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NOTE

SOME NEW RECORDS OF SCARAB BEETLES OF THE GENUS *ONTHOPHAGUS* LATREILLE, 1802 (COLEOPTERA: SCARABAEIDAE) FROM NORTHERN WESTERN GHATS, MAHARASHTRA, WITH A CHECKLIST

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NOTE

Some new records of scarab beetles of the genus *Onthophagus* Latreille, 1802 (Coleoptera: Scarabaeidae) from northern Western Ghats, Maharashtra, with a checklist

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Latreille in 1802 established the genus *Onthophagus*. It belongs to the tribe Onthophagini of the subfamily Scarabaeinae, and family Scarabaeidae. It is comprised of nearly 2,200 described species (Schoolmeesters 2016) from the world, making it a very diverse genus in the subfamily representing almost 38% of the Scarabaeinae beetles (Rossini et al. 2018) with cosmopolitan distribution (Tarasov & Kabakov 2010). Approximately, 182 species have been reported from Indian mainland (Arrow 1931; Balthasar 1963; Löbl & Smetana 2006; Sathindran & Sabu 2012). From Maharashtra, nearly 25 species are reported by Arrow (1931) and Jadhav & Sharma (2012).

Beetles from Scarabaeinae are being considered as important biological indicators due to their higher sensitivity to the changing climatic conditions (Rossini et al. 2018). Beetles of the genus *Onthophagus* are coprophagous and some are scavengers (carrion feeders). The main food source of these beetles is the faeces of

animals, which they partially decompose (Fischer 2006), and helps in increasing the nutrient content, texture and structure of soil. They are paracoprid nesters (tunnelers) with biparental care, an important phenomenon of the genus *Onthophagus*, wherein the female digs branched tunnel with a brood chamber under the dung pat and males move the portion of dung to the entrance of these tunnels and then, female makes pieces, put it in the brood chamber and lay one egg in each chamber (Sowig 1996).

The Western Ghats is one of the important biodiversity hotspots of the world (Myers 2003), with high level of endemism and species richness. The northern Western Ghats ecoregion is dominated with drier dipterocarp (Sabu et al. 2011), harbouring a vast diverse fauna along with endemic species. The Oriental *Onthophagus* fauna is inadequately studied (Tarasov & Kabakov 2010). Also, Tarasov & Kabakov (2010) and Sathindran & Sabu (2012) stated that the taxonomic

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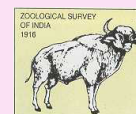
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errors from the Indian subcontinent are high for this genus. Moreover, the major documents like Arrow (1931) and Balthasar (1963) reporting this genus from this region are outdated (Sathiandran & Sabu 2012). Therefore, documenting diversity of this highly diverse genus will play an important role in removing the confusions and errors.

The dung beetle fauna of southern Western Ghats is very well documented (Arrow 1931; Balthasar 1963, 1974; Vinod & Sabu 2007, Sabu et al. 2011; Sathiandran & Sabu 2012; Sathiandran et al. 2015; Latha and Sabu, 2018). Sabu et al. (2011) recorded about 78 species of *Onthophagus* from moist southern Western Ghats. Of these recorded species, 19 are endemic to the entire Western Ghats, 12 are regional endemics to southern Western Ghats and a single species is a local endemic to the tropical montane cloud forest. On the contrary, very few or scattered publications are available on the diversity of dung beetle fauna from northern Western Ghats, Maharashtra (Arrow 1931; Balthasar 1963, 1974; Jadhav & Sharma 2012; Kalawate 2018). Hence, in the present study, an attempt has been made to prepare an updated checklist of the genus *Onthophagus* based on the collections from recent surveys, unidentified collections present at ZSI, WRC, Pune and also from the literature (Arrow 1931; Balthasar 1963, 1974; Jadhav & Sharma 2012; Kalawate 2018).

