

**TAXONOMIC STUDIES ON DUNG BEETLES
(COLEOPTERA: SCARABAEIDAE, GEOTRUPIDAE,
HYBOSORIDAE) OF CHHATTISGARH, INDIA**

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ABSTRACT: The study presents taxonomic account of 52 species of dung beetles belonging to 22 genera, 12 tribes, 04 subtribes, 05 subfamilies and 03 families viz. Scarabaeidae, Geotrupidae and Hybosoridae from Chhattisgarh. Interactive identification keys to the subfamilies, tribes, genera and species were prepared by studying thoroughly the morphological characters of all the dung beetles specimens collected from the state. The subfamilies; Aphodiinae and Orphninae and the genera namely; *Aphodius*, *Bolboceras*, *Caccobius*, *Copris*, *Drepanocerus*, *Phaeochrous*, *Phalops*, *Rhyssemus*, *Sisyphus*, *Tiniocellus*, *Oniticellus*, *Onitis* and *Orphnus* are first time studied, illustrated and keyed from the state. Out of 52 species, 36 species are reported as addition to the dung beetle fauna of Chhattisgarh. Based on the collection data, the highest number of species were recorded from Barnawapara Wildlife Sanctuary (41 spp.) followed by Achanakmar-Amarkantak Biosphere Reserve (27 spp.) and Kanger Valley National Park (15 spp.).

KEY WORDS: Taxonomy, Chhattisgarh, dung beetles, identification keys, new records and distribution.

Dung beetles are a globally distributed insect group, with their high diversity in tropical forests and savannas (Hanski & Cambefort, 1991) and are member of family Scarabaeidae of insect's largest order Coleoptera. The beetles mostly feed on the micro-organism rich liquid component of mammalian dung and use the more fibrous material to brood their larvae (Halffter & Edmonds, 1982; Halffter & Matthews, 1966). Based on their nesting strategies dung beetles are broadly classified into three functional groups viz. rollers (telocoprid), tunnelers (paracoprid) and dwellers (endocoprid). Rollers form balls from a dung pat, which are rolled away and buried in the ground for feeding and breeding while tunnelers make underground vertical chambers in close proximity to the dung pat and construct their nest using the dung from pat whereas dwellers breed in dung pats itself (Halffter & Edmonds, 1982). Geotrupidae and most of the tribes of subfamily Scarabaeinae (Dichotomiini, Coprini, Onitini, Phanaeini, Onthophagini and Oniticellini) are tunnelers and the tribes Canthonini, Scarabaeini, Eucraniini, Sisyphini, Gymnopleurini and Eurysternini are considered to be rollers. Some Oniticellini along with members of subfamily Aphodiinae are dwellers and various Onthophagini and Dichotomiini are kleptoparasites. Through their dung consumption and relocation activities, dung beetles are involved in the ecological functions of parasite suppression, secondary seed dispersal, nutrient cycling and bioturbation (Andresen 2002, 2003; Nichols et al., 2008; Stokstad, 2004; Waterhouse, 1974).

Review of literature on the taxonomic studies of dung beetle fauna of Central India including Madhya Pradesh and Chhattisgarh revealed a series of publications namely; Arrow (1931), Balthasar (1963a,b, 1964), Kuitjen (1978,

1983), Krikken (1977, 1980), Newton & Malcolm (1985), Chandra (1999, 2000, 2002, 2008, 2009); Chandra & Ahirwar (2005a,b, 2007); Chandra & Singh (2004), Chandra & Singh (2010), Chandra & Gupta (2011a,b,c, 2012a,b) and Chandra et al. (2011, 2012).

Arrow (1931) in the 'Fauna of British India' devoted to Coprinae (Scarabaeinae) studied 352 species of dung beetles from different parts of India and adjacent countries. Later monographic works on the subfamilies Aphodiinae and Scarabaeinae of the Palaearctic and Oriental region were made by Balthasar (1963a,b, 1964) but the information on diversity of these beetles in Chhattisgarh was lacking. Chandra (2000) published an inventory of 96 species of scarab beetles of Madhya Pradesh and discussed distribution of these beetles in different protected areas of the state. Chandra & Ahirwar (2007) further published a comprehensive account of the scarab beetles of Madhya Pradesh and Chhattisgarh and recorded 124 species/subspecies belonging to 45 genera under 11 subfamilies, including 81 species of dung beetles. Recently, Chandra and Singh (2010) reported 22 species of the scarab beetles belonging to 11 genera and 6 subfamilies from Achanakmar Wildlife Sanctuary, Chhattisgarh.

A perusal of literature on the diversity of dung beetles of Central India (Madhya Pradesh and Chhattisgarh) revealed that there are very few reports on the taxonomic studies and distribution of dung beetles of the state, Chhattisgarh. Keeping in view, the present work is aimed to prepare the identification keys and reports on the distribution and diversity of these beetles from the state. Altogether, 432 specimens collected from Chhattisgarh, resulted in the identification of 52 dung beetle species belonging to 22 genera distributed in 12 tribes, 4 sub tribes, 5 subfamilies, and 03 families. The diagnostic characters and photographs of all the species and the identification keys to the subfamilies, tribes, genera and species were also provided.

MATERIALS AND METHODS

Study area: Chhattisgarh is the tenth largest state of India, constituted on 1st November, 2000 and occupying a total area of 135,000 sq. km. with its capital at Raipur. It lies between latitudes 17° to 23.7° N and Longitudes 83.38° to 84.0° E. The total forest area of the state is 59,772 sq. km. (44 %). The climate of Chhattisgarh is mainly tropical, humid and sub-humid. Chhattisgarh can be divided into three distinct regions viz. Northern region, Central plains region and Southern region. There are 3 national parks, 11 wildlife sanctuaries and one biosphere reserve covering about an area of 6615 sq. km. Being 3rd largest forest cover in India, the state covers about 13% forests with its area of about 59772 sq. km.

Collection of beetles: Specimens for the present study were collected by different scientific teams of Zoological Survey of India (ZSI), Jabalpur during the year's viz. 2004, 2005, 2008 and 2011. A total of 432 specimens were collected from three main protected areas of the state; Achanakmar-Amarkantak Biosphere Reserve (AABR), Achanakmar Wildlife Sanctuary (AMWLS), Kanger Valley National Park (KVNP) and Barnawapara Wildlife Sanctuary (BWLS) (Figure 1). Two major collection tools viz. light trapping and handpicking methods were used for adult beetle sampling. After collection, beetles were killed in Benzene vapors and preserved dry pinned. Voucher specimens were deposited in National Zoological Collection of Zoological Survey of India, Jabalpur Madhya Pradesh (India).

Examination of external male genitalia: Wherever required external male genitalia were studied for assigning the species identity. For that purpose male specimen was dissected out and abdomen was separated from the body and aedeagus was extracted from the abdomen. The genitalia was then cleaned and softened in a dish of hot water and further cleaned in a hot water solution of 10% KOH. If not damaged, the abdomen was again glued to the specimen. The aedeagus was washed in 95% ethanol and stored in a glass vial containing 70% alcohol.

Identification of beetle species: The morphological studies were undertaken using a binocular microscope (Leica M205 A) and the photographs of adult beetles were taken with the help of a digital camera attached to it. Dung beetles were identified with the help of available literature (Arrow, 1931; Balthasar, 1963a, 1963b, 1964; Krikken, 1980; Kuitjen, 1978, 1983). A total of 432 specimens were studied which resulted in the identification of 52 species belonging to 22 genera distributed in 12 tribes, 4 sub tribes, 5 subfamilies and three families. The classification adopted in the article is after Smith (2006).

**Key to subfamilies, tribes and genera of dung beetles
of Chhattisgarh based on studied specimens**

1. Antennae 11-segmented and club rounded; abdomen exceptionally short.....
.....Bolboceratinae Mulsant.....2
- Antennae with 10 or fewer segments and club generally elongate, rarely
cupuliform.....3
2. **BOLBOCERATINAE:** Anterior margin of eye canthus smooth; frontal
protrusion situated centrally or anterior in position nearby or on frontal clypeal
suture; head with a pair of transversely conical tubercles; metasternum with
anterior lobe narrowly separating middle coxae, anteriorly always with a small
spiniform protrusion.....*Bolbohamatum* Krikken
- Anterior margin of eye canthus with medial tubercle; frontal ridge posterior in
position and transversely crossing over half of distance and between eyes;
metasternum with anterior lobe narrowly separating middle coxae, anteriorly
without a small spiniform protrusion.....*Bolboceras* Kirby
3. Antennae usually 10-segmented sometimes 9-segmented; labrum and
mandibles generally projected and visible from above or not concealed by
clypeus.....4
- Antennae usually 9-segmented, sometimes 8-segmented; labrum and mandibles
concealed by clypeus.....6
4. Antennae 10-segmented and club cupuliform.....Hybosorinae Erichson.....5
- Antennae 10-segmented and club simple.....
.....Orphninae Erichson.....*Orphnus* Macleay
5. **HYBOSORINAE:** Clypeus with antero-lateral angles sub rectangular
somewhat protruding forward; pronotum with lateral sides deplanate; external
claws of fore tarsi in male cleft.....*Phaeochrous* Castelnau
- Clypeus with antero-lateral angles obtuse often rounded not protruding forward;
pronotum with lateral sides not deplanate; external claws of fore tarsi simple.....
.....*Hybosorus* Macleay

6. Elytra completely covering abdomen; hind tibiae with two terminal spurs; middle coxae almost contiguous; scutellum visible.....Aphodiinae Leach.....7
 - Elytra leaving pygidium exposed; hind tibia with single spur; middle coxae rather widely separated; scutellum often invisible.....Scarabaeinae Latreille.....8
7. **APHODIINAE**: Posterior tibiae with two oblique transverse carinae. Hind femora normal or slightly thickened, never very long. Pronotum simple, without transverse folds or furrows.....Aphodiini Leach....**Aphodius** Illiger
 - Posterior tibiae with out transverse carinae. Pronotum with transverse folds separated by furrows.....Psammodiini Mulsant.....**Rhyssemus** Mulsant
8. **SCARABAEINAE**: Middle coxae not far apart, converging strongly behind; middle tibiae with one terminal spur.....9
 - Middle coxae far apart and almost parallel; middle tibiae with two terminal spur.....12
9. Elytra not excised behind shoulders; front tarsi absent.....
Scarabaeini Latreille.....**Scarabaeus** Linnaeus
 - Elytra excised behind shoulders; front tarsi present.....
Gymnopleurini Lacordaire.....10
10. **GYMNOPLEURINI**: Sides of abdomen not carinate at base.....
**Gymnopleurus** Illiger
 - Sides of abdomen carinate at base.11
11. Clypeus in front distinctly bi-dentate.....**Paragymnopleurus** Shipp
 - Clypeus in front distinctly tetra-dentate.....**Garreta** Janssens
12. Posterior legs extremely long and tarsi filiform.....
Sisyphini Mulsant.....**Sisyphus** Latreille
 - Posterior legs not extremely long and tarsi more or less flat and tapering13
13. Second segment of labial pulp smaller than first, third always distinct.....
Coprini Leach....14
 - Second segment of labial pulp longer than first, third very small sometimes scarcely visible or absent.....16
14. **COPRINI**: Elytra with one lateral carina.....**Copris** Geoffroy
 - Elytra with two lateral carina..... 15
15. First segment of antennal club shining not pubescent.....**Helicopris** Hope
 - First segment of Antennal club entirely pubescent.....**Catharsius** Hope
16. Pronotum with two median basal depressions.....
Onitini Laporte..**Onitis** Fabricius
 - Pronotum without two median basal depressions.....17
17. Scutellum invisible; antennae 9-segmented.....Onthophagini Burmeister....18
 - Scutellum visible; antennae 8-segmented.....Oniticellini Kolbe.....20
18. **ONTHOPHAGINI**: Four posterior tarsi broadly dilated....**Phalops** Erichson
 -Four posterior tarsi not broadly dilated.....19

