harold



Parameres



Female Dorsal habitus

*Copris sarpedon* Harold

**PLATE - 1 D**

Female Dorsal habitus

***Copris magicus* Harold**

Male Dorsal habitus



Female Dorsal habitus



Genital capsule



Parameres

***Onitis subopacus* Lansberge**

Male Dorsal habitus



Female Dorsal habitus



Genital capsule



Parameres

***Onitis virens* Lansberge****PLATE - 1 E**

Female Dorsal habitus

***Onthophagus bonasus* Fabricius**

Male Dorsal habitus



Female Dorsal habitus



Genital capsule



Parameres

***Onthophagus falcifer* Harold**

Male Dorsal habitus



Female Dorsal habitus



Genital capsule



Parameres

***Onthophagus dama* Fabricius**

## PLATE – I F



Male Dorsal habitus Female Dorsal habitus

Genital capsule

Parameres

*Onthophagus tragus* Fabricius

Male Dorsal habitus

Genital capsule

Parameres

*Onthophagus triceratops* Arrow

Female Dorsal habitus

Female Dorsal habitus

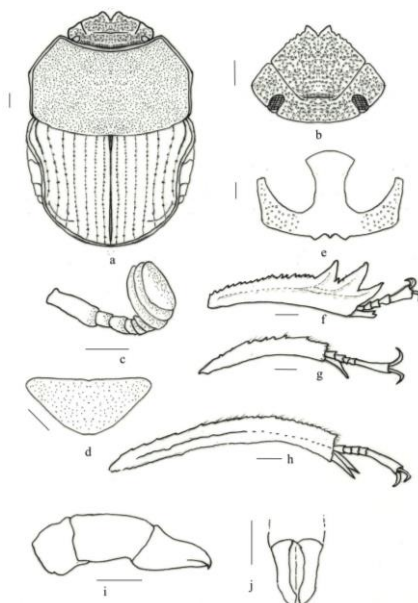
*Onthophagus armatus* Blanchard*Onthophagus bison* Boucomont

Figure 1a-j. *Gymnopleurus sinuatus* Olivier, var. *assamensis* Watson: Male: a. Dorsal habitus; b. Head & Clypeus, dorsal view; c. Antenna, lateral view; d. Pygidium, dorsal view; e. Mesosternum, ventral view; f. Fore tibia, tarsi & claws; g. Mid tibia, tarsi & claws; h. Hind tibia, tarsi & claws; i. Genital capsule, lateral view; j. Parameres, dorsal view.

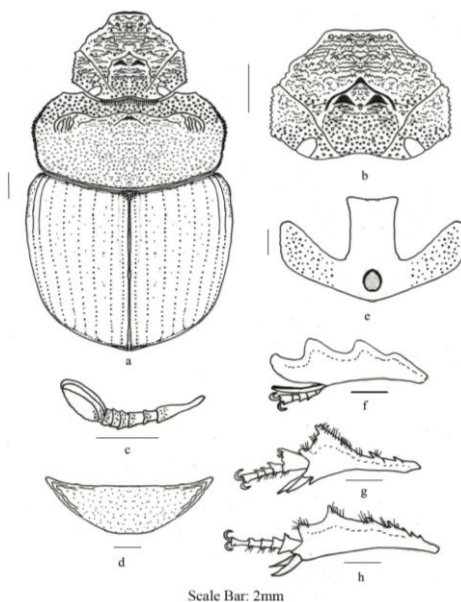


Figure 2a-h. *Heliocopris tyrannus* (Thomson): Female: a. Dorsal habitus; b. Head & Clypeus, dorsal view; c. Antenna, lateral view; d. Pygidium, dorsal view; e. Mesosternum, ventral view; f. Fore tibia, tarsi & claws; g. Mid tibia, tarsi & claws; h. Hind tibia, tarsi & claws.

