



AN ILLUSTRATED CHECKLIST OF DUNG BEETLES (COLEOPTERA: SCARABAEINAE) FROM THE PERIYAR TIGER RESERVE, KERALA, INDIA

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Abstract: An illustrated checklist of 36 species of dung beetles (Coleoptera: Scarabaeinae) from the Periyar Tiger Reserve in the southern Western Ghats is presented. Records of eight species endemic to the Western Ghats and a rare primitive old world dung beetle group, *Ochicanthon nitidus* (Paulian), from the forests of Periyar Tiger Reserve are provided.

Keywords: Forest dung beetles, *Ochicanthon nitidus*, Western Ghats, southern India.

The Periyar Tiger Reserve (PTR) Thekkady, named after the Periyar River is located in the southern Western Ghats of Kerala State. It was declared a tiger reserve in 1978 under the Project Tiger scheme and the core area as a national park in 1982 (Kerala Forest and Wildlife Department 2013). Seventy-five percent of PTR is covered with evergreen, semi-evergreen, moist deciduous forests, whereas grasslands make up the rest (25%) of the area. Sporadic patches of 'sholas', which are subtropical montane forests, occupy the crest and crevices of high altitude tracts, while clusters of bamboo occur along water logged areas (Peeyuskutty 2008; Kerala Forest and Wildlife Department 2013). Dense population of mammals, namely, Elephant *Elephas maximus*, Gaur *Bos gaurus*, Sambar Deer *Rusa unicolor*, Barking Deer

Muntiacus vaginalis, Nilgiri Langur *Semnopithecus johnii*, Bonnet Macaque *Macaca radiata*, Lion-tailed Macaque *Macaca silenus*, Wild Boar *Sus scrofa*, Tiger *Panthera tigris*, Leopard *Panthera pardus* are present in PTR (Kerala Forest and Wildlife Department 2013). Certainly, the presence of an abundant population of mammals would lead to highly diverse dung beetle fauna in PTR. Hence a checklist of dung beetles is attempted based on the classification system of Löbl & Smetana (2006), and Tarasov & Kabakov (2010). Data generated would provide baseline information on the composition of dung beetle fauna of the PTR and will be useful for comparison with faunal lists from other forests in the moist southern Western Ghats.

MATERIALS AND METHODS

Study region

The study was carried out at three sites namely, Uppupara, Poonkavanam and Anavachal in the Periyar Tiger Reserve, Thekkady, southern India. Low elevation shola (1200m), evergreen (1,000m) and deciduous forests (650m) are the vegetation types present in the study sites. The Reserve (9°15'–9°40'N & 76°55'–77°25'E) covers an area of 777km² (Kerala Forest and Wildlife

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Department 2013).

Dung beetles were collected with dung baited pitfall traps during pre-summer, summer and monsoon seasons during the period of 7 April 2009 to 18 November 2011 from the three forest types. Collected beetles were identified to species level using Arrow (1931) and Balthasar (1963) by the authors and were confirmed by comparing with the verified specimens in the collections of St. Joseph's College, Devagiri, Kozhikode. Identified specimens were deposited in the Coleoptera collections of St. Joseph's College, Devagiri, Kozhikode, and in the museum of Zoological Survey of India, Western Ghats Regional Station, Kozhikode. Photographs were taken using Nikon D50 digital camera attached to a trinocular stereo zoom microscope (Labomed ASZ-99TR) (Images 1–36). All species are listed with their valid names, authority, and the year of description, systematically by tribe, genus and subgenus in parenthesis. Species endemic to the Western Ghats are noted with the symbol '@'.

CHECKLIST

Scarabaeinae: Sisyphini

Sisyphus Latreille, 1807

Latreille, 1807, Gen. Crust. et Ins. II: 79; Gory, 1833, Monogr. Du genre Sisyphus: 1-15; Lacordaire, 1856, Gen. Col. III: 72; Reitter, 1892 (1893): 158, 164; Péringuey, 1900 (1901): 22, 94-103, 897, 898; Arrow, 1927a: 456-465; Arrow, 1931: 67; Balthasar, 1935: 52; Haaf, 1955: 341 ff.; Balthasar, 1963, I: 233.

Sisyphus (s.str.) *longipes* (Olivier, 1789) (Image 35)

Olivier, 1789, Entom. I, 3: 164, Tf. XIX, Fg. 177 (*Scarabaeus*); Arrow, 1927a: 457; Arrow, 1931: 71; Haaf, 1955: 347, 355; Balthasar, 1963, I: 239-240 (s.str).

Specimens examined: SJC-Z001, 2 exs, 5.x.2009, Poonkavanam, 9°28'N & 77°04'E, 1,000m, coll. T.R. Shiju.

Distribution: India (Karnataka; Kerala: Wayanad, Thekkady; Maharashtra; Odisha; Tamil Nadu: Ooty, Nilgiri Hills; West Bengal), Myanmar, Sri Lanka, Thailand.

Sisyphus (s.str.) *neglectus* Gory, 1833 (Image 36)

Gory, 1833, Monographie: 14; Arrow, 1927a: 460; Arrow, 1931: 73; Haaf, 1955: 348, 353; Balthasar, 1963, I: 242–243 (s.str).

Specimens examined: SJC-Z002, 2 exs, 5.x.2009, Poonkavanam, 9°28'N & 77°04'E, 1,000m, coll. T.R. Shiju.

