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Scarab beetles (Coleoptera: Scarabaeoidea) of Barnawapara Wildlife Sanctuary, Chhattisgarh, India

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Abstract: A faunistic survey in Barnawapara Wildlife Sanctuary, Chhattisgarh revealed 43 species belonging to 25 genera, 16 tribes and eight subfamilies in two families, Hybosoridae and Scarabaeidae of the superfamily Scarabaeoidea. All the species are recorded for the first time from the Sanctuary, while 31 species are new to the scarab fauna of Chhattisgarh, India.

Keywords: Chhattisgarh, distribution, new records, scarab beetles.

Scarab beetles comprise a speciose group and are a conspicuous component of the beetle fauna of the world. Adults of these beetles are noticeable due to their relatively large size, bright colors, often elaborate ornamentation, and interesting life histories. Life histories of scarab beetles are incredibly diverse and include adults that feed on dung, carrion, fungi, vegetation, pollen, fruits, compost, or roots. On the other hand, some scarab beetles live in the nests of ants (myrmecophiles), in the nests of termites (termitophiles), or in the nests of rodents or birds. Dung beetle is a common name applied to beetles in the subfamilies Scarabaeinae and Aphodiinae, while most species in the subfamilies Melolonthinae, Dynastinae, Rutelinae, and Cetoniinae feed on plant products and are occasionally agricultural pests of various commercial crops. Dung beetles as a whole perform a series of ecological functions such as nutrient cycling, soil aeration (Mittal 1993), seed dispersal (Estrada & Estrada 1991; Larsen 2004), and regulation of enteric parasites and dung breeding dipteran pests (Borenmissza 1970; Fincher 1981).

The family Scarabaeidae includes about 91% of all scarabaeoids (except Lucanidae and Passalidae) and includes about 27,800 species worldwide. Within the family Scarabaeidae, the two subfamilies Aphodiinae and Scarabaeinae include approximately 6,850 species worldwide, and the subfamilies Orphninae, Melolonthinae, Dynastinae, Rutelinae, Cetoniinae, Trichiinae and Valginae include approximately 20,950 species (Ratcliffe & Jameson 2001).

Taxonomic studies on scarab beetles of the Oriental region, especially of India, was mostly carried out by Arrow (1910, 1917, 1931), Balthasar (1963a, 1963b, 1964), Mikšić (1977), Endrodi (1985), Kuijten (1983), Chandra (1986, 1999), Gupta (1986), Kabakob (2006) and Krikken (2009). Comprehensive research on scarab beetle diversity of central India was made by Chandra (2000, 2003), Chandra & Ahirwar (2007), Chandra &

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Singh (2010) and Chandra & Gupta (2011; 2012 a,b,c). Chandra (2000) published an inventory of 96 species of scarabaeid beetles from Madhya Pradesh. Later, concentrating on the scarab diversity of central India, Chandra & Ahirwar (2007) published a comprehensive account of scarab beetles of Madhya Pradesh and Chhattisgarh and recorded 124 species/subspecies belonging to 45 genera in 11 subfamilies. Recently, Chandra & Singh (2010) reported 22 species of scarab beetles belonging to 11 genera and six subfamilies from Achanakamar Wildlife Sanctuary, Chhattisgarh. While inventorying the faunal diversity of protected areas in Chhattisgarh, an extensive survey of the sanctuary was undertaken and scarab beetles were also collected. The collection yielded 43 species belonging to 25 genera, 16 tribes and eight subfamilies in two families, Hybosoridae and Scarabaeidae of the superfamily Scarabaeoidea, and all the species are new records for the Barnawapara Wildlife Sanctuary, Chhattisgarh (Images 1–5).

Materials and Methods

Study Area

Barnawapara Wildlife Sanctuary is located in Raipur district of Chhattisgarh. The sanctuary covers an area of 245km^2. The topography of the region comprises flat and hilly terrain with elevations ranging between 265–400 m. The flora of the Sanctuary is comprised primarily of tropical dry deciduous forest with teak, sal, bamboo, and *Terminalia*. The major wildlife attractions of the sanctuary are tigers, gliding squirrels, jackals, leopards, chinkara, chital, sambhar, jungle cat, wild dogs, gaur, and nilgai.