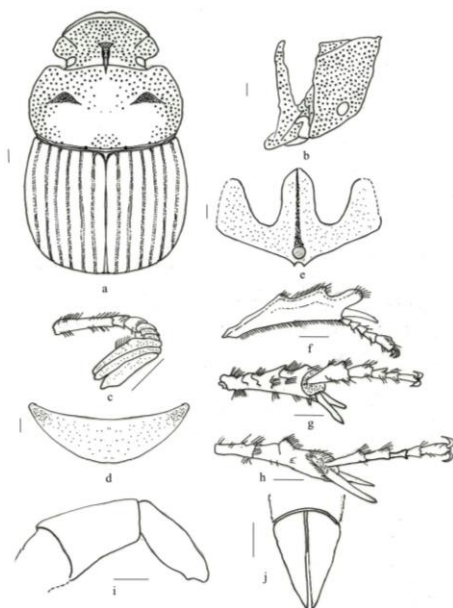


Figure 3a-j. *Catharsius birmanensis* Lansberge: Male: a. Dorsal habitus; b. Head & Clypeus, lateral view; c. Antenna, lateral view; d. Pygidium, dorsal view; e. Mesosternum, ventral view; f. Fore tibia, tarsi & claws; g. Mid tibia, tarsi & claws; h. Hind tibia, tarsi & claws; i. Genital capsule, lateral view; j. Parameres, dorsal view.



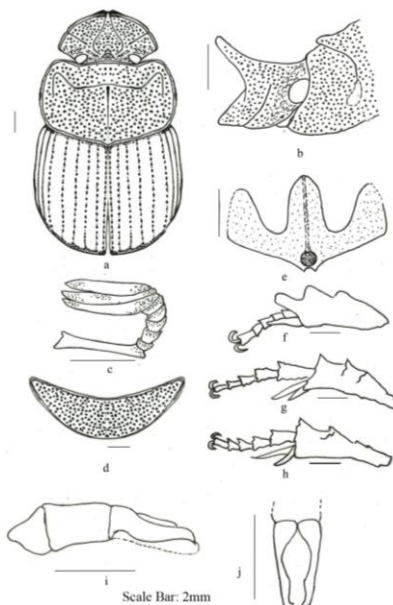


Figure 4a-j. *Catharsius molossus* (Linnaeus): Male: a. Dorsal habitus; b. Head & Clypeus, lateral view; c. Antenna, lateral view; d. Pygidium, dorsal view; e. Mesosternum, ventral view; f. Fore tibia, tarsi & claws; g. Mid tibia, tarsi & claws; h. Hind tibia, tarsi & claws; i. Genital capsule, lateral view; j. Parameres, dorsal view.

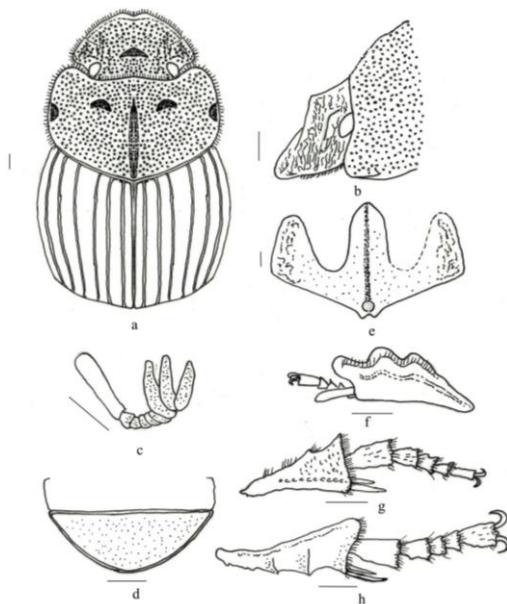


Figure 5a-h. *Catharsius capusinus* Fabricius: Female: a. Dorsal habitus; b. Head & Clypeus, lateral view; c. Antenna, lateral view; d. Pygidium, dorsal view; e. Mesosternum, ventral view; f. Fore tibia, tarsi & claws; g. Mid tibia, tarsi & claws; h. Hind tibia, tarsi & claws.



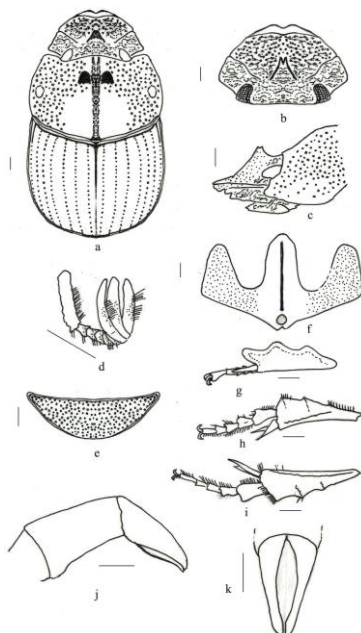


Figure 6a-k. *Catharsius javanus* Lansberge: Male: a. Dorsal habitus; b. Head & Clypeus, dorsal view; c. Head & Clypeus, lateral view; d. Antenna, lateral view; e. Pygidium, dorsal view; f. Mesosternum, ventral view; g. Fore tibia, tarsi & claws; h. Mid tibia, tarsi & claws; i. Hind tibia, tarsi & claws; j. Genital capsule, lateral view; k. Parameres, dorsal view.