19. Terminal margin of fore tibiae at right angle to inner margin; anterior angles of pronotum hollowed beneath.....**Caccobius** Thomson
 - Terminal margin of fore tibiae generally oblique; anterior angles of pronotum not hollowed beneath.....**Onthophagus** Latreille

20. **ONITICELLINI**: Pygidium margined or transversely carinate at base; upper surface setose.....**Drepanocerina** van Lansberge.....**Drepanocerus** Kirby
 - Pygidium neither margined nor carinate at base; upper surface shining and without setae.....**Oniticellina** Kolbe....21

21. Pronotum densely and sub-rugosely punctate; elytral intervals minutely granulate.....**Tiniocellus** Peringuey
 - Pronotum smooth; elytral intervals convex and finely and closely punctate.....
**Oniticellus** Serville

TAXONOMIC ACCOUNT

Order: Coleoptera Linnaeus, 1758
 Suborder: Polyphaga Emery, 1886

Family Geotrupidae Latreille, 1802
 Subfamily Bolboceratinae Mulsant, 1842
 Tribe Eubolbitini Nikolajev, 1970

Key to the species of genus *Bolbohamatum*

Lateral tubercles of pronotum marginally situated.....***Bolbohamatum marginale*** Krikken
 Lateral tubercles of pronotum not marginally situated..***Bolbohamatum calanus*** (Westwood)

1. *Bolbohamatum marginale* Krikken, 1980 (Plate 1B)

Diagnostic characters: Dorsal outline of left mandible lobate. Clypeus with a pair of dentiform tubercles each placed against lateral margin. Pronotum with strongly approximated paramedian tubercles and a pair of lateral tubercles situated marginally. Median longitudinal zone and lateral declivities of pronotum densely and coarsely punctate while impression between paramedian and lateral tubercles virtually devoid of punctures.

Collection data: Bilaspur, AABR, 18.vi.2004 (1♂), light trap.

Geographic distribution: India: Chhattisgarh, Madhya Pradesh, Tamil Nadu, Karnataka and Uttarakhand. *Elsewhere:* West Pakistan.

2. *Bolbohamatum calanus* (Westwood, 1848) (Plate 1A)

Diagnostic characters: Cephalic tubercles dentiform, isolated and placed on clypeal disc. Dorsal outline of left mandible sinuate lobate. Pronotum with a pair of feebly developed, slightly transverse median tubercles with lateral callosities. Pronotum abundantly punctate and paramedian tubercles separated by less than inter-ocular distance.

Collection data: Raipur, BWLS, 01.vii.2011 (1♂), light trap.

Geographical distribution: India: Assam, Bihar, Chhattisgarh, Karnataka, Madhya Pradesh, Maharashtra, Tamil Nadu, West Bengal and Uttarakhand. *Elsewhere:* Bangladesh and Java.

Tribe Bolboceratini Mulsant, 1842

3. *Bolboceras quadridens* (Fabricius, 1781) (Plate 1C)

Diagnostic characters: Short, globular, dark brown, shining and lower surface with long brown setae. Pronotum strongly punctate in anterior and lateral sides, smooth in middle except on median longitudinal furrow with four tubercles in anterior half with middle ones a little closer. Elytra finely punctate striate with intervals smooth. Scutellum finely and sparsely punctate.

Collection data: Bilaspur, AABR, 19.vii.2004 (1♂); Raipur, BWLS, 01.vii.2011 (4♂), light trap.

Geographical distribution: India: Chhattisgarh, Haryana, Madhya Pradesh and Uttarakhand.

Elsewhere: Asia, Europe, North America and South America.

Remarks: New state record.

Family Hybosoridae Erichson, 1847

Subfamily Hybosorinae Erichson, 1847

4. *Hybosorus orientalis* Westwood, 1845 (Plate 1D)

Diagnostic characters: Black and shining with elongate and oval body. Anterior margin of labrum with 9 denticles. Head very closely and rugosely punctate anteriorly. Pronotum transversely strongly and sparsely punctate. Elytra with 9 complete striae between suture and shoulder and 7-8 complete striae between shoulders and elytral margins.

Collection data: Bastar, KVNP, 12.iv.2005 (1 ex.); Raipur, BWLS, 01.vii.2011 (1 ex.), light trap.

Geographical distribution: India: Bihar, Chhattisgarh, Haryana, Himachal Pradesh, Kerala, Madhya Pradesh, Maharashtra, Orissa, Punjab, Rajasthan, Sikkim, Tamil Nadu, Uttar Pradesh, Uttarakhand and West Bengal. Elsewhere: Afghanistan, Sri Lanka, Myanmar, Nepal and Pakistan.

5. *Phaeochrous emarginatus emarginatus* (Castelnau, 1833) (Plate 1E)

Diagnostic characters: Brown, oblong and rather flat. Head irregularly punctate anteriorly. Pronotum glabrous with lateral sides de-planate and with strong intermixed punctures. Elytra strongly punctate striate with intervals almost flat and smooth. Fore tibia tridentate, with first two apical teeth strongly developed and basal one less developed, serrated in between and above teeth. Fore tarsal claws cleft in male.

Collection data: Raipur, BWLS, 01.vii.2011 (2♂3♀), 02.vii.2011 (4♂7♀), 03.vii.2011 (5♂11♀) light trap.

Male female ratio: 32 specimens: 11 male: 21 female (0.52)

Geographical distribution: India: Chhattisgarh, Haryana, South India and Uttar Pradesh.

Elsewhere: Sri Lanka, Bhutan, Vietnam, Laos, China, Japan, Thailand, Malaysia, Indonesia, Papua, Philippines and Australia,

Remarks: New state record.

Family Scarabaeidae Latreille, 1802

Subfamily Orphninae Erichson, 1847

Tribe Orphnini Erichson, 1847

6. *Orphnus impressus* Westwood, 1846 (Plate 1F)

Diagnostic characters: Brown-black, smooth and shining. Clypeus with antero-lateral angles feebly produced. In male, head with a triangular horn and pronotum with three-fourth anterior part excavated while in female, head with a small tubercle in middle and pronotum with a weak depression in middle of the anterior part. Pronotum with lateral margins rounded and anterior angles acute. Elytra strongly, sparsely and irregularly punctate in longitudinal rows with striae indistinct.

Collection data: Raipur, BWLS, 01.vii.2011 (2♂3♀), light trap.

Geographical distribution: India: Chhattisgarh, Haryana and Uttar Pradesh.

Remarks: New state record.

7. *Orphnus parvus* Wiedemann, 1823 (Plate 1G)

Diagnostic characters: Brown-black, smooth and shining. In male, head with a triangular long horn and pronotum with three-fourth anterior part excavated while in female, head with a small tubercle in middle and pronotum with a weak depression in middle of the anterior part. Pronotum with lateral margins rounded and anterior angles acute. Scutellum broad and smooth. Elytra strongly, sparsely and irregularly punctate in longitudinal rows with striae distinct.

Collection data: Raipur, BWLS, 01.vii.2011 (2♂), light trap.

Geographical distribution: India: Chhattisgarh, Madhya Pradesh, Orissa and West Bengal.

Remarks: New state record.

Subfamily Aphodiinae Leach, 1815
 Tribe Aphodiini Leach, 1815
 Subtribe Aphodiina Leach, 1815

Key to the species of genus *Aphodius*

Head not tuberculate in middle; not uniformly coloured; pronotum black with lateral sides yellow; elytra yellow with black strips..... *Aphodius (Calaphodius) moestus* Fabricius
 Head tuberculate in middle; uniformly blackish-brown in colour.....
*Aphodius (Pharaphodius) crenatus* Harold

8. *Aphodius (Calaphodius) moestus* Fabricius, 1801 (Plate1H)

Diagnostic characters: Pale-yellow in colour. Head, disc of pronotum, scutellum, and elytra with fourth interval in last half and sixth in anterior two third black, smooth and moderately shining. Pronotum very finely and sparsely punctate. Elytra superficially punctate-striate. Scutellum elongate and pointed towards apex with surface coriaceous having few minute punctures at base.

Collection data: Bastar, KVNP, 12.vii.2005 (1♀), 13.iv.2005 (1♀); Raipur, BWLS, 01.vii.2011 (2♂), light trap and dung.

Male female ratio: 4 specimens: 2 male: 2 female (1.0)

Geographical distribution: India: Chhattisgarh, Haryana, Himachal Pradesh, Madhya Pradesh, Rajasthan and Uttar Pradesh.

Remarks: New state record.

9. *Aphodius (Pharaphodius) crenatus* Harold, 1862 (Plate1I)

Diagnostic characters: Black or brown in colour. Scutellum with median longitudinal depressed line. Punctures of elytral striae cutting into sides of intervals. Elongate, very convex and broadly excised in middle, frontal clypeal suture with a short slender horn in middle. Para-ocular lobes angulate on sides. Pronotum moderately strongly, very sparsely and unevenly punctate. Scutellum broad and almost smooth. Elytra very strongly deeply punctate-striate.

Collection data: Bastar, KVNP, 03.iv.2005 (1ex.), dung

Geographical distribution: India: Andaman and Nicobar Island, Chhattisgarh, Haryana, Himachal Pradesh, Madhya Pradesh and Uttar Pradesh.

Remarks: New state record.

Tribe Psammodiini Mulsant, 1842
 Subtribe Psammodiina Mulsant, 1842

10. *Rhyssemus germanus* (Linnaeus, 1767) (Plate 1J)

Diagnostic characters: Head transversely granulate. Vertex with two oblique ridges on either side. Clypeus strongly excised in middle with two obtuse well marked angles and lateral sides angulated. Pronotum with five transverse folds and four grooves, anterior fold a little raised and granulate, next two more prominent, smooth and shining, fourth one interrupted in middle with both inner ends bent towards base, with a groove in between crossing posterior fold, furrow transversely, coarsely punctate, with lateral margins angulated in middle and nearly straight anteriorly and posterior. Elytra strongly punctate striate.