A faunistic survey of the sanctuary was conducted between 1 July 2011 and 4 July 2011 and beetles were collected from three different localities, viz., Tinsa Pathar (TP) (21^{0}28.861'N & 82^{0}27.831'E, elevation 461.46m); Barnawapara Camp (BC) (21^{0}24.00'N & 82^{0}25.314'E, elevation 303.88m); and Kari Dongri Forest (KDF) (21^{0}25.315'N & 82^{0}27.316'E, elevation 332.53m) under the leadership of the first author of the paper. Beetle specimens were collected using a light trap with a 160 watt mercury bulb as the light source and dung beetles were also collected from dung pats of dogs, cows and nilgai during the day, with the help of forceps. They were later identified using the literature (Arrow 1910, 1917, 1931; Janssens 1940, 1953; Balthasar 1963a, 1963b, 1964; Kuijten 1983; Chandra 1986; Gupta 1986; Krikken 2009) and matched with the reference collections present at the Zoological Survey of India (ZSI). Identified specimens were deposited in the National Zoological Collections of the ZSI. Species listed with asterisks are recorded for the first time from Chhattisgarh. Photographs were taken by second author.

Observations

Systematic account

Family**:** Hybosoridae Erichson, 1847

Subfamily: Hybosorinae Erichson, 1847

1. *Hybosorus orientalis* Westwood, 1845 (Image 1A)

Specimens examined: BC, 01.vii.2011 (1ex.).

Geographical distribution: India: Bihar, Chhattisgarh, Haryana, Himachal Pradesh, Kerala, Madhya Pradesh, Maharashtra, Odisha, Punjab, Rajasthan, Sikkim, Tamil Nadu, Uttar Pradesh, Uttarakhand and West Bengal; Afghanistan; Myanmar; Nepal: Tibet; Pakistan (Kuijten 1983; Kral & Löbl 2006).

Family: Scarabaeidae Latreille, 1802

I. Subfamily: Orphninae Erichson, 1847

Tribe Orphnini Erichson, 1847

2. *Orphnus impressus* Westwood, 1845* (Image 1B)

Specimens examined: BC, 01.vii.2011 (2 males, 3 females).

Geographical distribution: India: Chhattisgarh, Haryana, and Uttar Pradesh (Gupta 1986).

3. *Orphnus parvus* (Wiedemann, 1823)* (Image 1C)

Specimens examined: BC, 01.vii.2011 (2 males).

Geographical distribution: India: Chhattisgarh, Madhya Pradesh, Odisha, and West Bengal (Chandra & Ahirwar 2007).

II. Subfamily: Aphodiinae Leach, 1815

Tribe Aphodiini Leach, 1815

4. *Aphodius* (*Calaphodius*) *moestus* Fabricius, 1801* (Image 1D)

Specimens examined: BC, 01.vii.2011 (2 males).

Geographical distribution: India: Chhattisgarh, Haryana, Himachal Pradesh, Madhya Pradesh, Rajasthan, and Uttar Pradesh; Afghanistan; Bhutan; East-South Africa; Madagascar; Nepal; Sri Lanka; Indo-China (Stebnicka 1986, 1989; Chandra & Ahirwar 2007).

III. Subfamily: Scarabaeinae Latreille, 1802

Tribe Scarabaeini Latreille, 1802

5. *Scarabaeus* (*Kheper*) *sanctus* (Fabricius, 1798) (Image 1E)

Specimens examined: TP, 03.vii.2011 (2 males, 1 female).

Geographical distribution: India: Bihar, Chhattisgarh, Karnataka, Madhya Pradesh, Maharashtra, Odisha; Pakistan (Arrow 1931; Balthasar 1963a; Chandra &

Ahirwar 2007).

Tribe Sisyphini Mulsant, 1842

6. *Sisyphus* (*Sisyphus*) *longipes* (Olivier, 1789)* (Image 1F)

Specimens examined: TP, 03.vii.2011 (2 females).

Geographical distribution: India: Chhattisgarh, Madhya Pradesh, Maharashtra, Odisha, Tamil Nadu, and West Bengal; Sri Lanka; Myanmar (Arrow 1931; Balthasar 1963a; Chandra & Ahirwar 2007).

Tribe Gymnopleurini Lacordaire, 1856

7. *Gymnopleurus* (*Gymnopleurus*) *cyaneus* (Fabricius, 1798) (Image 1G)

Specimens examined: TP, 03.vii.2011 (2 males, 1 females).