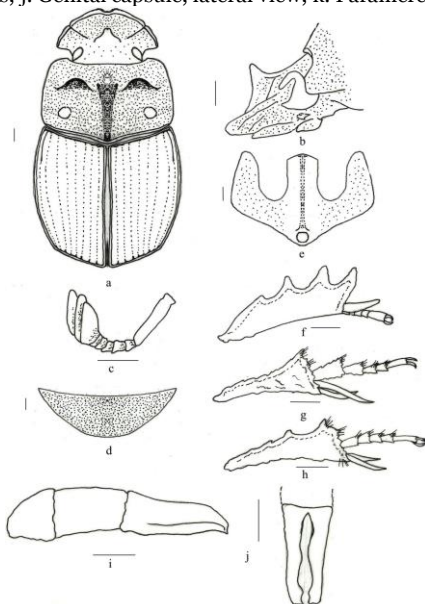


Figure 7a-j. *Copris corpulentus* Gillet: Male: a. Dorsal habitus; b. Head & Clypeus, lateral view; c. Antenna, lateral view; d. Pygidium, dorsal view; e. Mesosternum, ventral view; f. Fore tibia, tarsi & claws; g. Mid tibia, tarsi & claws; h. Hind tibia, tarsi & claws; i. Genital capsule, lateral view; j. Parameres, dorsal view.

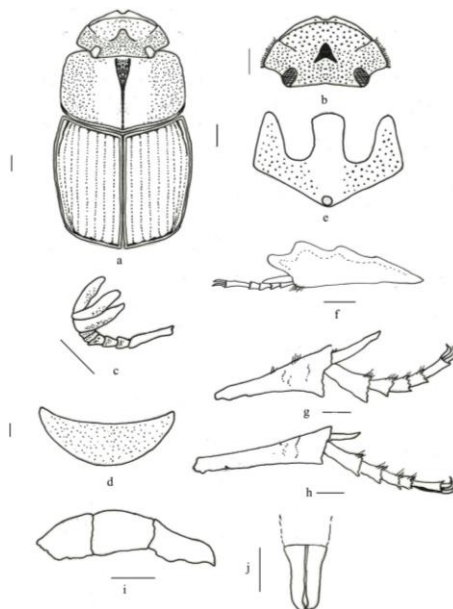


Figure 8a-j. *Copris doriae* Harold: Male: a. Dorsal habitus; b. Head & Clypeus, dorsal view; c. Antenna, lateral view; d. Pygidium, dorsal view; e. Mesosternum, ventral view; f. Fore tibia, tarsi & claws; g. Mid tibia, tarsi & claws; h. Hind tibia, tarsi & claws; i. Genital capsule, lateral view; j. Parameres, dorsal view.

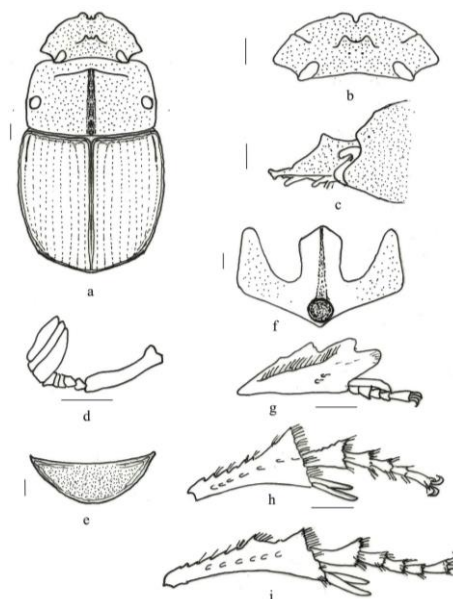


Figure 9a-i. *Copris sarpedon* Harold: Female: a. Dorsal habitus; b. Head & Clypeus, dorsal view; c. Head & Clypeus, lateral view; d. Antenna, lateral view; e. Pygidium, dorsal view; f. Mesosternum, ventral view; g. Fore tibia, tarsi & claws; h. Mid tibia, tarsi & claws; i. Hind tibia, tarsi & claws.