Collection data: Raipur, BWLS, 02.vii.2011 (5ex.), light trap.

Geographical distribution: India: Andaman and Nicobar Island, Chhattisgarh, Haryana, Madhya Pradesh and Uttarakhand.

Remarks: New state record.

Subfamily Scarabaeinae Latreille, 1802
 Tribe Scarabaeini Latreille, 1802

The members of this tribe are characterized by the presence of; anterior margin of head, which is six dentate, comprising quadric-dentate anterior margin of clypeus and two lateral teeth formed by the anterior angles of genae, long legs for ball-rolling and fast running and absence of fore tarsi. It comprises about 150 species and species distributions are centered in the Afro tropical (130 species), Palaearctic (22 species) and Oriental regions (3 species in India and Sri Lanka), as well as in southwest Madagascar (3 species). Another two species are

shared between the Palaearctic and Oriental regions (India) and a further two between the Afro-tropical and Palaearctic.

11. *Scarabaeus (Kheper) sanctus* (Fabricius, 1798) (Plate 2K)

Diagnostic characters: Broadly oval, shining, strongly punctate above. Dark green above, with lower surface and legs nearly black. Head coarsely, densely and rugosely punctate. Clypeus quadri-dentate. Pronotum moderately convex and densely punctate. Elytra finely striate, with the intervals coarsely punctate.

Collection data: Bilaspur, AMWLS, 21.vi.2004 (2♀), 27.vi.2004 (1♂); Bastar, KVNP, 13.vii.2005 (1♀); Raipur, BWLS, 03.vii.2011 (2♂ 1♀), dung.

Male female ratio: 7 specimens: 3 male: 4 female (0.75).

Nesting strategy: Roller (Telocoprid).

Geographical distribution: India: Bihar, Chhattisgarh, Karnataka, Madhya Pradesh, Maharashtra and Orissa.

Tribe Sisyphini Mulsant, 1842

The members of this tribe are characterized by the presence of eight antennal segments, relatively short bodies that are laterally compressed and flattened, especially at sides of the pronotum, elytra that are broad proximally but attenuate posteriorly and the exceptionally long middle and hind legs. The tribe comprises 60 species in only three genera which are entirely ball-rolling species showing diurnal flight activity. Pairs co-operate in ball rolling with the male pushing using the back legs, and the female pulling using the front legs.

Key to the species of genus *Sisyphus*

Hind femur gradually dilated.....*Sisyphus (Sisyphus) longipes* (Olivier)
Hind femur abruptly dilated.....*Sisyphus (Sisyphus) neglectus* Gory

12. *Sisyphus (Sisyphus) longipes* (Olivier, 1789) (Plate 2L)

Diagnostic characters: Broadly oval, highly convex, black and shining body with very minute clothing of erect setae fairly close upon pronotum and very scanty upon head and elytra. Lower surface and posterior legs extremely long. Middle and hind femora very slender at basal part.

Collection data: Bastar, KVNP, 03.iv.2005 (3♂4♀); Raipur, BWLS, 03.vii.2011 (2♀), dung.

Male female ratio: 9 specimens: 3 male: 6 female (0.5).

Nesting strategy: Roller (Telocoprid).

Geographical distribution: India: Chhattisgarh, Madhya Pradesh, Maharashtra, Orissa, Tamil Nadu and West Bengal. *Elsewhere:* Sri Lanka and Myanmar.

Remarks: New state record.

13. *Sisyphus (Sisyphus) neglectus* Gory, 1833 (Plate 2M)

Diagnostic characters: Oval, highly convex, with very long and slender posterior legs. Black and opaque and fairly closely clothed above with minute brown, erect, hooked setae. Front margin of clypeus bears two fairly widely separated teeth, divided by a curvilinear excision, and outer teeth blunt and feeble. Head and pronotum moderately closely punctate.

Collection data: Bilaspur, AABR, 07.v.2005 (1♂1♀) dung.

Male female ratio: 2 specimens: 1 male: 1 female (1.0).

Nesting strategy: Roller (Telocoprid).

Geographical distribution: India: Chhattisgarh, Gujarat, Karnataka, Madhya Pradesh, Maharashtra, Orissa and Uttar Pradesh. *Elsewhere:* Pakistan.

Remarks: New state record.

Tribe Gymnopleurini Lacordaire, 1856

The members of this ball-rolling tribe are characterized especially by an emargination of lateral edge of each elytron that exposes the underlying pleural sclerites. The tribe comprises about 110 ball-rolling species in four relatively species-rich genera. A ball intended for brood construction is rolled away from the dung, possibly by a single beetle or by male/female pairs.

Key to the species of tribe *Gymnopleurini*

1. Sides of abdomen not carinate at base.....2
- Sides of abdomen sharply carinate at base.4
2. Clypeus bi-dentate. Pronotum with fifteen shining spot.....
.....*Gymnopleurus (Metagymnopleurus) gemmatus* Harold
- Clypeus quadri-dentate.....3
3. Upper surface without hairy clothing.....
.....*Gymnopleurus (Gymnopleurus) cyaneus* (Fabricius)
- Upper surface clothed with fine hairs.....
.....*Gymnopleurus (Metagymnopleurus) miliaris* (Fabricius)
4. Clypeus bi-dentate.....*Paragymnopleurus sinuatus* (Olivier)
- Clypeus quadri-dentate.....5
5. Pronotum finely and distinctly punctate..... *Garreta mundus* Wiedemann
- Pronotum without punctures but distinctly granular throughout.....
.....*Garreta dejeani* Castelnau

14. *Gymnopleurus (Metagymnopleurus) gemmatus* Harold, 1871 (Plate 2N)

Diagnostic characters: Oval, rather flat and densely setose above. Head densely granulate. Clypeus with anterior margin bi-dentate. Pronotum granulate with fifteen shining spots. Elytra with intervals irregularly rugose. Pygidium closely and rather strongly punctate.

Collection data: Raipur, BWLS, 03.vii.2011 (1♂) fresh cow dung.

Nesting strategy: Roller (Telocoprid).

Geographical distribution: India: Andhra Pradesh, Chhattisgarh, Maharashtra, West Bengal, Madhya Pradesh, Chhattisgarh, West Bengal, Karnataka and Tamil Nadu. *Elsewhere:* Sri Lanka.

15. *Gymnopleurus (Gymnopleurus) cyaneus* (Fabricius, 1798) (Plate 2O)

Diagnostic characters: Bright metallic green with oval and convex body and devoid of hairs above. Clypeus with anterior margin quadric-dentate. Pronotum very strongly, unevenly and sparsely punctate. Elytra deeply punctate-striate with intervals strongly and transversely punctate.

Collection data: Bilaspur, AABR, day collection, 07.vi.2004 (3♂3♀), 08.vi.2004 (4♂4♀), 17.vi.2004 (2♂), 18.vi.2004 (3♂2♀), 19.vi.2004 (2♂2♀), 27.vi.2004 (2♂, 1♀), 22.vii.2004 (1♀), 07.v.2005 (1♂ 2♀), 11.v.2005 (1♂), 15.v.2005 (1♂), 05.vi.2008 (1♂), 10.vi.2008 (1♂) 12.vi.2008 (2♂1♀), AMWLS, 18.vii.2005 (1♂1♀); Raipur, BWLS, 03.vii.2011 (2♂, 1♀), dung.

Male female ratio: 44 specimens: 26 male: 18 female (1.44).

Nesting strategy: Roller (Telocoprid).

Geographical distribution: India: Chhattisgarh, Haryana, Himachal Pradesh, Karnataka, Madhya Pradesh, Maharashtra, Rajasthan, Tamil Nadu, Uttar Pradesh and West Bengal. *Elsewhere:* Sri Lanka.

16. *Gymnopleurus (Metagymnopleurus) miliaris* (Fabricius, 1755) (Plate 2P)

Diagnostic characters: Broad, not very convex, closely clothed with grey setae. Head densely granulate. Clypeus with anterior margin quadri-dentate. Pronotum densely granulate, with black shining spots; a central one surrounded by a ring of five spots, and an outer one on either lateral side.

Collection data: Raipur, BWLS, 01.vii.2011 (1♂, 1♀) Fresh cow dung.

Male female ratio: 2 Specimens: 1 male: 1 female (1.0).

Nesting strategy: Roller (Telocoprid).

Geographical distribution: India: Chhattisgarh, Maharashtra, Madhya Pradesh, Jammu & Kashmir, Karnataka, Orissa, Uttar Pradesh and Uttarakhand.

Remarks: New state record.

17. *Paragymnopleurus sinuatus* (Olivier, 1789) (Plate 2Q)

Diagnostic characters: Opaque, dark red-coppery with antennal clubs bright yellow. Broad, oval not very convex. Clypeus with anterior margin bi-lobed. Pronotum finely rather closely punctate. Elytra with intervals flat and coriaceous.

Collection data: Bilaspur, AABR, 18.vi.2001 (1♂), 07.vi.2004 (1♂1♀), 17.vi.2004 (1♂1♀), 21.vi.2008 (4♀); AMWLS, light trap, 03.vi.2004 (1♂), 14.vi.2004 (1♂), 18.vii.2005 (1♀); Raipur, BWLS, day collection, 04.vii.2011 (1♂1♀) Nilgai (*Boselaphus tragocamelus*) and cow dung.

Male female ratio: 14 Specimens: 6 male: 8 female (0.75).

Nesting strategy: Roller (Telocoprid).

Geographical distribution: India: Chhattisgarh, Haryana, Himachal Pradesh, Karnataka, Madhya Pradesh, Maharashtra, Tamil Nadu, Uttar Pradesh, Uttarakhand and West Bengal.

18. *Garreta mundus* Wiedemann, 1819 (Plate 2R)

Diagnostic characters: Broadly oval and not very convex. Dull, opaque, olive-green, entirely devoid of hairs. Head finely granular, with clypeus produced into four lobes and ocular lobes slightly prominent. Pronotum finely punctate with the interstices minutely coriaceous. Elytra finely striate and intervals finely coriaceous and without punctures.

Collection data: Raipur, BWLS, 03.vii.2011 (1♀, 1♂); Nilgai (*Boselaphus tragocamelus*) and cow dung.

Male female ratio: 2 Specimens: 1 male: 1 female (1.0).

Nesting strategy: Roller (Telocoprid).

Geographical distribution: Bihar, Chhattisgarh and Madhya Pradesh. *Elsewhere:* South West China.

Remarks: New state record.

19. *Garreta dejeani* Castelnau, 1840 (Plate 2S)

Diagnostic characters: Dark coppery greenish and entirely dull above. Very broad and flat body. Head and pronotum closely and finely granulate. Clypeus rugose in front and produced into four lobes at front margin. Elytra rather faintly striate and intervals rather more finely and less closely granular.