Geographical distribution: India: Chhattisgarh, Haryana, Himachal Pradesh, Karnataka, Madhya Pradesh, Maharashtra, Rajasthan, Tamil Nadu, Uttar Pradesh, and West Bengal; Sri Lanka; Nepal (Arrow 1931; Balthasar 1963a; Bezdek 2006; Chandra & Ahirwar 2007).

8. *Gymnopleurus* (*Metagymnopleurus*) *gemmatus* Harold, 1871(Image 1I)

Specimens examined: TP, 03.vii.2011 (1 male).

Geographical distribution: India: Andhra Pradesh, Chhattisgarh, Maharashtra, West Bengal, Madhya Pradesh, Chhattisgarh, West Bengal, Karnataka, and Tamil Nadu; Afghanistan; Sri Lanka (Arrow 1931; Balthasar 1963a; Chandra & Ahirwar 2007).

9. *Gymnopleurus* (*Metagymnopleurus*) *miliaris* (Fabricius, 1775)* (Image 1H)

Specimens examined: TP, 03.vii.2011 (1ex.).

Geographical distribution: India: Chhattisgarh, Maharashtra, Madhya Pradesh, Jammu and Kashmir, Karnataka, Odisha, Uttar Pradesh, and Uttarakhand; Afghanistan; Bhutan; Pakistan; Sri Lanka (Arrow 1931; Balthasar 1963a; Bezdek 2006; Chandra & Ahirwar 2007).

10. *Garreta dejeani* (Castelnau, 1840)* (Image 2A)

Specimens examined: KDF, 04.vii.2011 (3 males).

Geographical distribution: India: Chhattisgarh, Kerala, Maharashtra, Madhya Pradesh, and Uttarakhand (Arrow 1931; Balthasar 1963a; Chandra & Ahirwar 2007).

11. *Garreta mundus* (Wiedemann, 1819)* (Image 2B)

Specimens examined: TP, 03.vii.2011 (1 female, 1 male).

Geographical distribution: India: Bihar, Chhattisgarh, and Madhya Pradesh; southwestern China (Arrow 1931; Balthasar 1963a; Bezdek 2006; Chandra & Ahirwar 2007).

12. *Paragymnopleurus sinuatus* (Olivier, 1789) (Image 2C)

Specimens examined: KDF, 04.vii.2011 (1 female, 1 male).

Geographical distribution: India: Chhattisgarh, Haryana, Himachal Pradesh, Karnataka, Madhya Pradesh, Maharashtra, Tamil Nadu, Uttar Pradesh, Uttarakhand and West Bengal; China; Myanmar; Nepal (Arrow 1931; Balthasar 1963a; Bezdek 2006; Chandra & Ahirwar 2007).

Tribe Coprini Leach, 1815

13. *Heliocopris bucephalus* (Fabricius, 1775) (Image 2D)

Specimens examined: BC, 01.vii.2011 (2 females).

Geographical distribution: India: Bihar, Chhattisgarh, Haryana, Himachal Pradesh Madhya Pradesh, Maharashtra, Rajasthan, Uttar Pradesh, and West Bengal; Afghanistan; China; Laos; Vietnam; Thailand; Myanmar; Malay Peninsula; Java (Arrow 1931; Balthasar 1963a; Löbl et al. 2006a; Chandra & Ahirwar 2007).

14. *Catharsius* (*Catharsius*) *molossus* (Linnaeus, 1758) (Image 2E)

Specimens examined: BC, 01.vii.2011 (1 male), 02.vii.2011 (1male, 1 female).

Geographical distribution: India: Andaman and Nicobar Island, Arunachal Pradesh, Assam, Bihar, Chhattisgarh, Haryana, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Meghalaya, Odisha, Sikkim, Uttar Pradesh, Uttarakhand, and West Bengal; Afghanistan; China; Nepal; Pakistan (Arrow 1931; Balthasar 1963a; Löbl et al. 2006a; Chandra & Ahirwar 2007).

15. *Catharsius* (*Catharsius*) *sagax* (Quenstedt, 1806) (Image 2F)

Specimens examined: BC, 01.vii.2011 (1male, 2 females), 02.vii.2011 (3 females), 03.vii.2011 (3 females).

Geographical distribution: India: Andhra Pradesh, Bihar, Chhattisgarh, Haryana, Himachal Pradesh, Madhya Pradesh, Maharashtra, Punjab, Tamil Nadu, Uttar Pradesh, and West Bengal; Bhutan (Arrow 1931; Balthasar 1963a; Löbl et al. 2006a; Chandra & Ahirwar 2007).