Distribution: China, India (Karnataka; Kerala: Wayanad, Thekkady; Uttarakhand), Myanmar, Thailand

Canthonini

Ochicanthon Vaz-de-Mello, 2003

Boucomont, 1914, Ann. Soc. Ent. Fr. 83: 249; Arrow, 1931: 354; Paulian, 1945: 56; Balthasar, 1963, I: 269 (*Phacosoma*). Vaz-de-Mello, 2003, The Coleopterists Bulletin 57(1): 25–26 (*Ochicanthon*).

Ochicanthon nitidus (Paulian, 1980)@ (Image 9)

Paulian, 1980, Museum de Geneve 87(1): 59 (*Phacosoma*); Vaz-de-Mello, 2003, The Coleopterists Bulletin 57(1): 25–26 (*Ochicanthon*); Latha et al. 2011: 46.

Specimens examined: SJC-Z003, 2 exs, 25.x.2010, Uppupara, 9°27'N & 77°05'E, 1200m, coll. T.R. Shiju.

Distribution: India (Anamalai Hills: Valparai; Kerala: Nelliampathi; Mannavan shola; Wayanad; Thekkady)

Coprini

Catharsius Hope, 1837

Hope, 1837, Col. Man. I: 21; Burmeister, 1846, Gen. Ins. X, No. 27; Péringuey, 1900 (1901): 109, 323; Boucomont and Gillet, 1921:7; Arrow, 1931: 92; Balthasar, 1935: 62; Paulian, 1945: 68; Balthasar, 1963, I: 304.

Catharsius (s.str.) *molossus* (Linnaeus, 1758) (Image 2)

Linnaeus, 1758, Syst. Nat. Ed. X: 347 (*Scarabaeus*); Harold, 1877, 44; Boucomont & Gillet, 1921: 8; Arrow, 1931: 94; Balthasar, 1935: 65; Paulian, 1945: 69; Balthasar, 1963, I: 307–309 (s.str).

Specimens examined: SJC-Z004, 2 exs; 25.x.2010, Uppupara, 9°27'N & 77°05'E, 1200m, coll. T.R. Shiju.

Distribution: Afghanistan, Cambodia, China, India (Assam; Andaman Island; Bihar; Karnataka; Kerala: Wayanad, Nelliampathy, Thekkady; Odisha; Sikkim; Uttarakhand; West Bengal), Laos, Malaysia, Nepal, Sri Lanka, Sunda Islands, Taiwan, Thailand, Vietnam.

Copris Geoffroy, 1762

Geoffroy, 1762, Ins. Env. De Paris I:87; Burmeister, 1846, Genera Ins. Heft 10, Col. No. 27; Reitter, 1892 (1893): 39, 93; Péringuey, 1900 (1901): 110, 342; Boucomont and Gillet, 1921: 10; Arrow, 1931: 102; Balthasar, 1933: 263; Balthasar, 1935: 66; Janssens, 1939: 40; Paulian, 1945: 71; Balthasar, 1963, I: 317–319.

Copris (s.str.) *repertus* Walker, 1858 (Image 5)

Walker, 1858, Ann. Mag. Nat. Hist. (3) II: 208; Gillet, 1911: 290; Arrow, 1931:116; Balthasar, 1933: 272; Balthasar, 1935: 78; 1963, I: 351–352 (s.str).

Specimens examined: SJC-Z005, 4 exs, 7.iv.2009,

Poonkavanam, 9°28'N & 77°04'E, 1,000m, coll. T.R. Shiju.

Distribution: China, India (Bihar; Mumbai; Chattisgarh; Karnataka; Kerala: Malabar, Nelliampathy, Palghat, Thekkady, Wayanad, Madhya Pradesh, Maharashtra: Mumbai, Tamil Nadu: Nilgiri Hills, Anamalai Hills), Sri Lanka, Thailand.

***Paracopris* Balthasar, 1939**

Balthasar, 1939a, Redia XXV: 2; Paulian, 1945: 72; Balthasar, 1963, (*Copris*), I: 329–331; *Paracopris* (Genus) Löbl & Smetana, 2006: 153; Sabu et al. 2011: 32.

***Paracopris cribratus* (Gillet, 1927) (Image 3)**

Specimens examined: SJC-Z006, 3 exs; 25. x. 2010, Poonkavanam, 9°28'N & 77°04'E, 1,000m, coll. T.R. Shiju.

Gillet, 1927, Ann. Soc. Ent. Belg. LXVII: 253; Arrow, 1931: 129; Balthasar, 1963, (*Copris*), I: 373; *Paracopris* (Genus) Löbl & Smetana, 2006: 153; Sabu et al. 2011: 32.

Distribution: India (Gujarat; Karnataka; Kerala: Nelliampathy, Thekkady; Tamil Nadu: Anamalai Hills)

***Paracopris davisoni* (Waterhouse, 1891)[®] (Image 4)**

Specimens examined: SJC-Z007, 2 exs, 25.ix.2011, Poonkavanam, 9°28'N & 77°04'E, 1,000m, coll. T.R. Shiju.

Waterhouse, 1891, Ann. Mag. Nat. Hist. (6), VII: 520; Arrow, 1931: 132; Balthasar, 1963, (*Copris*), I: 373; *Paracopris* (Genus) Löbl & Smetana, 2006: 153; Sabu et al. 2011: 32.

Distribution: India (Karnataka; Kerala: Nelliampathy, Peerumedu, Travancore, Thekkady, Wayanad; Tamil Nadu: Nilgiri Hills, Palani Hills).