Collection data: Raipur, BWLS, 04.vii.2011 (3♂); Nilgai (*Boselaphus tragocamelus*) and cow dung.

Nesting strategy: Roller (Telocoprid).

Geographical distribution: India: Chhattisgarh, Kerala, Maharashtra, Madhya Pradesh and Uttarakhand.

Remarks: New state record.

Tribe Coprini Leach, 1815

The tribe Coprini comprises shiny black, medium to large bodied species averaging 9.5 mm to 30.0 mm long in length. This tunneling tribe comprises a total of about 400 species in 10 valid genera distributed in all geographical regions of the world. The genera are classed as fast-burying tunnellers as dung is first rapidly removed into a tunnel, which is re-located into one or more deeper tunnels for nest construction. The members of the tribe show predominantly nocturnal flight activity.

20. *Heliocopris bucephalus* (Fabricius, 1775) (Plate 3T)

Diagnostic characters: Broad and nearly quadrate. Head rather small with a moderately slender, pointed, slightly curved, nearly erect horn at centre in male and with a cephalic carina in female. Pronotum unevenly rugose, vertical in front with a sharp straight carina, feebly toothed at each end and anterior angles very smooth and rather sharply produced in male while in female, anterior carina sharp and gently curved with its front angles blunt.

Collection data: Bilaspur, AABR, 17.vi.2004 (2♀), 18.vi.2004 (2♀), 20.vii.2004 (1♀), 27.vii.2004 (1♀), 22.vi.2004 (2♀), 19.vii.2004 (2♀), 26.vi.2004 (1♀), 12.vi.2008 (1♀); Raipur, BWLS, 01.vii.2011 (2 ♀) light trap and dung.

Nesting strategy: Tunnelers (paracoprid).

Geographical distribution: India: Bihar, Chhattisgarh, Haryana, Himachal Pradesh Madhya Pradesh, Maharashtra, Rajasthan, Uttar Pradesh and West Bengal. *Elsewhere:* Myanmar, Malay Peninsula and Java.

Key to the species of genus *Catharsius*

- Elytra not entirely opaque; male with a horn and two tubercles on pronotum.....
.....*Catharsius (Catharsius) pithecius* (Fabricius)
- Elytra entirely opaque; male without tubercles.2

2. Head with a small smooth area adjoining each eye and bears a conical median horn which is broad at base, sharp-pointed at tip and inclined a little forward.....
*Catharsius (Catharsius) molossus* (Linnaeus)
 - Head without a small smooth area adjoining each eye and bears a cephalic horn which is less erect and situated farther forward upon head.....
*Catharsius (Catharsius) sagax* (Quenstedt)

21. *Catharsius (Catharsius) pithecius* (Fabricius, 1775) (Plate 3U)

Diagnostic characters: Black, shining, shortly oval and very convex. Head nearly semicircular, clypeus feebly excised in middle bearing nearly straight slender horn just in front of eyes in male while female bears slightly acuminate transverse elevation. Pronotum bears sharp and conical protuberance on each side of median groove in male. Elytra finely but distinctly striate with scarcely perceptible punctures.

Collection data: Bilaspur, AABR, 21.vi.2004 (1♂), 30.vi.2004 (1♀), 25.vii.2004 (1♀), 23.vii.2005 (1♀), 09.vii.2004 (1♀), 15.vii.2005 (1♀); Raipur, BWLS, 01.vii.2011 (3♂6♀), 02.vii.2011 (2♂3♀), 03.vii.2011 (1♀) light trap and cow dung.

Male female ratio: 21 Specimens: 6 male: 15 female (0.40).

Nesting strategy: Tunnelers (paracoprid).

Geographical distribution: India: Andhra Pradesh, Bihar, Chhattisgarh, Himachal Pradesh, Karnataka, Madhya Pradesh, Maharashtra, Punjab, Rajasthan, Tamil Nadu and Uttar Pradesh. *Elsewhere:* Sri Lanka.

Remarks: New state record.

22. *Catharsius (Catharsius) molossus* (Linnaeus, 1758) (Plate 3V)

Diagnostic characters: Black, broadly oval, very convex and opaque. Head broad with ocular lobes densely and coarsely granular with a small smooth shining area adjoining inner margin of each eye. Pronotum densely granulate with a sharp declivity in front and upper surface of which forms a sharp ridge feebly convex in middle and curved with its extremities. Male having a conical median horn with broad and flattened base and short pointed tip while female bears a short pointed process.

Collection data: Bilaspur, AABR, 04.xi.2007 (1♂1♀), AMWLS, 17.vi.2004 (1♂1♀), 24.vii.2005 (1♂), 13.vi.2004 (1♀); Bastar, KVNP, 14.vii.2005 (1♂); Raipur, BWLS, 01.vii.2011 (1♂), 02.vii.2011 (1♂1♀) light trap and dung.

Male female ratio: 10 Specimens: 6 male: 4 female (1.5).

Nesting strategy: Tunnelers (paracoprid).

Geographical distribution: India: Andaman and Nicobar Island, Arunachal Pradesh, Assam, Bihar, Chhattisgarh, Haryana, Himachal Pradesh, Karnataka, Kerala Madhya Pradesh, Meghalaya, Orissa, Sikkim, Uttar Pradesh, Uttarakhand and West Bengal.

23. *Catharsius (Catharsius) sagax* (Quenstedt, 1806) (Plate 3W)

Diagnostic characters: Black, opaque, broad, oval and very convex. Head broad and clypeus closely transversely rugose with ocular lobes densely and coarsely granular and head lacking smooth shining area adjoining eyes. Pronotum granulate and elytra finely and lightly striate. Male rather narrower in shape with the cephalic horn rather less erect and situated farther forward upon the head. Upper margin of thoracic declivity straight.

Collection data: Bilaspur, AABR, 09.vii.2004 (1♀), 01.vii.2004 (1♂1♀), 25.vii.2004 (1♀), 17.vi.2004 (2♀), 22.vi.2004 (1♂2♀), 23.vii.2004 (1♀), 11.viii.2005 (1♂), 27.vi.2005 (1♀), 18.vi.2004 (1♀), AMWS, 14.vi.2004 (2♀), 18.vii.2005 (1♀); Bastar, KVNP, 12.vii.2005 (1♂1♀), 14.vii.2005 (1♂1♀); Raipur, BWLS, 01.vii.2011 (1♂2♀), 02.vii.2011 (3♀), 03.vii.2011 (3♀) light trap and dung.

Male female ratio: 29 Specimens: 6 male: 23 female (0.26).

Nesting strategy: Tunnelers (paracoprid).

Geographical distribution: India: Andhra Pradesh, Bihar, Chhattisgarh, Haryana, Himachal Pradesh, Madhya Pradesh, Maharashtra, Punjab, Tamil Nadu, Uttar Pradesh and West Bengal. *Elsewhere:* Bhutan.

Key to the species of genus *Copris*

1. Pronotum with sharply defined anterior declivity.....2
 - Pronotum without sharply defined anterior declivity.....3

2. Pygidium strongly punctuate; clypeus narrowly notched in middle and feebly bi-lobed.....
 *Copris (Copris) carinicus* Gillet
 - Pygidium not strongly punctuate; clypeus deeply notched in middle and strongly bi-lobed..
*Copris (Copris) repertus* Walker
3. Pronotum with a median groove; elytral intervals convex and finely punctate; clypeal margin with one process.....*Copris (Paracopris) imitans* Felsche
 - Pronotum without a median groove; elytral intervals very closely punctate; clypeal margin with two margin processes..... *Copris (Paracopris) surdus* Arrow

24. *Copris (Copris) carinicus* Gillet, 1910 (Plate 3X)

Diagnostic characters: Broadly oval, highly convex, black and shining. Pronotum closely punctate except in front and middle and with a deep median longitudinal groove posteriorly. Elytra deeply striate and intervals slightly convex and minutely and sparsely punctate. Pygidium fairly strongly and closely punctate. In male, head bears a laterally compressed horn in middle and upper edge of the declivity of pronotum bears two minute tubercles while in female a short transverse carina is present on head and pronotum bears a straight transverse carina.

Collection data: Bilaspur, AABR, 14.vi.2004 (1♂ 5♀) light trap.

Male female ratio: 6 Specimens: 1 male: 5 female (0.2).

Nesting strategy: Tunnelers (paracoprid).

Geographical distribution: India: Assam, Chhattisgarh, Madhya Pradesh, Manipur and Meghalaya. *Elsewhere:* Myanmar.

Remarks: New state record.

25. *Copris (Copris) repertus* Walker, 1858 (Plate 3Y)

Diagnostic characters: Broadly oval, highly convex, black and shining. In female head bears a short, transverse, elevated carina and clypeus deeply notched in middle with a slight lobe on each side of the notch. Pronotum very shining with a strong longitudinal groove in middle. Elytra lightly striate except at base and apex and intervals flat and very minutely and inconspicuously punctate.

Collection data: Bastar, KVNP, 02.iv.2005 (1♀), 04.iv.2005 (1♀), 09.iv.2005 (1♀), 12.iv.2005 (1♀) light trap.

Nesting strategy: Tunnelers (paracoprid).

Geographical distribution: India: Bihar, Chhattisgarh, Haryana, Himachal Pradesh, Karnataka, Madhya Pradesh, Maharashtra, Karnataka, Uttar Pradesh and Tamil Nadu. *Elsewhere:* Sri Lanka and Myanmar.

Remarks: New state record.

26. *Copris (Paracopris) imitans* Felsche, 1910 (Plate 3Z)

Diagnostic characters: Broadly oval, convex, black and shining. Clypeal margin produced upward as a short erect process in front of middle. In male, anterior clypeal process flat and pronotum without a distinct longitudinal groove, while in female anterior clypeal process carinate behind, triangular in section at base and pronotum with a longitudinal median groove in its posterior half. Elytra deeply striate and intervals convex with minute rather scattered punctures. Pygidium strongly punctate.

Collection data: Bilaspur, AMWLS, 09.vi.2004 (1♂), 14.vi.2004 (1♀), 22.vii.2005 (1♀), 13.vii.2005 (1♀), light trap and dung.

Male female ratio: 4 Specimens: 1 male: 3 female (0.33).

Nesting strategy: Tunnelers (paracoprid).

Geographical distribution: India: Chhattisgarh, Madhya Pradesh, Goa, Karnataka and Maharashtra.

Remarks: New state record.

27. *Copris (Paracopris) surdus* Arrow, 1931 (Plate 3AA)

Diagnostic characters: Black and opaque with elongate-oval body. Clypeus bi-dentate in front, smooth in middle, lightly punctate at sides and with ocular lobes strongly punctate. Head, with a deep transverse depression at back and a short conical horn. Pronotum finely and closely punctate. Elytra finely striate, intervals flat and densely punctate. Metasternal shield smooth with few scattered punctures in front and sides strongly punctate.