Image 1. (A) *Hybosorus orientalis* Westwood, (B) *Orphnus impressus* Westwood, (C) *Orphnus parvus* (Wiedemann), (D) *Aphodius* (*Calaphodius*) *moestus* Fabricius, (E) *Scarabaeus* (*Kheper*) *sanctus* (Fabricius), (F) *Sisyphus* (*Sisyphus*) *longipes* (Olivier), (G) *Gymnopleurus* (*Gymnopleurus*) *cyaneus* (Fabricius), (H) *Gymnopleurus*; (M.) *miliaris* (Fabricius), (I) *Gymnopleurus* (*Metagymnopleurus*) *gemmatus* Harold

16. *Catharsius* (*Catharsius*) *pithecius* (Fabricius, 1775)* (Image 2G)

Specimens examined: BC, 01.vii.2011 (3 males, 6 females), 02.vii.2011 (2 males, 3 females), 03.vii.2011 (1 female).

Geographical distribution: India: Andhra Pradesh, Bihar, Chhattisgarh, Himachal Pradesh, Karnataka, Madhya Pradesh, Maharashtra, Punjab, Rajasthan, Tamil

Image 2. (A) *Garreta dejeani* (Castelnau), (B) *Garreta mundus* (Wiedemann), (C) *Paragymnopleurus sinuatus* (Olivier), (D) *Heliocopris bucephalus* (Fabricius), (E) *Catharsius* (*Catharsius*) *molossus* (Linnaeus), (F) *Catharsius* (*C.*) *sagax* (Quenstedt), (G) *Catharsius* (*C.*) *pithecius* (Fabricius), (H) *Copris* (*Paracopris*) *surdus* Arrow, (I) *Caccobius* (*Caccophilus*) *unicornis* (Fabricius)

Nadu, and Uttar Pradesh; China; Pakistan; Sri Lanka (Arrow 1931; Balthasar 1963a; Löbl et al. 2006a).

17. *Copris* (*Paracopris*) *surdus* Arrow, 1931* (Image 2H)

Specimens examined: TP, 03.vii.2011 (1 male, 2 females).

Geographical distribution: India: Chhattisgarh, Karnataka, Madhya Pradesh, Maharashtra, Tamil Nadu, Uttar Pradesh, and Uttarakhand (Arrow 1931; Chandra & Ahirwar 2007).

Tribe Onthophagini Burmeister, 1846

18. *Caccobius* (*Caccophilus*) *unicornis* (Fabricius, 1798)* (Image 2I)

Specimens examined: BC, 02.vii.2011 (3 males, 2 females).

Geographical distribution: India: Chhattisgarh, Haryana, Madhya Pradesh, Odisha, Uttar Pradesh, Uttarakhand, and West Bengal; Borneo; China; Java; Japan; Malay; North Korea; South Korea; Sumatra; Philippines; Vietnam; Sri Lanka (Arrow 1931; Balthasar 1963b; Löbl et al. 2006b; Chandra & Ahirwar 2007).

19. *Onthophagus* (*Colobonthophagus*) *hindu* Arrow, 1931* (Image 3A)

Specimens examined: BC, 01.vii.2011 (1 male).

Geographical distribution: India: Chhattisgarh, Jammu and Kashmir, Madhya Pradesh, Maharashtra, and southern India; Afghanistan; Sri Lanka (Arrow 1931; Balthasar 1963b; Löbl et al. 2006b; Chandra & Ahirwar 2007).

20. *Onthophagus* (*Digitonthophagus*) *gazella* (Fabricius, 1787) (Image 3B)

Specimens examined: BC, 01.vii.2011 (19 males, 14 females), 02.vii.2011 (1 female), 03.vii.2011 (1 male) dung, 04.vii.2011 (3 females).

Geographical distribution: India: Andhra Pradesh, Chhattisgarh, Delhi, Gujarat, Haryana, Himachal Pradesh, Karnataka, Madhya Pradesh, Maharashtra, Punjab, Rajasthan, and Tamil Nadu; Australian region; Africa; Arabia; China; Egypt; Madagascar; Nepal, Neartic region, Neotropical region, Pakistan, and Sri Lanka (Arrow 1931; Balthasar 1963b; Löbl et al. 2006b; Chandra & Ahirwar 2007).