Specimens were collected from different parts of the northern Western Ghats, Maharashtra. They were collected by installing light traps using 160-Watt mercury bulb as a light source as they are attracted to the light in night. Some of the beetles were hand-picked from the dung pats present in the field in day during the field surveys in the northern Western Ghats, Maharashtra. The collected beetles were euthanized by ethyl acetate vapours and brought to the laboratory for further studies. The specimens were relaxed, pinned and stored in the fumigated entomological boxes for further examination. They were examined under Leica EZ4E® with in-built photographic facility. The male genitalia were dissected wherever necessary by carefully removing it from the abdomen. After removal, it was further boiled in 10% KOH for 5–10 minutes to remove the adhered tissues and soft muscles and then rinsed in distilled water. The genitalia were stored in separate vials containing 70% ethanol with same catalogue number as the specimen. The map of the collection locality has been prepared using QGIS software. The beetles were determined as per the available literature viz., Arrow (1931) and Balthasar (1963) and the classification followed is as per Arrow (1931) and Balthasar (1963) with modifications

as per Lobl & Smetana (2006). The distribution of the species provided here are taken from Arrow (1931), Balthasar (1963), Chandra & Gupta (2011, 2013), Sabu et al. (2011), and Sathiandran et al. (2015). The checklist of the genus *Onthophagus* from Maharashtra including northern Western Ghats (Maharashtra) based on the collections from the recent surveys, unidentified collections from ZSI, WRC, Pune and also from the literature, with the record of endemic beetles has been provided.

A total of 36 species in eight subgenera of *Onthophagus* have been reported based on the recent collection (*) and reports from available literature. Of the recorded species, *O. (Onthophagus) madoqua* Arrow, 1931 and *O. (Gibbonthophagus) duporti* Boucomont, 1914 are new records for Maharashtra and northern Western Ghats. The details of new recorded species like material examined, distribution, description, genitalial features, images of adult habitus and genitalia are also given in this paper. Among the studied species, two endemic species namely *O. (O) madoqua* Arrow, 1931 and *O. coeruleicollis* Arrow, 1907 are recorded. A checklist of the species from Maharashtra is presented in Table 1. Image 1 represents the new recorded species along with their genitalial figures. The map of collection locality of the recorded species and the new reported species are given in Figures 1 and 2.

As stated earlier, a few literatures are available on this genus from Maharashtra; 21 and 25 species of *Onthophagus* have been reported from Vidarbha region of Maharashtra by Khadakkar et al. (2018) and entire Maharashtra by Arrow (1931) and Jadhav & Sharma (2012), respectively. Chandra & Gupta (2012) enlisted 34 species under six subgenera of *Onthophagus* from Madhya Pradesh. This study resulted into enumeration of 36 species under eight subgenera from the genus *Onthophagus* from the studied area (Table 2).

Genus *Onthophagus* Latreille, 1802

Onthophagus Latreille, 1802; Hist. Nat. Crust. Et. Ins. 3: 141.

Onthophagus, Arrow, 1931; Fauna of British India including Ceylon and Burma (Coleoptera: Lamellicornia: Coprinae) 3: 159–162.

Type species: *Scarabaeus taurus* Schreber, 1759

1. *Onthophagus (Onthophagus) madoqua* Arrow, 1931 (Image 1 A–B)

Onthophagus madoqua Arrow, 1931; Fauna of British India including Ceylon and Burma (Coleoptera: Lamellicornia: Coprinae), 3 : 258–259.