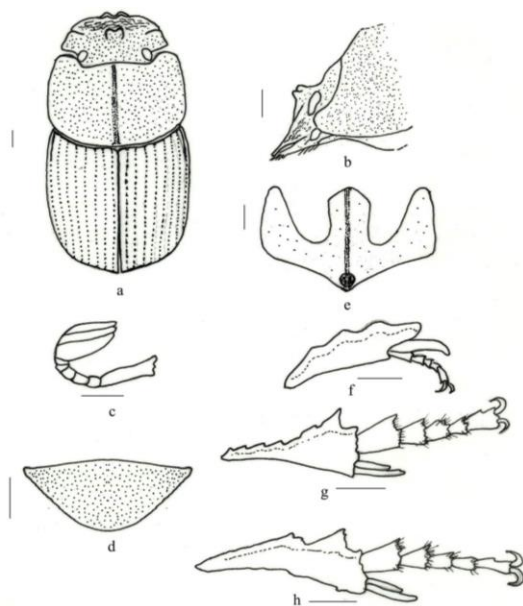


Figure 10a-h. *Copris magicus* Harold: Female: a. Dorsal habitus; b. Head & Clypeus, dorsal view; c. Antenna, lateral view; d. Pygidium, dorsal view; e. Mesosternum, ventral view; f. Fore tibia, tarsi & claws; g. Mid tibia, tarsi & claws; h. Hind tibia, tarsi & claws.

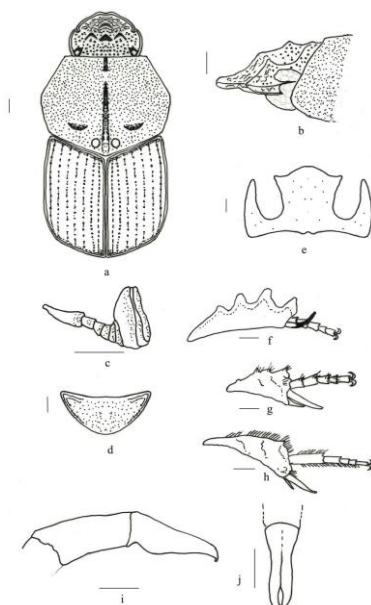
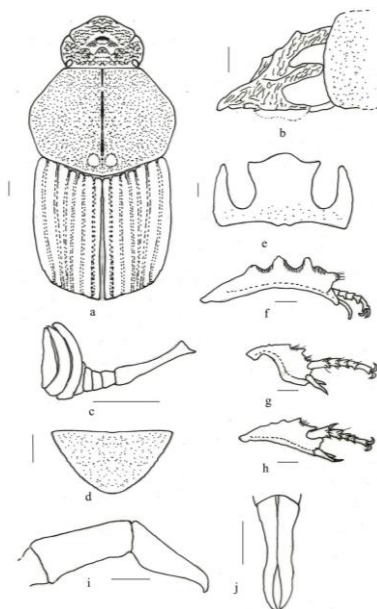
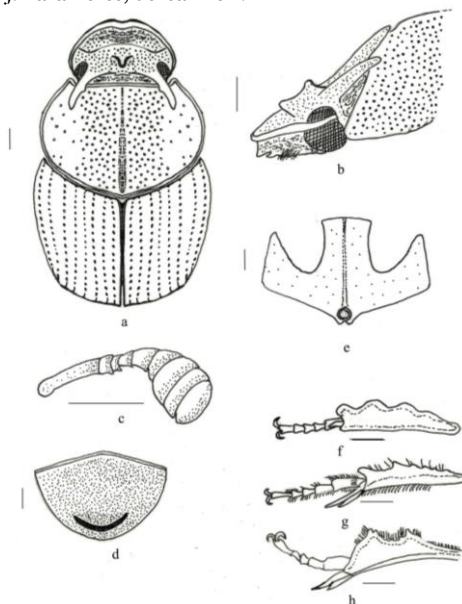