21. *Onthophagus* (*Onthophagus*) *abreui* Arrow, 1931*(Image 3C)

Specimens examined: KDF, 04.vii.2011 (3 females).

Geographical distribution: India: Chhattisgarh, Haryana, Kerala, Madhya Pradesh, southern India, and Uttarakhand (Arrow 1931; Balthasar 1963b; Chandra & Ahirwar 2007).

22. *Onthophagus* (*Onthophagus*) *cervus* (Fabricius, 1798)* (Image 3D)

Specimens examined: BC, 01.vii.2011 (1 male, 3 females).

Geographical distribution: India: Andaman and Nicobar Island, Chhattisgarh, Madhya Pradesh, Maharashtra, Tamil Nadu, and West Bengal; Sri Lanka. (Arrow 1931; Balthasar 1963b; Chandra & Ahirwar 2007).

23. *Onthophagus* (*Onthophagus*) *dama* (Fabricius, 1798)* (Image 3E)

Specimens examined: BC, 01.vii.2011 (8 females).

Geographical distribution: India: Chhattisgarh, Haryana, Himachal Pradesh, Karnataka, Madhya Pradesh, Maharashtra, Odisha, Tamil Nadu, Uttar Pradesh, and Uttarakhand; Bhutan; Nepal; Sri Lanka (Arrow 1931; Balthasar 1963b; Chandra & Ahirwar 2007).

24. *Onthophagus* (*Onthophagus*) *griseosetosus* Arrow, 1931* (Image 3F)

Specimens examined: KDF, 04.vii.2011 (1ex.).

Geographical distribution: India: Chhattisgarh, Himachal Pradesh, Madhya Pradesh, Maharashtra, Tamil Nadu, and Uttarakhand (Arrow 1931; Balthasar 1963b; Chandra & Ahirwar 2007).

25. *Onthophagus* (*Onthophagus*) *ramosus* (Wiedemann, 1823)* (Image 3G)

Specimens examined: BC, 01.vii.2011 (8 males, 5 females), 02.vii.2011 (1 male, 2 females), 03.vii.2011 (2 males, 4 females).

Geographical distribution: India: Bihar, Chhattisgarh, Haryana, Himachal Pradesh, Jammu and Kashmir, Karnataka, Madhya Pradesh, Maharashtra, Odisha, Punjab, Uttarakhand, Uttar Pradesh, and Tamil Nadu (Arrow 1931; Balthasar 1963b; Chandra & Ahirwar 2007).

26. *Onthophagus* (*Onthophagus*) *spinifex* (Fabricius, 1781)* (Image 3H)

Specimens examined: BC, 03.vii.2011 (1 male).

Geographical distribution: Bihar, Chhattisgarh, South India, Haryana, Madhya Pradesh, Maharashtra, and West Bengal; Nepal; Sri Lanka (Arrow 1931; Balthasar 1963b; Löbl et al. 2006b; Chandra & Ahirwar 2007).

27. *Onthophagus* (*Onthophagus*) *unifasciatus* (Schaller, 1783)* (Image 3I)

Specimens examined: BC, 01.vii.2011 (2 males, 6 females).

Geographical distribution: India: Bihar, Chhattisgarh, Jharkhand, Maharashtra, Tamil Nadu, Karnataka, and Uttar Pradesh; Sri Lanka (Arrow 1931; Balthasar 1963b).

28. *Onthophagus* (*Onthophagus*) *quadridentatus* (Fabricius, 1798)* (Image 4A)

Specimens examined: TP, 03.vii.2011 (1 male).

Geographical distribution: India: Arunachal Pradesh,

Image 3. (A) *Onthophagus* (*Colobonthophagus*) *hindu* Arrow, (B) *Onthophagus* (*Digitonthophagus*) *gazella* (Fabricius), (C) *Onthophagus* (*Onthophagus*) *abreui* Arrow, (D) *Onthophagus* (*O.*) *cervus* (Fabricius), (E) *Onthophagus* (*O.*) *dama* (Fabricius), (F) *Onthophagus* (*O.*) *griseosetosus* Arrow, (G) *Onthophagus* (*O.*) *ramosus* (Wiedemann), (H) *Onthophagus* (*O.*) *spinifex* (Fabricius), (I) *Onthophagus* (*O.*) *unifasciatus* (Schaller).