***Paracopris signatus* (Walker, 1858) (Image 6)**

Specimen examined: SJC-Z008, 1 ex, 25.ix.2011, Poonkavanam, 9°28'N & 77°04'E, 1,000m, coll. K.V. Vinod.

Walker, 1858, Ann. Mag. Nat. Hist. (3), 2: 208; Boucomont & Gillet, 1921: 12; Arrow, 1931: 131; Paulian, 1945: 74; Balthasar, 1963, (*Copris*), I: 371; *Paracopris* (Genus) Löbl & Smetana, 2006: 153; Sabu et al. 2011: 32.

Distribution: India (Karnataka; Kerala: Mahe, Travancore, Thekkady, Wayanad; Maharashtra; Tamil Nadu: Coimbatore), Laos, Sri Lanka, Vietnam.

Onthophagini

***Caccobius* Thomson, 1863**

Thomson, 1863, Skand. Col. V: 34; Harold, 1867, Col. Hefte I: 5; Harold, 1867, 1.c.II: 1; Mulsant, 1871: 75; Jekel, 1872, Rev. Mag. Zool.: 405; Waterhouse, 1875, Trans. Ent. Soc. London: 73; Reitter, 1892 (1893): 39, 91; d'Orbigny, 1898; 127; Péringuey, 1900 (1901): 275; Péringuey, 1908: 565; d'Orbigny, 1913: 17; Boucomont

& Gillet, 1921: 27; Arrow, 1931: 141; Portevin, 1931: 39; Porta, 1932: 412; Matsumura, 1936: 61; Paulian, 1945: 81; Balthasar, 1949: 1; Balthasar, 1963, II: 113.

-subg. *Caccophilus* Jekel, 1872, 1.c: 410; d'Orbigny, 1898: 130; d'Orbigny, 1913: 21; Balthasar, 1935e: 183; Balthasar, 1949: 7.

***Caccobius* (*Caccophilus*) *meridionalis* Boucomont, 1914 (Image 1)**

Specimens examined: SJC-Z009, 2 exs, 25.x.2010, Poonkavanam, 9°28'N & 77°04'E, 1,000m, coll. K.V. Vinod.

Boucomont, 1914, Ann. Mus. Civ. Genova VI (XLVI): 239; Arrow, 1931: 142, 148; Balthasar, 1949: 8, 36; Balthasar, 1963, II: 138.

Distribution: India (Karnataka; Kerala: Mahe, Nelliampathy, Thekkady, Wayanad; Maharashtra; Tamil Nadu: Anamalai Hills, Nilgiri Hills), Sri Lanka.

***Onthophagus* Latreille, 1802**

Latreille, 1802, Hist. Nat. Crust. Ins. III: 141; Mulsant, 1842: 102; Erichson, 1848. III: 762; Lacordaire, 1856. Gen. Col. III: 107; Mulsant-rey, 1871: 78; Reitter, 1892 (1893): 47; d'Oribgny, 1898: 132; d'Oribgny, 1900: 289; Peringuey, 1900 (1901): 168; Peringuey, 1908: 560; Reitter, 1909: 325; Bedel, 1911; 25; d'Oribgny, 1913: 49; 1915: 378 (Suppl.); Boucomont, 1914: 238; Boucomont & Gillet, 1921: 1; Boucomont, 1924a: 669; Arrow, 1930: 159; Portevin, 1931: 42; Porta, 1932: 408; Balthasar, 1935d: 303; Savcenko, 1938; 46, 136; Paulian, 1941: 66; Paulian, 1945: 85; Endrödi, 1956: 94; Tesař, 1957: 127; Balthasar, 1963, II: 153.

-subg. *Proagoderus* Lansberge, 1883, Not. Leyd. Mus. V: 14; d'Oribgny, 1913: 493; Boucomont, 1914: 261; Marcus, 1917, A (1919): 1; Marcus, 1920, D. Ent. Zeitschr: 177, 1921, ibid. 163; Balthasar, 1963, II: 158.

-*Tauronthophagus* Shipp, 1895, Entomologist XXVIII: 179.

-subg. *Serrophorus* Balthasar, 1935, Fol. Zool. Hydrob. VIII: 306; Paulian, 1945: 86; Balthasar, 1963, II: 160.

-subg. *Micronthophagus* Balthasar, 1935, 1.c.: 306; Paulian 1945: 86

-subg. *Colobonthophagus* Balthasar, 1935, 1.c.: 308; Paulian, 1945, 87; Balthasar, 1963, II: 164.

-subg. *Paraphanaeomorphus* Balthasar, 1959, 1.c.: 465; Balthasar, 1963, II: 162

-subg. *Matashia* Matsumura, 1938, Ins. Matsum. XII: 63

-subg. *Macronthophagus* Ochi, 2003, Gi it Ent. 262



Images 1–12. Dung beetle species collected from the Periyar Tiger Reserve of the southern Western Ghats:

1 - *Caccobius meridionalis*, 2 - *Catharsius molossus*, 3 - *Paracopris cribratus*, 4 - *Paracopris davisoni*, 5 - *Copris repertus*, 6 - *Paracopris signatus*, 7 - *Tibiodrepanus setosus*, 8 - *Liatongus indicus*, 9 - *Ochicanthon nitidus*, 10 - *Onthophagus amphicoma*, 11 - *O. amphinasus*, 12 - *O. andrewesi*.