Collection data: Bilaspur, AABR, 23.vii.2004 (1♀); Raipur, BWLS, 03.vii.2011 (1♂ 2♀), light trap and dung.

Male female ratio: 4 Specimens: 1 male: 3 female (0.33).

Nesting strategy: Tunnelers (paracoprid).

Geographical distribution: India: Chhattisgarh, Karnataka, Madhya Pradesh, Maharashtra, Tamil Nadu, Uttar Pradesh and Uttarakhand. *Elsewhere*: Sri Lanka.

Remarks: New state record.

Tribe Onthophagini Burmeister, 1846

The members of tribe Onthophagini are characterized by the presence of; antennae with nine antennal segments, fore tibiae usually with four teeth and scutellum invisible. Species separation is based especially on, horns, ridges and clypeal indentation on head, sculpturing of pronotal disc, and on punctuation and/or granulation of head, thorax and abdomen. The tribe includes over 2200 species distributed in 40 genera of which 345 species are so far reported from the Oriental region.

28. *Caccobius (Caccophilus) unicornis (Fabricius, 1798)* (Plate 3AB)

Diagnostic characters: Broad oval, compact and moderately convex. Black or pitchy with clypeus, elytra and legs dark red. In male, head bears a short erect horn while in female clypeus, separated by a rounded carina from forehead. Pronotum evenly and moderately strongly punctate. Elytra finely striate and 7th striae strongly curved.

Collection data: Raipur, BWLS, 02.vii.2011 (3♂ 2♀) light trap.

Male female ratio: 5 Specimens: 3 male: 2 female (1.5).

Nesting strategy: Tunnelers (paracoprid).

Geographical distribution: India: Chhattisgarh, Haryana, Madhya Pradesh, Orissa, Uttar Pradesh, Uttarakhand and West Bengal. *Elsewhere*: Borneo, China, Java, Malay Peninsula, Philippines and Sri Lanka.

Remarks: New state record.

29. *Phalops divisus (Wiedemann, 1823)* (Plate-4AC)

Diagnostic characters: Bright metallic green. Elytra decorated with yellow triangular patch at outer edge just behind middle. Upper surface shining and clothed with fine erect yellow setae. Pronotum closely and evenly covered with fine granules. In male, clypeus smoother in front than behind and reflexed into a tongue-like lobe, a blunt sub angular process in front of eyes, and posterior part of head produced backwards into a broad lamina, terminating in two slightly separate but not divergent points while in females clypeus slightly bi-lobed.

Collection data: Bilaspur, AABR, 15.vii.2005 (1♂), 10.vi.2008 (1♀); Raipur, BWLS 01.vii.2011 (1♀) light trap and dung.

Male female ratio: 3 Specimens: 1 male: 2 female (0.5).

Nesting strategy: Tunnelers (paracoprid).

Geographical distribution: India: Chhattisgarh, Haryana, Himachal Pradesh, Kerala, Madhya Pradesh, Uttar Pradesh and Tamil Nadu. *Elsewhere*: Sri Lanka.

Remarks: New state record.

Key to the species of genus *Onthophagus*

1. Pronotum completely or partly granulate or rugose2
- Pronotum punctate without granules.....10
2. Pronotum entirely granulate or rugose without distinct punctures.....3
- Pronotum partly granulate or rugose with some punctures or smooth areas.....5
3. Granules of pronotum not closely packed; metallic in colour; male with a long horn protruding up to base of pronotum.....*Onthophagus (Onthophagus) spinifex* (Fabricius)
- Granules of pronotum closely packed.....4
4. Head gently rounded at sides; pronotum opaque.....
.....*Onthophagus (Onthophagus) griseosetosus* Arrow
- Head very strongly angular at sides; pronotum brilliant coppery red.....
.....*Onthophagus (Onthophagus) igneus* Vigors

5. Base of pronotum strongly produced in middle.....	
..... <i>Onthophagus (Proaogoderus) pactolus</i> (Fabricius)	
- Base of pronotum not strongly produced in middle	6
6. Front angles of pronotum not produced very blunt.....	
..... <i>Onthophagus (Onthophagus) ramosellus</i> Bates	
- Front angles of pronotum more or less produced.....	7
7. Elytra pale.....	8
- Elytra dark	9
8. Anterior angles of pronotum very sharp; male with two horns and with a tubercle in between them; armatures identical in both sexes.....	
..... <i>Onthophagus (Digitonthophagus) bonasus</i> (Fabricius)	
- Anterior angles of pronotum not very sharp; male with two horns and without a tubercle in between horns; armatures differ between sexes.....	
..... <i>Onthophagus (Digitonthophagus) gazella</i> (Fabricius)	
9. Not metallic; male with two long laterally compressed and curved horns.....	
..... <i>Onthophagus (Onthophagus) ramosus</i> (Wiedemann)	
- Slightly metallic; male with a short backwardly directed horn on posterior margin of head..	
..... <i>Onthophagus (Onthophagus) abreu</i> Arrow	
10. Upper surface without hair, smooth or with only very minute, scanty and inconspicuous setae.....	11
- Upper surface distinctly hairy or setose.....	16
11. Upper surface not entirely dark; elytra mottled; male bears a pair of erect horns upon line of clypeo-frontal suture.....	
..... <i>Onthophagus (Serrophorus) sagittarius</i> (Fabricius)	
- Upper surface entirely dark; male single horned or with two horns on posterior margin of head.....	12
12. Pronotum finely rather sparsely punctate.....	13
- Pronotum well rather closely punctate.....	14
13. Metallic green; vertex of male with a pair of horns arising close to eyes inclined slightly backward, curving outward and approaching one another at tips.....	
..... <i>Onthophagus (Onthophagus) dama</i> (Fabricius)	
- Black; in male, hind margin of head produced backward, forming a pair of short horns curving upward and outward and slightly approximating at tips; at base of each horn a short upwardly directed spine like tooth present.....	
..... <i>Onthophagus (Onthophagus) quadridentatus</i> (Fabricius)	
14. Elytral suture with a minute elevation near base; middle of posterior margin of head produced backward as a short pointed horn.....	
..... <i>Onthophagus (Colobonthophagus) hindu</i> Arrow	
- Elytral suture without a minute elevation near the base; head two horned.....	15
15. Pronotum closely and uniformly punctate; in male, posterior margin of head produced backward as broad smooth lamina, gently curving upward and its outer angles forming a pair of short horns which curves strongly each other.....	
..... <i>Onthophagus (Onthophagus) armatus</i> Blanchard	
- Pronotum unequally and unevenly punctate; posterior margin of head bears a pair of short straight horns and a tubercle on clypeo-frontal carina.....	
..... <i>Onthophagus (Onthophagus) agnus</i> Gillet	
16. Pronotum evenly and uniformly punctate.....	
..... <i>Onthophagus (Onthophagus) unifasciatus</i> (Schall.)	
- Pronotum unequally and unevenly punctate.....	20

20. Pygidium and lower surface more or less pale.....
*Onthophagus (Onthophagus) cervus* (Fabricius)
 - Pygidium and lower surface entirely dark...*Onthophagus (Onthophagus) ludio* Boucomont

30. *Onthophagus (Onthophagus) spinifex* (Fabricius, 1781) (Plate 4AD)

Diagnostic characters: Dark metallic blue, broadly oval, convex and clothed with fine yellow hairs. Males with a long slender horn on head. Clypeus coarsely and transversely rugose with anterior margin semicircular. Pronotum moderately strongly and closely granulate. Elytra with intervals finely and irregularly granulate.

Collection data: Raipur, BWLS, 03.vii.2011 (1♂), light trap.

Nesting strategy: Tunnelers (paracoprid).

Geographical distribution: West Bengal, Maharashtra, Bihar, Chhattisgarh, South India, Haryana and Madhya Pradesh. *Elsewhere:* Sri Lanka.

Remarks: New state record.

31. *Onthophagus (Onthophagus) griseosetosus* Arrow, 1931 (Plate 4AE)

Diagnostic characters: Oval, convex, dull black and upper surface clothed with small grey setae. Clypeus produced anteriorly with anterior margin rounded and strongly reflexed. Pronotum densely covered with strong granules. Elytra very lightly punctate-striate, with intervals bearing numerous aspirate punctures.

Collection data: Raipur, BWLS, 04.vii.2011 (1ex.) dung.

Nesting strategy: Tunnelers (paracoprid).

Geographical distribution: India: Chhattisgarh, Himachal Pradesh, Madhya Pradesh, Maharashtra, Tamil Nadu and Uttarakhand.

Remarks: New state record.

32. *Onthophagus (Onthophagus) igneus* Vigors, 1825 (Plate 4AF)

Diagnostic characters: Broad oval and very convex. Black with head (except anterior part of clypeus) and pronotum fiery crimson. Head flat, rather coarsely rugose and strongly angulate on each side. Pronotum very convex, closely and evenly covered with not very minute oval granules. Elytra finely striate with intervals flat and very minutely granular.

Collection data: AABR, Bilaspur, 23.vii.2004 (1♂).

Nesting strategy: Tunnelers (paracoprid).

Geographical distribution: India: Chhattisgarh, Karnataka and Tamil Nadu.

Remarks: New state record.

33. *Onthophagus (Proagoderus) pactolus* (Fabricius, 1787) (Plate 4AG)

Diagnostic characters: Deep metallic green, with sides of pronotum golden yellow. Oval and convex. Pronotum with base strongly proceed into a flat lobe in middle having a slight apical depression. Elytra finely and closely punctate. Male with a long slender slightly curved horn on head.

Collection data: Bilaspur, AABR, 21.vi.2004 (1♀); Raipur, BWLS, 01.vii.2011 (1♂), cow dung.

Male female ratio: 2 Specimens: 1 male: 1 female (1.0).

Nesting strategy: Tunnelers (paracoprid).

Geographical distribution: India: Chhattisgarh, Haryana, Karnataka, Madhya Pradesh, Maharashtra, Karnataka, Uttar Pradesh and Uttarakhand.

34. *Onthophagus (Onthophagus) ramosellus* Bates, 1891 (Plate 4AH)

Diagnostic characters: Black, opaque above and shining beneath. Broadly oval, compact and convex and devoid of hairs above and beneath. In male, head bears a pair of horns which diverge a little from base to apex, nearly straight, and scarcely curved, but feebly bi-sinuate. The sides of pronotum, a little depressed anteriorly. In females, horns very short and pronotum not depressed at sides. Elytra strongly punctate-striate, with intervals very minutely and sparsely punctate.

Collection data: Bilaspur, AABR, Day 23.vii.2004 (1♂), night, 13.vi.2008 (1♂3♀), 12.vi.2008 (1♂2♀); Bastar, KVN, 01.iv.2005 (1♂); Raipur, BWLS, Day 03.vii.2011 (1♂) light trap and cow dung.