Bihar, Chhattisgarh, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Odisha, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh, and West Bengal; Sri Lanka (Arrow 1931; Balthasar 1963b).

29. *Onthophagus* (*Proagoderus*) *pactolus* (Fabricius, 1787) (Image 4B)

Specimens examined: KDF, 04.vii.2011 (1 male).

Geographical distribution: India: Chhattisgarh, Haryana, Karnataka, Madhya Pradesh, Maharashtra, Uttar Pradesh, and Uttarakhand; Nepal; Sri Lanka (Arrow 1931; Balthasar 1963b; Löbl et al. 2006b; Chandra & Ahirwar 2007).

30. *Onthophagus* (*Serrophorus*) *sagittarius* (Fabricius, 1775)* (Image 4C)

Specimens examined: BC, 01.vii.2011 (3 males, 1 female).

Geographical distribution: India: Chhattisgarh, Madhya Pradesh, Odisha, Uttar Pradesh, and West Bengal; Java; Myanmar; Malay; Peninsula; southern China (Arrow 1931; Balthasar 1963b; Löbl et al. 2006b; Chandra & Ahirwar 2007).

Tribe Onitini Laporte, 1840

31. *Onitis philemon* Fabricius, 1801* (Image 4D)

Specimens examined: BC, 01.vii.2011 (5 males, 10 females).

Geographical distribution: India: Bihar, Chhattisgarh, Haryana, Himachal Pradesh, Karnataka, Madhya Pradesh, Maharashtra, Odisha, Punjab, Tamil Nadu, Uttar Pradesh, Uttarakhand, and West Bengal; China; Laos; Myanmar; Nepal; Pakistan; Sri Lanka; Thailand; Vietnam (Arrow 1931; Balthasar 1963b; Bezdek & Krell 2006; Chandra & Ahirwar 2007).

32. *Onitis subopacus* Arrow, 1931* (Image 4E)

Specimens examined: BC, 01.vii.2011 (1 male).

Geographical distribution: India: Assam, Bihar, Chhattisgarh, Haryana, Himachal Pradesh, Jammu & Kashmir, Punjab, Tamil Nadu, Uttar Pradesh, Uttarakhand, and West Bengal; Afghanistan; Myanmar; Sri Lanka; Nepal; Pakistan (Arrow 1931; Balthasar 1963b; Bezdek & Krell 2006; Chandra & Ahirwar 2007).

Tribe Oniticellini Kolbe, 1905

33. *Oniticellus* (*Oniticellus*) *cinctus* (Fabricius, 1775)* (Image 4F)

Specimens examined: BC, 01.vii.2011 (5 males, 3 females).

Geographical distribution: India: Chhattisgarh, Haryana, Himachal Pradesh, Madhya Pradesh, Maharashtra, Tamil Nadu, Uttarakhand, Uttar Pradesh, and West Bengal; China; Laos; Vietnam (Arrow 1931; Janssens 1953; Balthasar 1963b; Bezdek &Krell 2006; Chandra & Ahirwar 2007).

34. *Tiniocellus spinipes* (Roth, 1851)* (Image 4G)

Specimens examined: KDF, 04.vii.2011 (4 females).

Geographical distribution: India: Chhattisgarh, Himachal Pradesh, Karnataka, Madhya Pradesh, Maharashtra, Punjab, Tamil Nadu, and Uttarakhand; Africa, Nepal, and Uganda (Arrow 1931; Balthasar 1963b; Bezdek & Krell 2006; Chandra & Ahirwar 2007).

35. *Tibiodrepanus setosus* (Wiedemann, 1823)* (Image 4H)

Specimens examined: BC, 01.vii.2011 (2 females, 1 male).

Geographical distribution: India: Chhattisgarh, Himachal Pradesh, Haryana, Madhya Pradesh, Maharashtra, Tamil Nadu, Uttarakhand, and Uttar Pradesh; Sri Lanka; Nepal (Arrow 1931; Balthasar 1963b; Bezdek & Krell 2006; Chandra & Ahirwar 2007).

IV. Subfamily: Rutelinae MacLeay, 1819

Tribe Anomalini Streubel, 1839

36. *Mimela macleayana* (Vigors, 1825)* (Image 4I)

Specimens examined: BC, 03.vii.2011 (1 male).

Geographical distribution: India: Andhra Pradesh, Chhattisgarh, Karnataka, Madhya Pradesh, and Maharashtra; Sri Lanka (Arrow 1917; Machatschke 1972; Chandra & Ahirwar 2007).