***Onthophagus* (s.str.) *amphicoma* Boucomont, 1914 (Image 10)**

Specimen examined: SJC-Z010, 1 ex, 25.x.2010, Uppupara, 9°27'N & 77°05'E, 1200m, coll. K.V. Vinod.

Boucomont, 1914, Ann. Mus. Civ. Genova, 3, VI (XLVI): 239; Arrow, 1931:262; Balthasar, 1963, II: 269–270 (s.str).

Distribution: India (Kerala: Mahe, Nelliampathi, Travancore, Thekkady; Tamil Nadu: Nilgiri Hills)

***Onthophagus* (s.str.) *amphinasus* Arrow, 1931[®] (Image 11)**

Specimens examined: SJC-Z011, 3 exs, 5.x.2009, Poonkavanam, 9°28'N & 77°04'E, 1,000m, coll. K.V. Vinod.

Arrow, 1931, Fauna Brit. India, Lamell. III: 184, 195; Balthasar, 1963, II: 270 (s.str).

Distribution: India (Kerala: Wayanad, Thekkady; Tamil Nadu: Nilgiri Hills).

***Onthophagus* (s.str.) *andrewesi* Arrow, 1931[®] (Image 12)**

Specimens examined: SJC-Z012, 2 exs; 5.x.2009, Poonkavanam, 9°28'N & 77°04'E, 1,000m, coll. T.R. Shiju.

Arrow, 1931, Fauna Brit. India, Lamell. III: 321, 324; Balthasar, 1963, II: 273–274 (s.str).

Distribution: India (Karnataka; Kerala: Nelliampathi, Thekkady Wayanad; Tamil Nadu: Anamalai Hills, Nilgiri Hills).

***Onthophagus (Paraphanaeomorphus) bifasciatus* (Fabricius, 1781) (Image 13)**

Specimen examined: SJC-Z013, 1 ex, 5.x.2009, Poonkavanam, 9°28'N & 77°4'E, 1,000m, coll. K.V. Vinod.

Fabricius, 1781, Spec. Ins. I: 25 (*Scarabaeus*); Arrow, 1931: 327, 339; Balthasar, 1963, II: 292–293 (*Paraphanaeomorphus*).

Distribution: India (Assam; Bihar; Kerala: Wayanad, Thekkady; Sikkim; Tamil Nadu: Nilgiri Hills; West Bengal), Myanmar.

***Onthophagus (s.str.) bronzeus* Arrow, 1907[®] (Image 14)**

Specimens examined: SJC-Z014, 3 exs, 5.x.2009, Poonkavanam, 9°28'N & 77°4'E, 1,000m, coll. K.V. Vinod.

Arrow, 1907, Ann. Mag. Nat. Hist. (7), XIX: 429; Arrow, 1931: 184, 192; Balthasar, 1963, II: 299 (s.str).

Distribution: India (Karnataka; Kerala: Nelliampathy, Thekkady, Wayanad; Tamil Nadu: Nilgiri Hills)

***Onthophagus (s.str.) castetsi* Lansberge, 1867 (Image 15)**

Specimens examined: SJC-Z015, 3 exs, 25.ix.2011, Poonkavanam, 9°28'N & 77°4'E, 1,000m, coll. T.R. Shiju.

Lansberge, 1867, Not. Leyden Mus., IX: 163; Arrow, 1931: 210, 215; Balthasar, 1963, II: 304 (s.str).

Distribution: India (Kerala: Eravikulam, Nelliampathy, Thekkady, Travancore, Trivandrum, Wayanad; Tamil Nadu: Kodaikanal, Madhura; Uttar Pradesh).

***Onthophagus (Micronthophagus) cavia* Boucomont, 1914 (Image 30)**

Specimen examined: SJC-Z016, 1 ex, 25.ix.2011, Poonkavanam, 9°28'N & 77°4'E, 1,000m, coll. K.V. Vinod.

Boucomont, 1914, Ann. Mus. Civ. Genova, XLVI: 237; Arrow, 1931: 163,166; Balthasar, 1963, II: 305 (*Micronthophagus*).

Distribution: India (Karnataka: Nandidroog; Kerala: Nelliampathy, Thekkady; Mumbai; Tamil Nadu: Nilgiri Hills).

***Onthophagus (s.str.) cervus* (Fabricius, 1798) (Image 32)**

Specimen examined: SJC-Z017, 1 ex; 25.ix.2011, Poonkavanam, 9°28'N & 77°4'E, 1,000m, coll. K.V. Vinod.

Fabricius, 1798, Ent. Syst. Suppl.: 31 (*Copris*); d'Orbigny, 1898: 214; Boucomont, 1914a: 227; Arrow, 1931: 328, 348; Balthasar, 1963, II: 307 (s.str).

Distribution: India (Coimbatore; Karnataka; West Bengal; Kerala: Calicut, Wayanad, Thekkady; Madhya Pradesh; Maharashtra; Puducherry; Tamil Nadu: Nilgiri Hills; Uttarakhand), Sri Lanka.

***Onthophagus (Colobonthophagus) dama* (Fabricius, 1798) (Image 16)**

Specimens examined: SJC-Z018, 2 exs, 25.ix.2011, Anavachal, 9°35'N & 77°12'E, 650m, coll. K.V. Vinod.