Male female ratio: 10 Specimens: 5 male: 5 female (1.0).

Nesting strategy: Tunnelers (paracoprid).

Geographical distribution: India: Bihar, Chhattisgarh, Haryana, Himachal Pradesh, Madhya Pradesh, Maharashtra, Punjab, Rajasthan, Uttar Pradesh, Uttarakhand and West Bengal. *Elsewhere:* Pakistan.

Remarks: New state record.

35. *Onthophagus (Digitonthophagus) bonasus (Fabricius, 1775)* (Plate 4AI)

Diagnostic characters: Broadly oval and convex. Testaceous yellow with head and pronotum more dark greenish. Head with a pair of strongly diverging and backwardly directed horns with a tubercle in between them. Pronotum smooth in middle with few scattered granules and with a median groove having a slight tubercle on either side in anterior part. Elytra with intervals minutely and scarcely punctate.

Collection data: Bastar, KVNP, 27.ii.2004 (1♂), 13.iv.2005 (1♂); 10.iv.2005 (1♂); Bilaspur, AABR, 03.vi.2004 (1♂), 20.ii.2003 (1♂) light trap.

Nesting strategy: Tunnelers (paracoprid).

Geographical distribution: India: Bihar, Chhattisgarh, Himachal Pradesh, Karnataka, Orissa, Madhya Pradesh, Maharashtra, Punjab, Rajasthan, Tamil Nadu Uttar Pradesh, Uttarakhand and West Bengal. *Elsewhere:* Myanmar, Pakistan, Thailand and Vietnam.

36. *Onthophagus (Digitonthophagus) gazella (Fabricius, 1787)* (Plate 4AJ)

Diagnostic characters: Testaceous yellow with broad, oval, convex, smooth and shining body. Pronotum bears few granules in middle and fine scattered punctures behind. Elytra finely striate with intervals flat and impunctate. Vertex of male bears a pair of slender horns and pronotum with two minute prominences separated by a slight groove.

Collection data: Bilaspur, AABR, 03.vi.2004 (2♂1♀), 26.vi.2004 (1♀); Bastar, KVNP, 25.v.2005 (1♂), 24.v.2005 (1♀); Raipur, BWLS, 01.vii.2011 (19♂14♀), 02.vii.2011 (1♀), 03.vii.2011 (1♂) dung, 04.vii.2011 (3♀) light trap and cow dung.

Male female ratio: 44 Specimens: 23 male: 21 female (1.09).

Nesting strategy: Tunnelers (paracoprid).

Geographical distribution: India: Andhra Pradesh, Chhattisgarh, Delhi, Gujarat, Haryana, Himachal Pradesh, Karnataka, Madhya Pradesh, Maharashtra, Punjab, Rajasthan and Tamil Nadu. *Elsewhere:* Africa, Arabia, Madagascar, Pakistan and Sri Lanka.

37. *Onthophagus (Onthophagus) ramosus (Wiedemann, 1823)* (Plate 4AK)

Diagnostic characters: Opaque, black or indigo black, with broad, oval, compact, and moderately convex body. Head semicircular, entirely rugose and separated from clypeal region by a rounded carina, and vertex bearing a pair of backwardly inclined horns united by straight carina and a sharp tubercle in middle. Pronotum closely punctate and elytra finely striate and intervals flat and finely punctate.

Collection data: Bastar, KVNP, 12.vii.2005 (1♀), 13.vii.2005 (3♀), 14.vii.2005 (1♂1♀); Bilaspur, AABR, 24.vii.2004 (1♂); Raipur, BWLS, 01.vii.2011 (8♂5♀), 02.vii.2011 (1♂2♀), 03.vii.2011 (2♂ 4♀), light trap.

Male female ratio: 29 Specimens: 13 male: 16 female (0.81).

Nesting strategy: Tunnelers (paracoprid).

Geographical distribution: India: Bihar, Chhattisgarh, Haryana, Himachal Pradesh, Karnataka, Kashmir, Madhya Pradesh, Maharashtra, Orissa, Punjab, Uttarakhand, Uttar Pradesh and Tamil Nadu. *Elsewhere:* Thailand.

Remarks: New state record.

38. *Onthophagus (Onthophagus) abreu Arrow, 1931* (Plate 5AM)

Diagnostic characters: Narrowly oval and moderately convex. Deep chocolate-brown with a light coppery or greenish luster above and beneath. Upper surface clothed with yellowish setae. Head possess a short process in middle. Pronotum rather finely and closely punctate. Elytra finely striate and intervals flat and bear minute irregular granules.

Collection data: Raipur, BWLS, 04.vii.2011 (3♀), cow dung.

Nesting strategy: Tunnelers (paracoprid).

Geographical distribution: India: Chhattisgarh, Haryana, Kerala, Madhya Pradesh and Uttarakhand.

Remarks: New state record.

39. *Onthophagus (Serrophorus) sagittarius (Fabricius, 1775)* (Plate 5AN)

Diagnostic characters: Testaceous yellow, oval, moderately compact, fairly convex, not very shining. Devoid of hairs above and very scantily hairy beneath. In male clypeus bears a pair of short erect horns upon line of the clypeo-frontal suture while in female an erect horn present on vertex. Pronotum smooth in front and well punctate behind. Elytra strongly striate with intervals flat and sparsely punctate, except at sides.

Collection data: Jagdalpur, KVNP, 11.iii.2007 (1♀), 17.iii.2007 (1♀); Raipur, BWLS, 01.vii.2011 (3♂1♀) light trap.

Male female ratio: 6 specimens: 3 male: 3 female (1.0).

Nesting strategy: Tunnelers (paracoprid).

Geographical distribution: India: Chhattisgarh, Madhya Pradesh, Orissa, Uttar Pradesh and West Bengal. *Elsewhere*: Java, Myanmar, Malay Peninsula and South China.

Remarks: New state record.

40. *Onthophagus (Onthophagus) dama* (Fabricius, 1798) (Plate 5AO)

Diagnostic characters: Dark greenish, oval, compact, shining and without hairs above. Clypeus semicircular with margin more strongly raised. Pronotum finely and sparsely punctate. Elytral striae distinctly punctate with intervals flat. Vertex of male with a pair of horns and each having an external tooth beyond middle, while in female an erect, flattened and truncate tubercle present upon vertex.

Collection data: Bastar, KVNP, 12.iv.2005 (1♂), 14.vii.2005 (1♀); Bilaspur, AABR, 07.i.2007 (1♀), 04.vi.2004 (1♀), 12.vi.2008 (1♀), 13.vi.2008 (1♀); Raipur, BWLS, 01.vii.2011 (8♀) light trap and cow dung.

Male female ratio: 14 specimens: 1 male: 13 female (0.076).

Nesting strategy: Tunnelers (paracoprid).

Geographical distribution: India: Chhattisgarh, Haryana, Himachal Pradesh, Karnataka, Madhya Pradesh, Maharashtra, Orissa, Tamil Nadu, Uttar Pradesh and Uttarakhand. *Elsewhere*: Bhutan and Sri Lanka.

41. *Onthophagus (Onthophagus) quadridentatus* (Fabricius, 1798) (Plate 5AP)

Diagnostic characters: Black, smooth and shining, broad, oval and convex body. Head, smooth and shining with clypeal margin, rounded and strongly reflexed and separated from fore head by a slight rounded carina and hind margin having a pair of short horns. At base of each horn a short spine like tooth present in male. Pronotum finely and sparsely punctate and striae of elytra closely punctate.

Collection data: Bilaspur, AABR, 03.vi.2004 (2♂); Bastar, KVNP, 13.vii.2005 (1♂), 14.vii.2005 (1♂); Raipur, BWLS, 03.vii.2011 (1♂) light trap and cow dung.

Nesting strategy: Tunnelers (paracoprid).

Geographical distribution: India: Arunachal Pradesh, Bihar, Chhattisgarh, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Orissa, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh and West Bengal. *Elsewhere*: Sri Lanka.

Remarks: New state record.

42. *Onthophagus (Colobonthophagus) hindu* Arrow, 1931 (Plate 5AQ)

Diagnostic characters: Black, oval and not very convex. In male posterior margin of head produced backward as a sinuous sharp-pointed horn. Pronotum smooth and shining in front and slightly hollowed and almost vertical in middle. In male terminal spurs of front tibia very short and quadrate. Elytra shallowly but distinctly striate.

Collection data: Raipur, BWLS, 01.vii.2011 (1♂) light trap.

Nesting strategy: Tunnelers (paracoprid).

Geographical distribution: India: Chhattisgarh, Madhya Pradesh, Maharashtra and South India. *Elsewhere*: Sri Lanka.

Remarks: New state record.

43. *Onthophagus (Onthophagus) armatus* Blanchard, 1853 (Plate 5AR)

Diagnostic characters: Black without hair above. Broadly oval, compact and moderately convex. Clypeus finely punctate with its front margin strongly reflexed and bluntly bi-angulated in middle. Posterior margin of head produced backward as a broad smooth lamina, gently curving upward, its outer angles forming a pair of short horns, curving strongly towards each other. Pronotum finely and not closely punctate. Elytra deeply striate.

Collection data: Bilaspur, AABR, 12.vi.2008 (2♂), light trap.

Nesting strategy: Tunnelers (paracoprid).

Geographical distribution: India: Assam and Chhattisgarh. *Elsewhere*: Java Myanmar, Philippines, Sunda-Island, Taiwan, Marina islands, Guam and Vietnam.

44. *Onthophagus (Onthophagus) agnus* Gillet, 1925 (Plate 5AS)

Diagnostic characters: Oval and not very convex. Black and shining with elytra and pygidium sub opaque. Clypeus short, evenly but not very closely punctate, separated by a curved carina from forehead and bears a slight tubercle just behind carina. In males, posterior margin of head bears a pair of short straight horns. Pronotum strongly and not closely punctate, sloping in middle of front margin.

Collection data: Bilaspur, AABR, 03.vi.2004 (3♂), 22.vii.2004 (1♂), 29.vii.2004 (1♂), 12.vi.2008 (2♂), 13.vi.2008 (2♂); Raipur, BWLS, 04.vii.2011 (3♂), 03.vii.2011 (2♂), light trap and cow dung.

Nesting strategy: Tunnelers (paracoprid).

Geographical distribution: India: Chhattisgarh, Jharkhand, Madhya Pradesh, Maharashtra and West Bengal.

Remarks: New state record.

45. *Onthophagus (Onthophagus) unifasciatus (Schall., 1783)* (Plate 5AT)

Diagnostic characters: Oval, very convex, bluish green or coppery, elytra orange-yellow, with a transverse median band on 5th elytral interval at base. Pronotum longitudinally depressed in middle, both sides of depression strongly elevated, with three prominences in a transverse row in anterior half. Pronotum rather strongly and closely punctate. Both sexes without any horn.