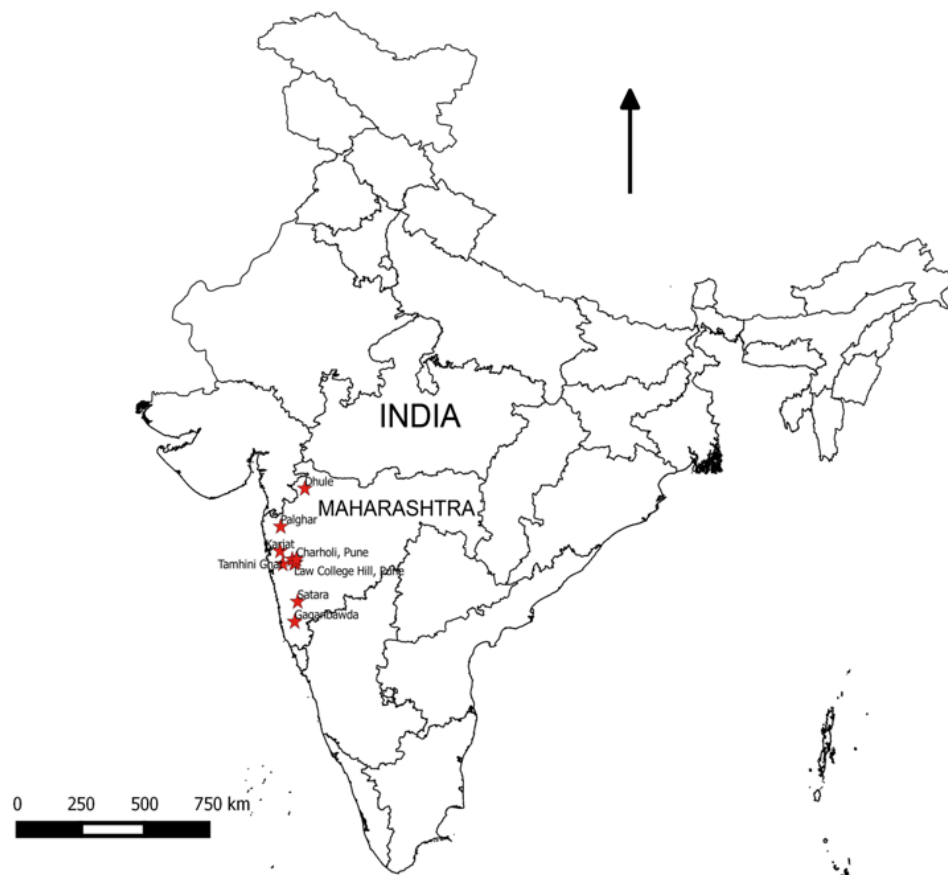


Figure 1. Collection locality of *Onthophagus* from northern Western Ghats, Maharashtra.