Fabricius, 1798, Syst. Suppl.: 32 (*Copris*); d'Orbigny, 1898: 217; Arrow, 1931: 279, 280; Balthasar, 1963, II: 325-326 (s.str); Löbl & Smetana, 2006: 163 (*Colobonthophagus*).

-Onthophagus cervicornis Kirby, 1825: 565, syn.nov. Rossini et al. 2014: 111–115

Distribution: Bhutan, India (Bihar; Karnataka; Kerala: Nilambur, Wayanad, Thekkady; Maharashtra; Sikkim; Tamil Nadu: Anamalai Hills, Nilgiri Hills; Uttarakhand; West Bengal), Nepal, Sri Lanka.

***Onthophagus (s.str.) deflexicollis* Lansberge, 1883 (Image 17)**

Specimen examined: SJC-Z019, 1 ex, 5.x.2009, Poonkavanam, 9°28'N & 77°4'E, 1,000m, coll. T.R. Shiju.

Lansberge, 1883, Not. Leyden Mus.V: 72; Boucomont, 1914: 311; Boucomont & Gillet, 1921: 59, 60; Arrow, 1931: 327, 331; Balthasar, 1935d: 340; Paulian, 1945: 90,118. Balthasar, 1963, II: 327–328 (s.str).

Distribution: India (Assam; Arunachal Pradesh; Kerala: Nelliampathy, Thekkady; Sikkim; Uttarakhand; West Bengal), Myanmar, Tonkin, Sumatra.

***Onthophagus (Gibbonthophagus) duporti* Boucomont, 1914 (Image 18)**

Specimens examined: SJC-Z020, 2 exs; 5.x.2009, Poonkavanam, 9°28'N & 77°4'E, 1,000m, coll. T.R. Shiju.

Boucomont, 1914, Ann. Mus. Civ. Genova XLVI: 228; Boucomont & Gillet, 1921: 58; Arrow, 1931: 328, 353; Balthasar, 1935d: 346; Paulian, 1945: 123; Balthasar, 1963, II: 337–338 (s.str); *Palaeonthophagus*, Löbl & Smetana 2006: 167; *Gibbonthophagus*, Kabakov & Shokhin 2014: 50.

Distribution: India (Arunachal Pradesh; Bihar; Karnataka; Tamil Nadu: Nilgiri Hills; Kerala: Thekkady; West Bengal), Laos, Myanmar, Tonkin.

***Onthophagus (s.str.) ensifer* Boucomont, 1914 (Image 19)**

Specimens examined: SJC-Z021, 4 exs, 5.x.2009, Poonkavanam, 9°28'N & 77°4'E, 1,000m, coll. T.R. Shiju.

Boucomont, 1914, Ann. Mus. Civ. Genova, XLVI: 220; Arrow, 1931: 327, 334; Balthasar, 1963, II: 342 (s.str).

Distribution: India (Arunachal Pradesh; Gujarat; Kerala: Nelliampathy, Thekkady, Wayanad; Tamil Nadu: Madhura, Nilgiri Hills, Anamalai Hills).



Images 13–24. 13 - *Onthophagus bifasciatus*, 14 - *O. bronzeus*, 15 - *O. castetsi*, 16 - *O. dama*, 17 - *O. deflexicollis*, 18 - *O. duporti*, 19 - *O. ensifer*, 20 - *O. fasciatus*, 21 - *O. furcillifer*, 22 - *O. laevis*, 23 - *O. manipurensis*, 24 - *O. refulgens*.

***Onthophagus (s.str.) fasciatus* Boucomont, 1914 (Image 20)**

Specimens examined: SJC-Z022, 3 exs, 5.x.2009, Poonkavanam, 9°28'N & 77°4'E, 1,000m, coll. T.R. Shiju.

Boucomont, 1914, Ann. Mus. Civ. Genova, XLVI: 231; Arrow, 1931: 310, 311; Balthasar, 1963, II: 347 (s.str).

Distribution: India (Karnataka; Kerala: Nelliampathy, Thekkady, Wayanad; Madhya Pradesh; Mumbai; Tamil Nadu: Anaimalai Hills, Madhura, Nilgiri Hills; Uttarakhand; West Bengal).

***Onthophagus (s.str.) favrei* Boucomont, 1914 (Image 28)**

Specimen examined: SJC-Z023, 1 ex, 25.x.2010,

Anavachal, 9°35'N & 77°12'E, 650m, coll. T.R. Shiju.

Boucomont, 1914, Ann. Mus. Civ. Genova, XLVI: 225; Arrow, 1931: 311, 315; Balthasar, 1963, II: 347–348 (s.str).

Distribution: India (Karnataka; Kerala: Nelliampathy, Thekkady, Wayanad; Tamil Nadu: Coimbatore, Nilgiri Hills), Sri Lanka.

***Onthophagus (s.str.) furcillifer* Bates, 1891 (Image 21)**

Specimens examined: SJC-Z024, 3 exs; 25.x.2010, Uppupara, 9°27'N & 77°05'E, 1,200m, coll. T.R. Shiju.

Bates 1891, Entomologist XIV, Suppl.: 11; Arrow, 1931: 270, 273; Balthasar, 1963, II: 360 (s.str).

Distribution: India (Assam; Kashmir; Kerala:

Nelliampathy, Thekkady, Wayanad; Punjab; Uttarakhand)

***Onthophagus* (s.str.) *kchatriya* Boucomont, 1914 (Image 29)**

Specimens examined: SJC-Z025, 2 exs, 5.x.2009, Poonkavanam, 9°28'N & 77°4'E, 1,000m, coll. T.R. Shiju.