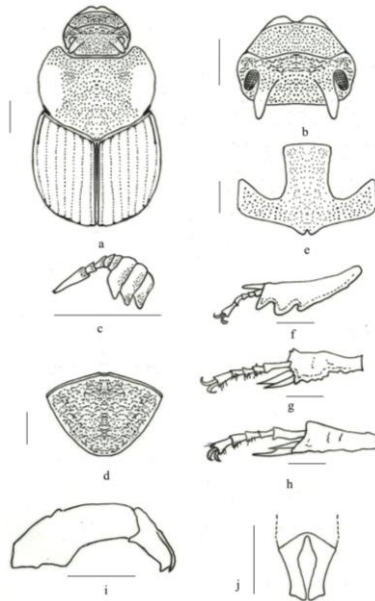
Figure 11a-j. *Onitis subopacus* Lansberge: Male: a. Dorsal habitus; b. Head & Clypeus, lateral view; c. Antenna, lateral view; d. Pygidium, dorsal view; e. Mesosternum, ventral view; f. Fore tibia, tarsi & claws; g. Mid tibia, tarsi & claws; h. Hind tibia, tarsi & claws; i. Genital capsule, lateral view; j. Parameres, dorsal view.



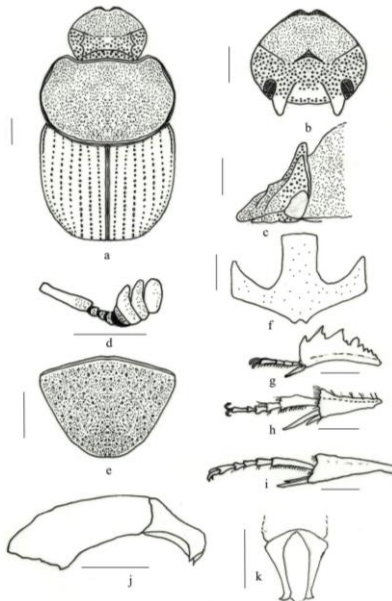
Figures 12a-j. *Onitis virens* Lansberge: Male: a. Dorsal habitus; b. Head & Clypeus, lateral view; c. Antenna, lateral view; d. Pygidium, dorsal view; e. Mesosternum, ventral view; f. Fore tibia, tarsi & claws; g. Mid tibia, tarsi & claws; h. Hind tibia, tarsi & claws; i. Genital capsule, lateral view; j. Parameres, dorsal view.



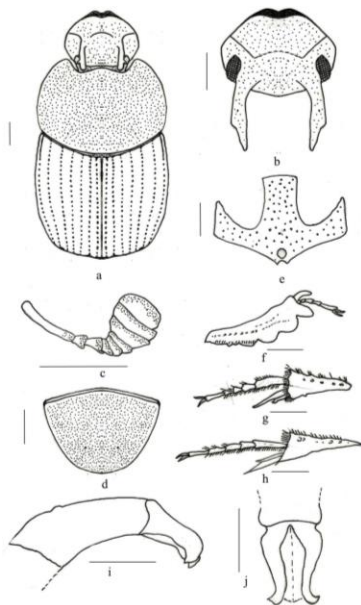
Figures 13a-h. *Onthophagus bonasus* Fabricius: Female: a. Dorsal habitus; b. Head & Clypeus, lateral view; c. Antenna, lateral view; d. Pygidium, dorsal view; e. Mesosternum, ventral view; f. Fore tibia, tarsi & claws; g. Mid tibia, tarsi & claws; h. Hind tibia, tarsi & claws.



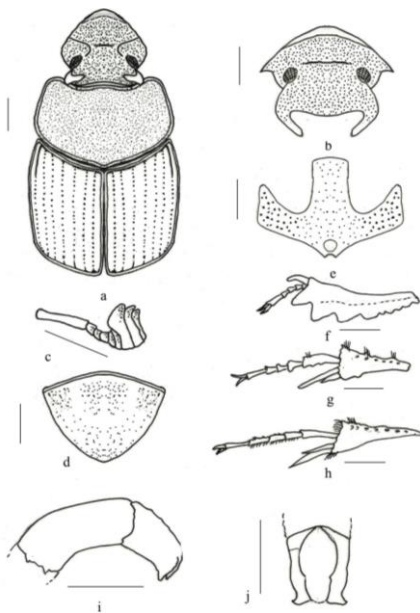
Figures 14a-j. *Onthophagus falcifer* Harold: Male: a. Dorsal habitus; b. Head & Clypeus, dorsal view; c. Antenna, lateral view; d. Pygidium, dorsal view; e. Mesosternum, ventral view; f. Fore tibia, tarsi & claws; g. Mid tibia, tarsi & claws; h. Hind tibia, tarsi & claws; i. Genital capsule, lateral view; j. Parameres, dorsal view.