Collection data: Raipur, BWLS, 01.vii.2011 (2♂, 6♀), dog dung.

Male female ratio: 8 specimens: 2 male: 6 female (0.33).

Nesting strategy: Tunnelers (paracoprid).

Geographical distribution: India: Bihar, Chhattisgarh, Jharkhand, Maharashtra, Tamil Nadu, Karnataka and Uttar Pradesh.

Remarks: New state record.

46. *Onthophagus (Onthophagus) cervus (Fabricius, 1798)* (Plate 6AU)

Diagnostic characters: Oval and moderately convex. Shining black with head, pronotum and lower surface, coppery or greenish-black. Elytra decorated with orange band forming a broad external margin, extending almost to suture posteriorly. Upper surface thinly clothed with minute yellow setae. Pronotum fairly strongly not very closely but unevenly punctate. Male with a pair of horns arising behind eyes.

Collection data: Raipur, BWLS, 01.vii.2011 (4♀).

Nesting strategy: Tunnelers (paracoprid).

Geographical distribution: India: Chhattisgarh, Madhya Pradesh, Maharashtra, Tamil Nadu and West Bengal. *Elsewhere*: Sri Lanka.

Remarks: New state record.

47. *Onthophagus (Onthophagus) ludio Boucomont, 1914* (Plate 5AU)

Diagnostic characters: Black and shining with pronotum and posterior part of head blue. Elytra bright yellow with black markings, consisting of a sutural line, a transverse patch crossing suture at base and an irregular transverse bar crossing it well beyond. Posterior margin of head produced backward as a triangular lamina and apex of which drawn into a short pointed horn curving upward. Pronotum a little hollowed between two tubercles.

Collection data: Bilaspur, AABR, 10.vi.2008 (1♂) light trap.

Nesting strategy: Tunnelers (paracoprid).

Geographical distribution: India: Maharashtra, Chhattisgarh and Tamil Nadu. *Elsewhere*: Sri Lanka.

Remarks: New state record.

Tribe Onitini Laporte, 1840

The members the tribe Onitini are characterized by nine segmented antennae, fore tibiae with four teeth and presence of a visible scutellum. The tribe includes about 210 tunneling species under 18 genera, distributed from Africa to the Palaearctic and Oriental zoogeographic regions. Onitini are mostly slow tunnellers and most, though not all, *Onitis* species are night-flyers.

Key to the species of genus *Onitis*

Green or coppery in colour; metasternum longitudinally grooved in front; front tibia armed with four feeble teeth.....*Onitis philemon* Fabricius
 Black or pitchy black in colour; metasternum flat not grooved in front; front tibia armed with three short teeth and a blunt terminal process.....*Onitis subopacus* Arrow

48. *Onitis philemon* Fabricius, 1801 (Plate 6AV)

Diagnostic characters: Green, coppery and oval. Head rugulose with ocular lobes rather smooth and clypeus parabolic and separated from forehead by an interrupted curved carina

and with a short transverse carina just before it and a conical tubercle just behind it. Pronotum strongly punctate without well marked median line. Elytra strongly striate and intervals very finely and sparsely punctate.

Collection data: Bilaspur, AABR, 04.xi.2007 (1♀), 06.xi.2007 (1♀); Bastar, KVNP, 14.vii.2005 (1♂), 09.iv.2005 (3♀), Raipur, BWLS, 01.vii.2011 (5♂10♀), light trap and cow dung.

Male and female ratio: 21 specimens: 6 male: 15 female (0.4)

Nesting strategy: Tunnelers (paracoprid).

Geographical distribution: India: Bihar, Chhattisgarh, Haryana, Himachal Pradesh, Karnataka, Madhya Pradesh, Maharashtra, Orissa, Punjab, Tamil Nadu, Uttar Pradesh, Uttaranchal and West Bengal. *Elsewhere*: Myanmar, Pakistan, Sri Lanka, Thailand and Vietnam.

Remarks: New state record.

49. *Onitis subopacus* Arrow, 1931 (Plate 6AW)

Diagnostic characters: Black or pitchy black with oval, rather narrow, smooth and moderately convex body. Head and pronotum shining and elytra rather dull. Pronotum closely punctate with incomplete smooth median line. Pygidium opaque and smooth. In male front tibia long, slender and strongly curved with a single or double tooth near base and armed with three short teeth and a blunt process, while in female front tibia short with four stout external teeth.

Collection data: Bilaspur, AABR, 12.vi.2008 (1♂), 26.vi.2004 (1♂); Raipur, BWLS, 01.vii.2011 (1♂) light trap and dung.

Nesting strategy: Tunnelers (paracoprid).

Geographical distribution: India: Assam, Bihar, Chhattisgarh, Haryana, Himachal Pradesh, Madhya Pradesh, Punjab, Tamil Nadu, Uttar Pradesh, Uttarakhand and West Bengal.

Remarks: New state record.

Tribe Oniticellini Kolbe, 1905

The members of tribe Oniticellini are characterized by the presence of eight segmented antennae and a small visible scutellum. Body shape elongate, usually quasi-rectangular but occasionally tapering posteriorly, with a slightly flattened, square appearance from an end-on view. The tribe includes about 180 described species comprising 15 genera assigned to three different subtribes viz. Helictopleurina, Drepanocerina and Oniticellina.

Subtribe Oniticellina Kolbe, 1905

50. *Oniticellus (Oniticellus) cinctus* (Fabricius, 1775) (Plate 6AX)

Diagnostic characters: Oblong-oval, not very convex. Smooth and shining black. Head shining and smooth and without any carina. Pronotum very smooth with a rather deeply impressed median longitudinal line upon its posterior half. Elytra deeply striate and each elytron with a pale yellow external border extending from behind shoulder to sutural angle.

Collection data: Raipur, BWLS, 01.vii.2011 (5♂3♀).

Male and female ratio: 8 specimens: 5 male: 3 female (1.66)

Nesting strategy: Dwellers (endocoprid).

Geographical distribution: India: Chhattisgarh, Haryana, Himachal Pradesh, Madhya Pradesh, Maharashtra, Tamil Nadu, Uttarakhand, Uttar Pradesh and West Bengal.

Remarks: New state record.

51. *Tiniocellus spinipes* (Roth, 1851) (Plate 6AY)

Diagnostic characters: Opaque and dark brown with elongate-oval and flat body. Head lacking carina, slightly shining in front and rugose behind. Pronotum densely and sub-rugosely punctate. Intervals of elytra flat and minutely granulate. Meta-sternum opaque and sparsely granulate at sides.

Collection data: Raipur, BWLS, 04.vii.2011 (4♀).

Nesting strategy: Dwellers (endocoprid).

Geographical distribution: India: Chhattisgarh, Himachal Pradesh, Karnataka, Madhya Pradesh, Maharashtra, Punjab, Tamil Nadu and Uttarakhand. *Elsewhere*: Africa and Uganda.

Remarks: New state record.

Subtribe Drepanocerina van Lansberge, 1875

52. *Drepanocerus setosus* (Wiedemann, 1823) (Plate 6AZ)

Diagnostic characters: Elongate-oval, dark-brown, opaque clothed with grey scale-like setae arranged mostly in longitudinal rows. Clypeus with anterior margin strongly bi-lobed. In male, pronotum with a large depression posteriorly, basal part with a slender obliquely forwarded horn, a little bifid at apex. Pronotum almost flat with shallow pits. Elytral intervals having more or less complete setose ridge.

Collection data: Raipur, BWLS, 01.vii.2011 (2♀1♂).

Nesting strategy: Dwellers (endocoprid).

Geographical distribution: India: Chhattisgarh, Himachal Pradesh, Haryana, Madhya Pradesh,

Maharashtra, Tamil Nadu, Uttarakhand and Uttar Pradesh. *Elsewhere:* Sri Lanka.

Remarks: New state record.

RESULTS AND DISCUSSION

Species diversity: The dung beetle fauna of Chhattisgarh is represented by three families of Laparostict scarabs' viz. Hybosoridae, Geotrupidae and Scarabaeidae. Altogether, 52 species of dung beetles belonging to 22 genera distributed in 12 tribes, 04 subtribes, 05 subfamilies and 03 families were studied from Chhattisgarh. The highest number of species were studied from family Scarabaeidae (47 species) followed by Geotrupidae (03 species) and Hybosoridae (02 species). Within Scarabaeidae, the subfamily Scarabaeinae constitutes 42 species, Aphodiinae 03 species and Orphninae 02 species respectively (Figure 2). *Onthophagus* includes 18 species under 05 sub genera was found to be the most species rich genus followed by *Copris* (04 species), *Catharsius* (03 species), *Aphodius*, *Bolbohamatum*, *Garreta*, *Gymnopleurus*, *Sisyphus*, *Orphnus* and *Onitis*, (each with 02 species). Other genera such as; *Bolboceras*, *Caccobius*, *Drepanocerus*, *Heliocopris*, *Hybosorus*, *Phaeochrous*, *Phalops*, *Paragymnoleurus*, *Rhyssemus*, *Scarabaeus*, *Tiniocellus* and *Oniticellus*, were each represented by only single species.

New records and distribution in studied protected areas: The study adds 36 new records to the faunal diversity of dung beetles of Chhattisgarh. The subfamily Aphodiinae and Orphninae were recorded for the first time from the state. The genera namely; *Aphodius*, *Bolboceras*, *Caccobius*, *Copris*, *Drepanocerus*, *Phaeochrous*, *Phalops*, *Rhyssemus*, *Sisyphus*, *Tiniocellus*, *Oniticellus*, *Onitis*, and *Orphnus*, are first time recorded from the state. Based on the beetle collections, the study reveals that the diversity of these beetles is quite variable in studied protected areas of the state. The highest number of species were reported from Barnawapara Wildlife Sanctuary (41 species) followed by Achanakmar-Amarkantak Biosphere Reserve (27 species) and Kanger Valley National Park (15 species).

Identification keys: Identification keys to the subfamilies, tribes, genera and species were prepared by studying thoroughly the morphological characters of the dung beetle specimens collected from the state. The morphology of head, pronotum, elytra, legs, and metasternum are the main diagnostic characters on which the identification of these beetles is based on.