Boucomont, 1914, Ann. Mus. Civ. Genova XLVI: 233; Arrow, 1931: 252, 255; Balthasar, 1963, II: 401–402 (s.str).

Distribution: India (Karnataka; Kerala: Nilambur, Thekkady; Tamil Nadu: Anamalai Hills, Nilgiri Hills, Yercaud).

***Onthophagus* (*Serrophorus*) *laevis* Harold, 1880 (Image 22)**

Specimen examined: SJC-Z026, 1 ex, 25.ix.2011, Poonkavanam, 9°28'N & 77°4'E, 1,000m, coll. T.R. Shiju.

Harold, 1880, Not. Leyden Museum II: 194; Harold, 1886, apud Ritsema, Col. Midden Sumatra: 26; Boucomont, 1914: 276; Boucomont & Gillet, 1921: 51; Arrow, 1931: 171; Paulian, 1945: 89, 109; Balthasar, 1963, II: 412–413 (s.str); Kabakov and Yanushev, 1983:160; Ochi, 2003:270; Tarasov & Kabakov, 2010: 25 (*Serrophorus*).

Distribution: Borneo, China, India (Kerala: Nelliampathy, Thekkady, Wayanad; Sikkim; Uttarakhand; West Bengal), Java, Myanmar, Sumatra, Thailand.

***Onthophagus* (*Macronthophagus*) *manipurensis* Arrow, 1907 (Image 23)**

Specimens examined: SJC-Z027, 3 exs; 5.x.2009, Poonkavanam, 9°28'N & 77°4'E, 1,000m, coll. T.R. Shiju.

Arrow, 1907, Ann. Mag. Nat. Hist. 7, XIX: 426; Arrow, 1931: 230, 242;

-diabolicus (*rubricollis* Hope) var. *manipurensis* Arr. Apud Boucomont & Gillet, 1921: 31;

-nilgirensis Gillet, 1922, Ann. Soc. Sci. Brux. LI: 128, (ex parte); Arrow, 1931: 242 (ex parte); Balthasar 1963, II: 431 (*Digitonthophagus*); Kabakov & Yanushev, 1983: 160 (subgenus *Serrophorus*); Kabakov & Napolov 1999: 88 (Genus *Serrophorus*); Ochi, 2003 a, 10: 262–264 (*Macronthophagus*).

Distribution: India (Assam; Arunachal Pradesh; Kerala: Nelliampathy, Thekkady; Manipur), Myanmar.

***Onthophagus* (s.str.) *pacificus* Lansberge, 1885 (Image 25)**

Specimens examined: SJC-Z028, 2 exs, 25.ix.2011, Poonkavanam, 9°28'N & 77°4'E, 1,000m, coll. T.R. Shiju.

Lansberge, 1885, not Leyden Mus. VII: 17; Boucomont, 1914: 280; Boucomont & Gillet, 1921: 34, 53; Arrow, 1931: 171, 172; Balthasar, 1963, II: 465 (s.str).

Distribution: Bangladesh, Borneo, China, India (Assam; Karnataka; Kerala: Nelliampathy, Thekkady, Wayanad; Tamil Nadu: Nilgiri Hills; Uttarakhand; West Bengal), Indonesia: Java, Sumatra, Myanmar, Malaysia, Sunda Islands, Thailand, Laos, Vietnam.

***Onthophagus* (s.str.) *rectecornutus* Lansberge, 1883 (Image 31)**

Specimens examined: SJC-Z029, 2 exs, 5.x.2009, Poonkavanam, 9°28'N & 77°4'E, 1,000m, coll. T.R. Shiju.

Lansberge, 1883, not Leyden Mus. V: 49 (female); Arrow, 1907: 421 (male); Boucomont, 1914: 293; Boucomont, 1914a: 228; Boucomont & Gillet, 1921: 55; Arrow, 1931: 229, 233; Balthasar, 1935 d; 342; Paulian, 1945: 90, 119; Balthasar, 1963, II: 498–499 (*Serrophorous*); Kabakov & Yanushev, 1983: 160; Kabakov & Napolov, 1999: 81, (*Gibbonthophagus*); Ochi, 2003a: 270 (*Serrophorous*); Tarasov & Kabakov 2010: 25 (s.str).

Distribution: China, India (Assam; Bangalore; Bihar; Karnataka; Kerala: Malabar, Nelliampathy, Thekkady, Wayanad; Tamil Nadu: Nilgiri Hills; West Bengal), Sri Lanka, Sunda Islands, Thailand.

***Onthophagus* (s.str.) *refulgens* Arrow, 1931[®] (Image 24)**

Specimens examined: SJC-Z030, 2 exs, 25.ix.2011, Anavachal, 9°35'N & 77°12'E, 650m, coll. T.R. Shiju.

Arrow, 1931, Fauna Brit. India Lamell.: 279–281; Balthasar, 1963, II: 499 (s.str).

Distribution: India (Kodaikanal; Kerala: Eravikulam, Nelliampathy, Thekkady)

***Onthophagus* (s.str.) *tritinctus* Boucomont, 1914 (Image 27)**

Specimen examined: SJC-Z031, 1 ex, 5.x.2009, Poonkavanam, 9°28'N & 77°4'E, 1,000m, coll. K.V. Vinod.