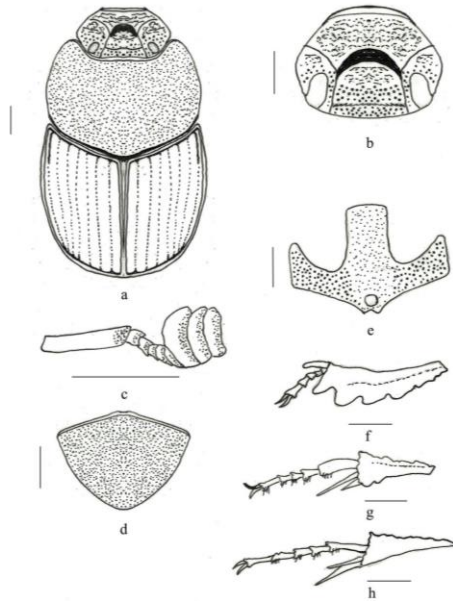
Figures 15a-j. *Onthophagus dama* Fabricius: Male: a. Dorsal habitus; b. Head & Clypeus, dorsal view; c. Antenna, lateral view; d. Pygidium, dorsal view; e. Mesosternum, ventral view; f. Fore tibia, tarsi & claws; g. Mid tibia, tarsi & claws; h. Hind tibia, tarsi & claws; i. Genital capsule, lateral view; j. Parameres, dorsal view.



Figures 16a-j. *Onthophagus tragus* Fabricius: Male: a. Dorsal habitus; b. Head & Clypeus, dorsal view; c. Antenna, lateral view; d. Pygidium, dorsal view; e. Mesosternum, ventral view; f. Fore tibia, tarsi & claws; g. Mid tibia, tarsi & claws; h. Hind tibia, tarsi & claws; i. Genital capsule, lateral view; j. Parameres, dorsal view.



Figures 17a-j. *Onthophagus triceratops* Arrow: Male: a. Dorsal habitus; b. Head & Clypeus, dorsal view; c. Antenna, lateral view; d. Pygidium, dorsal view; e. Mesosternum, ventral view; f. Fore tibia, tarsi & claws; g. Mid tibia, tarsi & claws; h. Hind tibia, tarsi & claws; i. Genital capsule, lateral view; j. Parameres, dorsal view.



Figures 18a-h.: *Onthophagus armatus* Blanchard: Female: a. Dorsal habitus; b. Head & Clypeus, lateral view; c. Antenna, lateral view; d. Pygidium, dorsal view; e. Mesosternum, ventral view; f. Fore tibia, tarsi & claws; g. Mid tibia, tarsi & claws; h. Hind tibia, tarsi & claws.

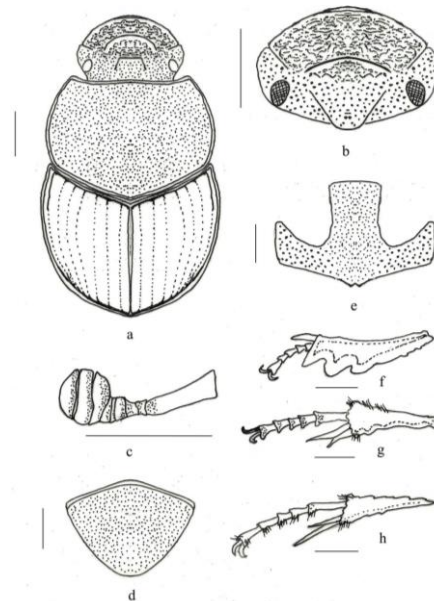


Figure 19a-h. *Onthophagus bison* Boucomont: Female: a. Dorsal habitus; b. Head & Clypeus, lateral view; c. Antenna, lateral view; d. Pygidium, dorsal view; e. Mesosternum, ventral view; f. Fore tibia, tarsi & claws; g. Mid tibia, tarsi & claws; h. Hind tibia, tarsi & claws.