Tribe Adoretini Burmeister, 1844

37. *Adoretus duvauceli* Blanchard, 1850* (Image 5A)

Specimens examined: BC, 02.vii.2011 (1 male, 1 female).

Geographical distribution: India: Chhattisgarh, Haryana, Madhya Pradesh, Uttar Pradesh, and West Bengal (Arrow 1917; Machatschke 1972; Chandra & Ahirwar 2007).

V. Subfamily: Cetoniinae Leach, 1815

Tribe Gymnetini Kirby, 1827

38. *Clinteria klugi* (Hope, 1831) (Image 5B)

Specimens examined: TP, 03.vii.2011 (1 male, 3 females).

Geographical distribution: India: Chhattisgarh, Haryana, Karnataka, Madhya Pradesh, Maharashtra, Uttar Pradesh, Uttarakhand, Tamil Nadu, and West Bengal; Nepal; Sri Lanka (Arrow 1910; Mikšić 1977; Chandra & Ahirwar 2007).

I. Subfamily. Dynastinae MacLeay, 1819

Tribe Pentodontini Mulsant, 1842

39. *Phyllognathus dionysius* (Fabricius, 1792) (Image 5C)

Image 4. (A) *Onthophagus* (*O.*) *quadridentatus* (Fabricius), (B) *Onthophagus* (*Proagoderus*) *pactolus* (Fabricius), (C) *Onthophagus* (*Serrophorus*) *sagittarius* (Fabricius), (D) *Onitis philemon* Fabricius, (E) *Onitis subopacus* Arrow, (F) *Oniticellus* (*Oniticellus*) *cinctus* (Fabricius), (G) *Tiniocellus spinipes* (Roth), (H) *Tibiodrepanus setosus* (Wiedemann), (I) *Mimela macleayana* (Vigors).

Specimens examined: BC, 01.vii.2011 (1 male, 1 female).

Geographical distribution: India: Andhra Pradesh, Bihar, Chhattisgarh, Haryana, Himachal Pradesh, Karnataka, Madhya Pradesh, Maharashtra, Odisha, Sikkim, Tamil Nadu, Uttarakhand, and Uttar Pradesh; China (Taiwan); Nepal; Sri Lanka (Arrow 1910; Krell 2006; Chandra & Ahirwar 2007).

Image 5. (A) *Adoretus duvauceli* Blanchard, (B) *Clinteria klugi* (Hope), (C) *Phyllognathus dionysius* (Fabricius), (D) *Eophileurus platypterus* (Wiedemann) (E) *Schizonycha ruficollis* (Fabricius), (F) *Apogonia proxima* Waterhouse.

Tribe Phileurini Burmeister, 1847

40. *Eophileurus platypterus* (Wiedemann, 1823)* (Image 5D)

Specimens examined: BC, 01.vii.2011 (1 male).

Geographical distribution: India: Chhattisgarh, Haryana, Madhya Pradesh, Maharashtra, Tamil Nadu, Uttar Pradesh, and West Bengal (Arrow 1910; Chandra & Ahirwar 2007).

II. Subfamily: Melolonthinae MacLeay, 1819

Tribe Melolonthini Leach, 1819

41. *Holotrichia sculpticollis* Blanchard, 1850*

Specimens examined: BC, 01.vii.2011 (1 female).

Geographical distribution: India: Chhattisgarh, Madhya Pradesh, and Maharashtra (Chandra & Ahirwar 2007).

42. *Schizonycha ruficollis* (Fabricius, 1781)* (Image 5E)

Specimens examined: BC, 02.vii.2011 (1 male).

Geographical distribution: India: Bihar, Chhattisgarh, Madhya Pradesh, Odisha, Uttar Pradesh, Uttarakhand, and West Bengal (Chandra & Ahirwar 2007).

Tribe Diplotaxini Kirby, 1837

43. *Apogonia proxima* Waterhouse, 1877* (Image 5F)

Specimens examined: BC, 02.vii.2011 (1 male).

Geographical distribution: India: Andaman and Nicobar Island, Chhattisgarh, Haryana, Madhya Pradesh, and Uttar Pradesh (Chandra 1986; Bezdek 2004; Chandra & Gupta 2011).