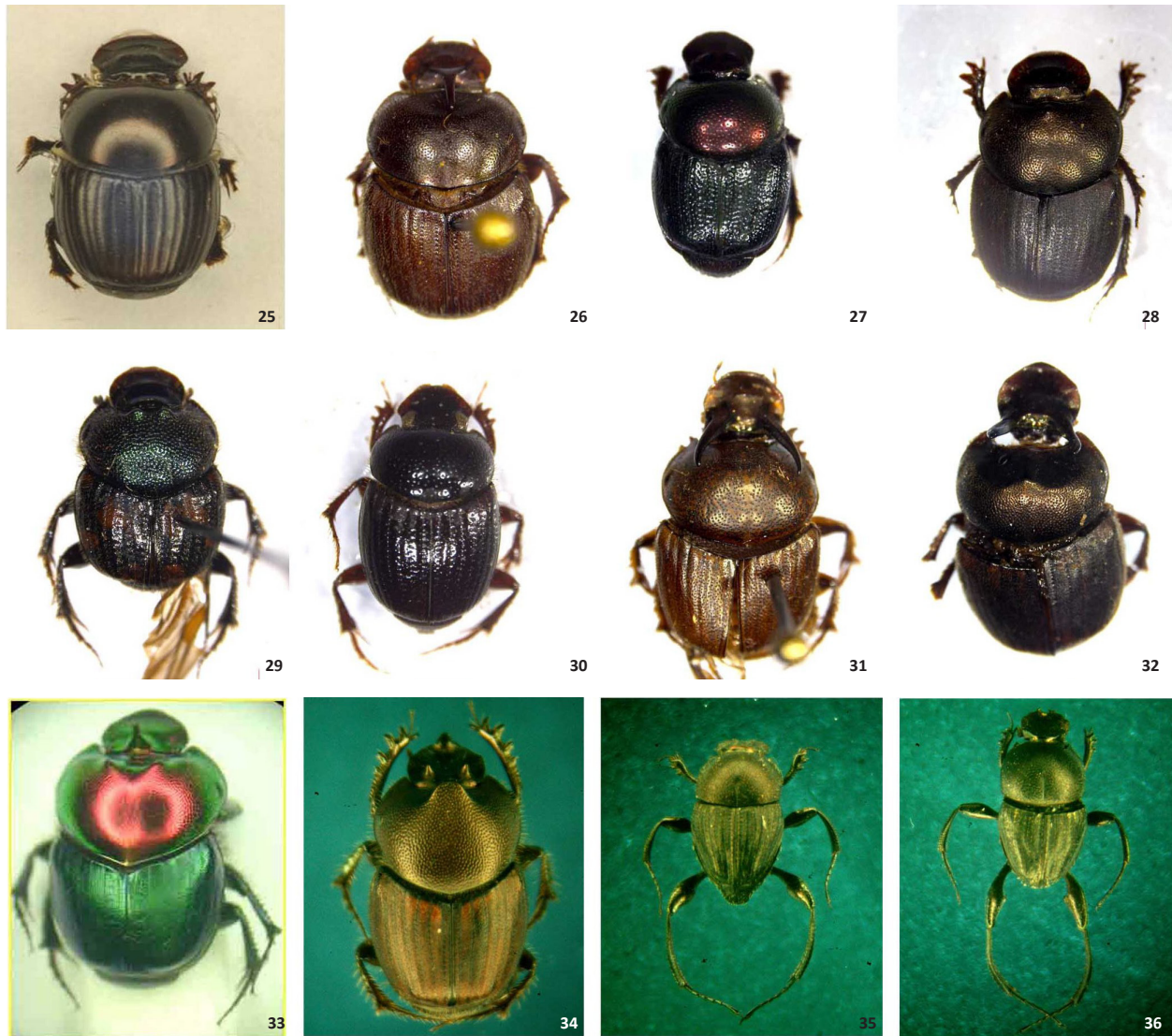
Boucomont, 1914, Ann. Mus. Civ. Genova XLVI: 217; Arrow, 1931: 263, 266; Balthasar, 1935d: 338; Paulian, 1945: 89, 127 ; Balthasar, 1963, II: 564 (s.str).

Distribution: India (Karnataka: Nandidrug; Kerala: Thekkady; Maharashtra: Nagpur; Tamil Nadu: Coonoor), Sri Lanka.

***Onthophagus* (s.str.) *turbatus* Walker, 1858 (Image 26)**

Specimens examined: SJC-Z032, 3 exs, 5.x.2009, Poonkavanam, 9°28'N & 77°4'E, 1,000m, coll. K.V. Vinod.

Walker, 1858, Ann. Mag. Nat. Hist. (3), II: 209; Boucomont, 1914a: 222; Boucomont & Gillet, 1921: 54;



Images 25–36. 25 - *Onthophagus pacificus*, 26 - *O. turbatus*, 27 - *O. tritinctus*, 28 - *O. faveri*, 29 - *O. kchatriya*, 30 - *O. cavia*, 31 - *O. rectecornutus*, 32 - *O. cervus*, 33 - *O. vividus*, 34 - *O. vladimiri*, 35 - *Sisyphus longipes*, 36 - *S. neglectus*.

Arrow, 1931: 327, 329; Balthasar, 1963, II: 569 (s.str).

Distribution: India (Karnataka; Kerala: Mahe, Malabar, Nelliampathy, Thekkady, Wayanad; Maharashtra: Pudukcherry; Tamil Nadu: Nilgiri Hills), Sri Lanka.