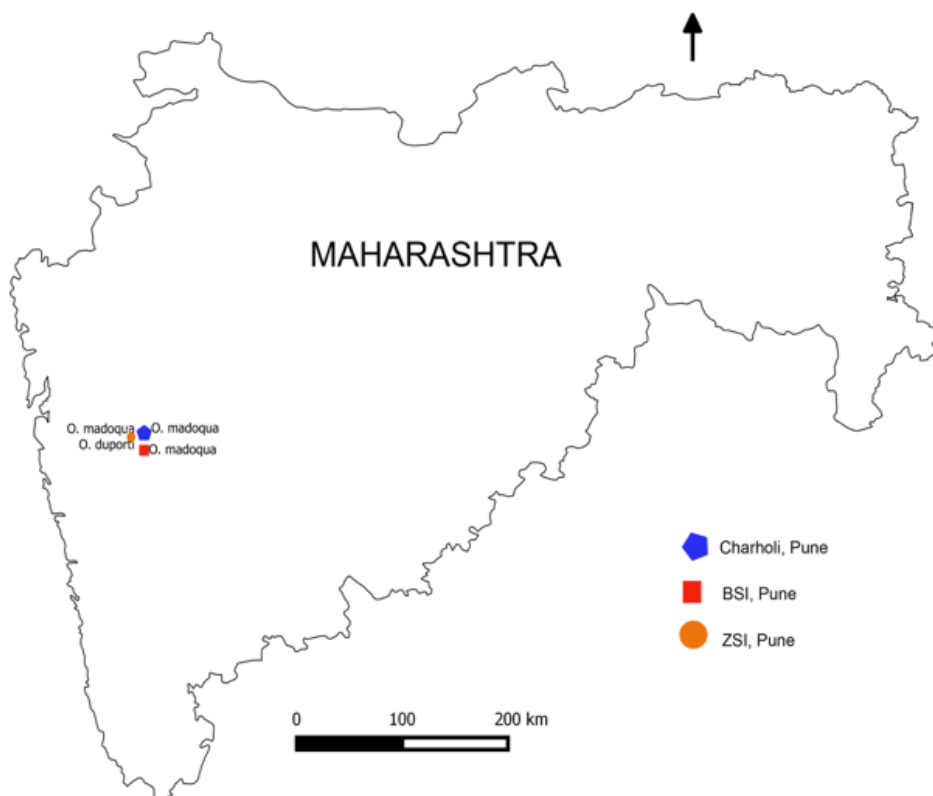


Figure 2. Collection locality of *O. madoqua* and *O. duporti*.



Table 1. The checklist of the genus *Onthophagus* Latreille, 1802 from Maharashtra including northern Western Ghats, with distribution and endemic record.

Order COLEOPTERA Linnaeus, 1758 Suborder POLYPHAGA Emery, 1886 Superfamily SCARABAEOIDEA Latreille, 1802 Family SCARABAEIDAE Latreille, 1802 Subfamily: SCARABAEINAE Latreille, 1802 Tribe ONTHOPHAGINI Burmeister, 1846	Location	Reference	Remark
Genus <i>Onthophagus</i> Latreille, 1802			
Subgenus <i>Onthophagus</i> Latreille, 1802			
<i>O. unifasciatus</i> (Schaller, 1783) *	BSI, Pune; Gaganbawda		Responsible for Scarabiasis in young children
<i>O. abreui</i> Arrow, 1931		Thakare et al. 2012	
<i>O. fasciatus</i> Boucomont, 1914		Jadhav & Sharma 2012	
<i>O. madoqua</i> Arrow, 1931*	BSI, ZSI, Charholi, Pune		New record for Northern Western Ghats, Maharashtra. Endemic to India.
<i>O. cervus</i> (Fabricius, 1798) *	ZSI, BSI, Tamhini Ghat, Pune		
<i>O. ludio</i> Boucomont, 1914*	ZSI, BSI, Pune		
<i>O. quadridentatus</i> (Fabricius, 1798) *	ZSI, Pune		
<i>O. turbatus</i> Walker, 1858*	Tamhini Ghat		
<i>O. orientalis</i> Harold, 1868		Jadhav & Sharma 2012	
<i>O. spinifex</i> (Fabricius, 1781)		Jadhav & Sharma 2012	
<i>O. tritinctus</i> Boucomont, 1914		Jadhav & Sharma 2012	
<i>O. centricornis</i> (Fabricius, 1798)		Jadhav & Sharma 2012	
<i>O. griseosetosus</i> Arrow, 1931		Jadhav & Sharma 2012	
<i>O. abacus</i> Boucomont, 1921		Kalawate 2019	
<i>O. malabarensis</i> Boucomont, 1919		Arrow 1931	
Subgenus <i>Trichonthophagus</i> Zunino, 1979			
<i>O. tarandus</i> Fabricius, 1792		Jadhav & Sharma 2012	
Subgenus <i>Colobonthophagus</i> Balthasar, 1935			
<i>O. dama</i> (Fabricius, 1798) *	Satara; Karjat; Gaganbawda; BSI, Tamhini Ghat, Pune		
<i>O. hindu</i> Arrow, 1931*	Charoli, BSI, ZSI, Pune; Palghar; Satara; Dhule		
<i>O. agnus</i> Gillet, 1925*	BSI, ZSI, Pune; Satara	Kalawate 2018	
<i>O. armatus</i> Blanchard, 1853*	Tamhini Ghat		
<i>O. aenescens</i> (Wiedemann, 1823) *		Kalawate 2019	Reported first time from Maharashtra (Kalawate 2019).
<i>O. ramosus</i> (Wiedemann, 1823) *	Tamhini Ghat		
<i>O. ramosellus</i> (Bates, 1891)		Jadhav & Sharma 2012	
Subgenus <i>Micronthophagus</i> Balthasar, 1963			
<i>O. gulo</i> Arrow, 1931		Jadhav & Sharma 2012	
<i>O. hystrix</i> Boucomont, 1914		Jadhav & Sharma 2012	
Subgenus <i>Gibbonthophagus</i> Balthasar, 1963			
<i>O. duporti</i> Boucomont, 1914*	BSI, ZSI, Pune		New record for Northern Western Ghats, Maharashtra.
Subgenus <i>Eremonthophagus</i> Zunino, 1979			
<i>O. semicinctus</i> Dornbigny, 1897		Arrow 1931	
Subgenus <i>Proagoderus</i> van Lansberge, 1883			
<i>O. pactolus</i> (Fabricius, 1787)		Jadhav & Sharma 2012	
Species incertae sedis			
<i>O. coeruleicollis</i> Arrow, 1907		Kalawate 2019	Endemic to India