Results and Discussion

Altogether 43 species of scarab beetles belonging to 25 genera, 16 tribes and eight subfamilies in two

families, viz., Hybosoridae and Scarabaeidae of the superfamily Scarabaeoidea were collected from Barnawapara Wildlife Sanctuary, Chhattisgarh (Images 1, 2, 3, 4 & 5). All the species are recorded for the first time from the sanctuary, while 31 species are new to the scarab fauna of Chhattisgarh, India. The dominant subfamily Scarabaeinae includes 31 species followed by Melolonthinae with three species, Rutelinae, Orphninae and Dynastinae with two species each, and subfamilies Aphodiinae, Hybosorinae and Cetoniinae consisting of a single species each.

Within the subfamily Scarabaeinae, seven tribes were represented, including the dung feeders that use all three nesting strategies, viz., rollers, tunnelers, and dwellers. The rollers, with eight species, are represented by three tribes: Scarabaeini (1 species), Sisyphini (1 species) and Gymnopleurini (6 species). The tunnelers constitute 19 species distributed in three tribes: Coprini (4 species), Onthophagini (13 species) and Onitini (2 species). The tribe Oniticellini, with 3 species, represents the dwellers in the Scarabaeinae beetle diversity of the sanctuary (Fig. 1).

In terms of species diversity among genera, the most diverse genus is *Onthophagus*, which includes 12 species. The species in the Scarabaeinae genera *Scarabaeus*, *Sisyphus*, *Gymnopleurus*, *Garreta*, *Paragymnopleurus*, *Copris*, *Tiniocellus*, and four species of *Onthophagus* (*O. pactolus*, *O. griseosetosus*, *O. quadridentatus*, and *O. abreui*) were mostly collected from well conserved forests at Tinsa Pathar and Kari Dongri during the day only. The highest diversity of scarab beetles was found near Barnawapara camp with 28 species followed by Tinsa pathar (9 spp.) and Kari Dongri Forest (6 spp.).

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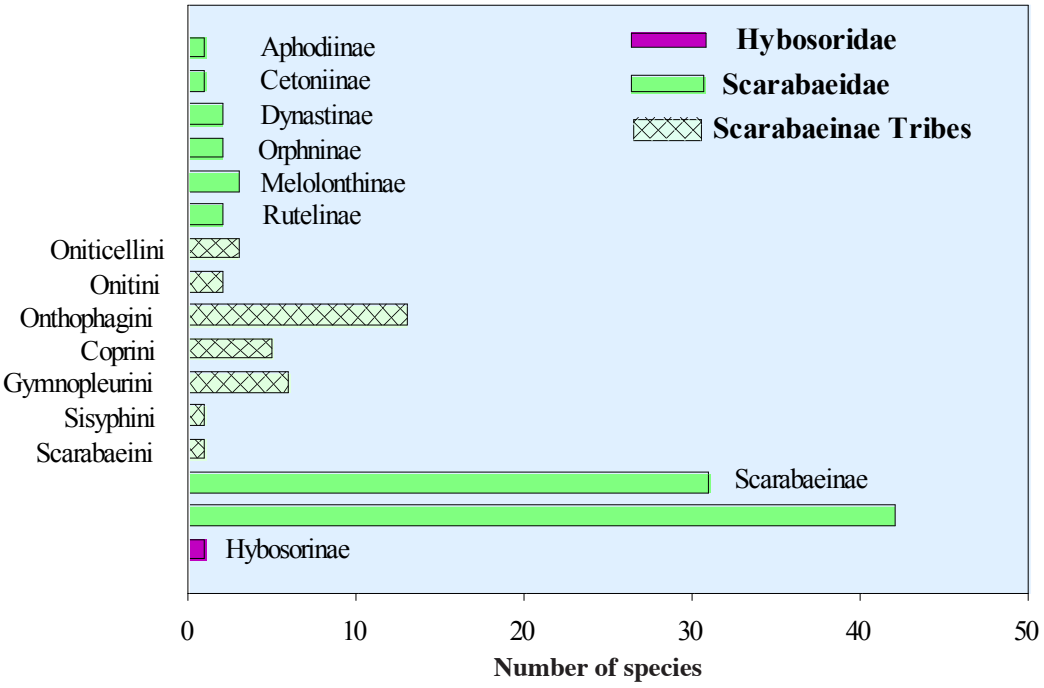

Figure 1. Species diversity of scarab beetles in different subfamilies, tribes and families of superfamily Scarabaeoidea

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