***Onthophagus (Proagoderus) vividus* Arrow, 1907 (Image 33)**

Specimens examined: SJC-Z033, 2 exs, 25.ix.2011, Anavachal, 9°35'N & 77°12'E, 650m, coll. K.V. Vinod.

Arrow, 1907, Ann. Mag. Nat. Hist. 7, XIX: 428; Boucomont, 1914: 264; Arrow, 1931: 230, 245; Balthasar, 1963, II: 584–585 (*Proagoderus*).

Distribution: India (Karnataka; Kerala: Peerumedu, Trivandrum, Travancore, Thekkady, Wayanad; Tamil Nadu: Nilgiri Hills, northern Salem)

***Onthophagus (s.str.) vladimiri* Frey, 1957[®] (Image 34)**

Specimens examined: SJC-Z034, 3 exs, 5.x.2009, Poonkavanam, 9°28'N & 77°4'E, 1,000m, coll. T.R. Shiju.

Frey, 1957, Ent. Arb. Mus. Frey, VIII: 687; Balthasar, 1963, II: 237, 585 (s.str.).

- *Onthophagus anamalaiensis* Balthasar, 1974: 183; Tarasov, 2010: 48.

- *Onthophagus taruni* Biswas & Chatterjee, 1986: 92 syn. nov.

Distribution: India (Kerala: Nelliampathy, Silent Valley, Thekkady, Wayanad; Tamil Nadu: Anamalai Hills).

Oniticellini

***Tibiodrepanus* Krikken, 2009**

Tibiodrepanus Krikken, 2009, Haroldius, 4: 1–30.

***Tibiodrepanus setosus* (Wiedemann, 1823) (Image 7)**

Specimens examined: SJC-Z035, 3 exs, 5.x.2009, Poonkavanam, 9°28'N & 77°4'E, 1,000m, coll. T.R. Shiju.

Wiedemann, 1823, Zool. Mag. II, 1: 19 (*Copris*); Arrow, 1931: 381; Janssens, 1953: 19, 31; Balthasar, 1963, II: 68–69 (*Drepanocerus*); Krikken, 2009, Haroldius, 4: 1–30 (*Tibiodrepanus*).

Distribution: India (Kerala: Nilambur, Nelliampathy, Thekkady, Wayanad; Madhya Pradesh; Maharashtra; Uttarakhand), Sri Lanka.

***Liatongus* Reitter, 1892**

Liatongus Reitter, 1892, Bestimmungstab. d. Lucaniden u. copr. Lamell.: 38, 45; d'Oribgny, 1898: 222; Boucomont, 1923; 53; Arrow, 1931: 79, 362; Balthasar, 1935: 26, 103; Janssens, 1953: 10, 62.

***Liatongus* (s.str.) *indicus* (Arrow, 1908)[®] (Image 8)**

Specimens examined: SJC-Z036, 2 exs, 5.x.2009, Poonkavanam, 9°28'N & 77°4'E, 1,000m, coll. T.R. Shiju.

Arrow, 1908, Ann. Mag. Nat. Hist. (8), 1: 180 (*Oniticellus*); Arrow, 1931: 363, 368; Janssens, 1953; 75, 95; Balthasar, 1963, II: 101–102 (s.str).

Distribution: India (Kerala: Nelliampathy, Thekkady, Wayanad; Tamil Nadu: Anamalai Hills, Nilgiri Hills).

DISCUSSION

The presence of 36 species, comprising nine genera namely, *Caccobius*, *Catharsius*, *Copris*, *Liatongus*, *Ochicanthon*, *Onthophagus*, *Paracopris*, *Sisyphus* and *Tibiodrepanus* and five tribes - Canthonini, Coprini, Oniticellini, Onthophagini and Sisyphini were recorded from the low elevation shola, evergreen and deciduous forests of PTR of the southern Western Ghats. Lack of new species from PTR is attributed to the record of all the species collected from PTR in the earlier collections done by Arrow (1931) in the nearby hill ranges of the Western Ghats prior to the extensive habitat modifications. *Onthophagus deflexicollis* Lansberge, *O. manipurensis* Arrow and *O. laevis* Harold were known earlier from South East Asia and from northern and northeastern regions of the Indian mainland (Arrow 1931; Balthasar 1963). Very recently these species were recorded for the first time from southern India in the Anamalais and Nilgiris of the Western Ghats (Sabu et al. 2011). The exclusive presence of three species (*Onthophagus*

deflexicollis, *O. manipurensis* and *O. laevis*) in the widely separated Anamalais/Nilgiris/PTR in the Western Ghats indicates that habitat connectivity existed between these regions which permitted their widespread distribution in the region and their isolated presence in the protected areas in the Western Ghats indicates that Anamalais/Nilgiris/PTR like areas are a refuge for such isolated species. Species of three genera, *Paragymnopleurus* Shipp, *Onitis* Fabricius and *Oniticellus* Serville present in other forests in the Western Ghats with low abundance (Sabu 2011) were not recorded from PTR and this may be due to low abundance and lack of intensive sampling.

Eight species endemic to the Western Ghats namely, *Ochicanthon nitidus*, *Paracopris davisoni*, *Onthophagus amphinusus*, *O. andrewesi*, *O. bronzeus*, *O. refulgens*, *O. vladimiri* and *Liatongus indicus* were collected from the region. Except the rare primitive old world species, *Ochicanthon nitidus*, (Latha et al. 2011) all others are common endemics in the Western Ghats.

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