Field observations: Survey of the state and data available from previous collections of dung beetles yielded many interesting facts about dung beetles from Chhattisgarh. In the present study, according to the mode of food manipulation, dung beetles belonging to all the three nesting strategies; rollers, tunnellers and

dwellers were recorded. The first category, which consists of ball rollers (telocoprid), was represented the genera; *Scarabaeus*, *Gymnopleurus*, *Paragymnopleurus*, *Garreta* and *Sisyphus*. The second group of dung-burying beetles, called as tunnelers (paracoprid), take the dung to the underground chamber at the end of the burrow and make it into a ball, include the genera; *Hybosorus*, *Phalops*, *Onthophagus*, *Heliocopris*, *Copris*, *Catharsius* and *Onitis*. The third group, called as dwellers or dung feeders (endocoprid) are represented by *Oniticellus*, *Tiniocellus*, *Drepanocerus* and *Aphodius*. Some of the genera, such as *Bolboceras*, *Bolbohamatum*, *Orphnus*, *Rhyssemus* and *Phaeochrous* undoubtedly feed on dung, but were collected from light sources. Most of the species were collected using light trap method, while there were some species which did not attract towards light and were exclusively captured from dung pats itself. *Drepanocerus setosus*, *Tiniocellus spinipes*, *Oniticellus (Oniticellus) cinctus*, *Onthophagus (O.) griseosetosus*, *Onthophagus (O.) unifasciatus*, *Onthophagus (Proagoderus) pactolus*, *Garreta dejeani*, *Garreta mundus*, *Gymnopleurus (Metagymnopleurus) gemmatus*, *Gymnopleurus (M.) miliaris*, *Gymnopleurus (Gymnopleurus) cyaneus*, *Paragymnopleurus sinuatus*, *Scarabaeus (Kheper) sanctus*, *Sisyphus (Sisyphus) longipes*, *Sisyphus (S.) neglectus* were among such species that were only collected from dung not from light source. On the other hand, the species belonging to *Bolboceras*, *Bolbohamatum*, *Orphnus* and some species of *Onthophagus* and *Rhyssemus* were collected mostly from light sources. While species under the genera; *Heliocopris*, *Copris*, *Catharsius*, *Onthophagus*, *Onitis*, *Hybosorus* and *Aphodius* were collected from both dung pats and light sources.

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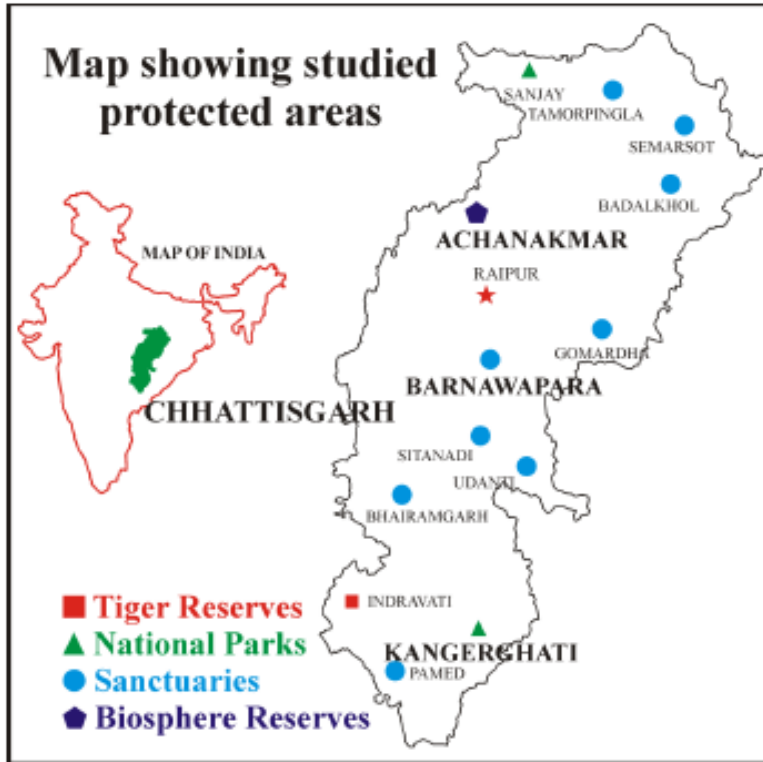


Figure 1. Map showing studied protected areas in Chhattisgarh (India).

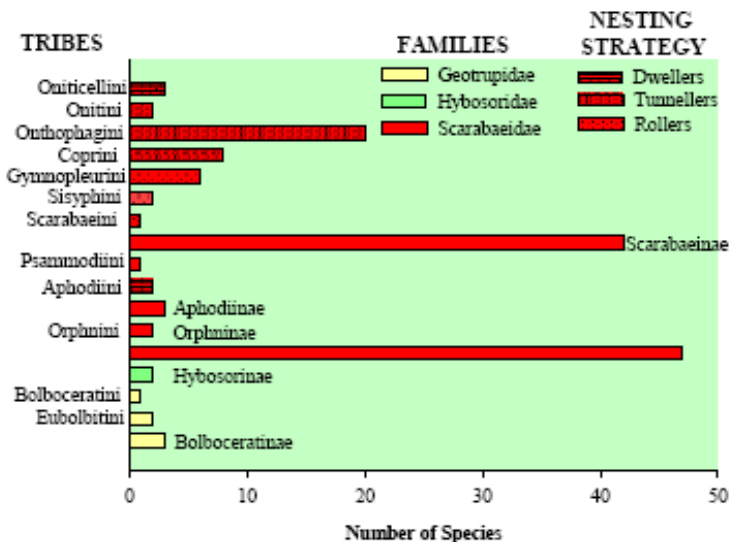


Figure 2. Graphical presentation of species diversity among subfamilies, tribes and families.



Plate 1. (A) *Bolbohamatum calanus* (Westwood), (B) *Bolbohamatum marginale* Krikken (C) *Bolboceras quadridens* (Fabricius), (D) *Hybosorus orientalis* Westwood, (E) *Phaeochrous emarginatus emarginatus* (Castelnaud), (F) *Orphnus impressus* Westwood, (G) *Orphnus parvus* Wiedemann, (H) *Aphodius (Calaphodius) moestus* Fabricius (I) *Aphodius (Pharaphodius) crenatus* Harold, (J) *Rhyssemus germanus* (Linnaeus).



Plate 2. (K) *Scarabaeus (Kheper) sanctus* (Fabricius), (L) *Sisyphus (Sisyphus) longipes* (Olivier), (M) *Sisyphus (Sisyphus) neglectus* Gory, (N) *Gymnopleurus (Metagymnopleurus) gemmatus* Harold, (O) *Gymnopleurus (Gymnopleurus) cyaneus* (Fabricius), (P) *Gymnopleurus (Metagymnopleurus) miliaris* (Fabricius), (Q) *Paragymnopleurus sinuatus* (Olivier), (R) *Garreta mundus* Wiedemann, (S) *Garreta dejeani* Castelnau.



Plate 3. (T) *Heliocopris bucephalus* (Fabricius), (U) *Catharsius (Catharsius) pithecius* (Fabricius), (V) *Catharsius (Catharsius) molossus* (Linnaeus), (W) *Catharsius (Catharsius) sagax* (Quenstedt), (X) *Copris (Copris) carinicus* Gillet, (Y) *Copris (Copris) repertus* Walker, (Z) *Copris (Paracopris) imitans* Felsche, (AA) *Copris (Paracopris) surdus* Arrow, (AB) *Caccobius (Caccophilus) unicornis* (Fabricius).



Plate 4. (AC) *Phalops divisus* (Wiedemann), (AD) *Onthophagus (Onthophagus) spinifex* (Fabricius), (AE) *Onthophagus (Onthophagus) griseosetosus* Arrow, (AF) *Onthophagus (Onthophagus) igneus* Vigors, (AG) *Onthophagus (Proagoderus) pactolus* (Fabricius), (AH) *Onthophagus (Onthophagus) ramosellus* Bates, (AI) *Onthophagus (Digitonthophagus) bonasus* (Fabricius), (AJ) *Onthophagus (Digitonthophagus) gazella* (Fabricius) (AK) *Onthophagus (Onthophagus) ramosus* (Wiedemann).



Plate 5. (AM) *Onthophagus (Onthophagus) abreui* Arrow, (AN) *Onthophagus (Serrophorus) sagittarius* (Fabricius), (AO) *Onthophagus (Onthophagus) dama* (Fabricius), (AP) *Onthophagus (Onthophagus) quadridentatus* (Fabricius), (AQ) *Onthophagus (Colobonthophagus) hindu* Arrow, (AR) *Onthophagus (Onthophagus) armatus* Blanchard, (AS) *Onthophagus (Onthophagus) agnus* Gillet, (AT) *Onthophagus (Onthophagus) unifasciatus* (Schall.), (AU) *Onthophagus (Onthophagus) ludio* Boucomont.

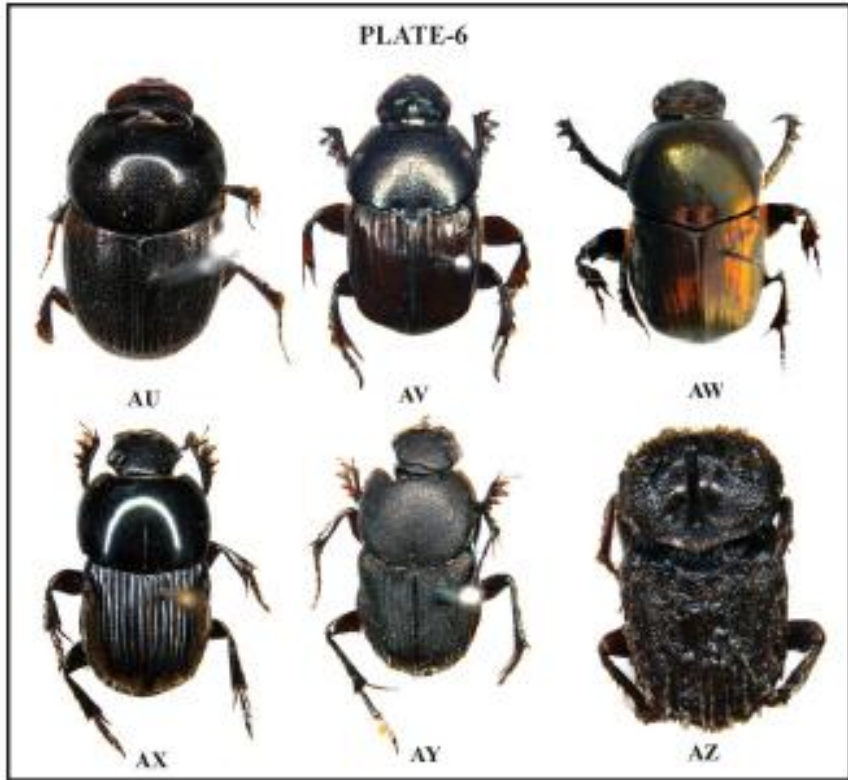


Plate 6. (AU) *Onthophagus (Onthophagus) cervus* (Fabricius), (AV) *Onitis philemon* Fabricius, (AW) *Onitis subopacus* Arrow, (AX) *Oniticellus (Oniticellus) cinctus* (Fabricius), (AY) *Tiniocellus spinipes* (Roth), (AZ) *Drepanocerus setosus* (Wiedemann).