<i>O. zebra</i> Arrow, 1931		Kalawate & Sharma 2019	
<i>O. laborans</i> Arrow, 1931		Kalawate & Sharma 2019	
<i>O. vultur</i> Arrow, 1931		Kalawate & Sharma 2019	
<i>O. turbatus</i> Walker, 1858		Sathiandran et al. 2015	
<i>O. lilliputanus</i> Lansberg, 1883		Arrow 1931	
<i>O. circulifer</i> Arrow, 1931		Arrow 1931	
Subgenus <i>Parascatonomus</i> Paulian, 1932			
<i>O. quaestus</i> Sharp, 1875		Kalawate & Sharma 2019	

* species collected and studied.

Onthophagus (Onthophagus) madoqua. Balthasar, 1963; Monographie der Scarabaeidae und Aphodiidae der Palaearktischen and Orientalischen Region (Coleoptera: Lamellicornia), 2: 426.

Specimen examined: ZSI-WRC, ENT-1/3234, 06.xi.2017, 07 ex., Charholi, Pune, Maharashtra (18.653°N, 73.907°E), coll. A.S. Kalawate; ZSI-WRC, ENT-1/3240, 23.viii.2018, 06 ex., ZSI, WRC, Pune, Maharashtra (18.6482°N & 73.760°E, 580m), coll. B. Mukhopadhyay; ZSI-WRC, ENT-1/3251, 27.viii.2018, 02 ex., BSI, WRC, Pune, Maharashtra (18.540°N & 73.885°E, elevation 556m), coll. B. Mukhopadhyay; ZSI-WRC, ENT-1/3257, 27.viii.2018, 11 ex., ZSI, WRC, Pune, Maharashtra (18.6482°N & 73.760°E, 580m), coll. B. Mukhopadhyay; ZSI-WRC, ENT-1/3265, 28.viii.2018, 12 ex., ZSI, WRC, Pune, Maharashtra (18.648°N & 73.760°E, 580m), coll. B. Mukhopadhyay; ZSI-WRC, ENT-1/3271, 28.viii.2018, 07 ex., BSI, WRC, Pune, Maharashtra (18.540°N & 73.885°E, 556m), coll. B. Mukhopadhyay.

Description (Image 1A): Length, 4–5 mm., breadth, 3mm. Black, shining, oval and convex. Head coppery, short and broad; clypeus smooth in front, with its margin strongly reflexed; forehead separated by curved carina; a pair of quite separate, straight, erect and parallel horns at vertex. Pronotum deep golden-green, smooth in front, slopes steeply but not abruptly. Elytra decorated, red patch on each elytron at shoulder and hind margin. Upper surface clothed with erect pale setae.

Male genitalia (Image 1B): Phallobase is almost same in length as parameres, gently curved in lateral view. Parameres funnel shaped, broad at base, minutely constricted in the middle, strongly bent downward, acuminate, tips rounded. Maximum Length, about 1.39mm; maximum width, about 0.504mm.

Known distribution until this study: India (Gujarat, Karnataka, Rajasthan, Tamil Nadu).

Table 2. Details of the surveyed localities.

Location	Coordinates
Tamhini Ghat	18.494°N & 73.425°E, elevation 631m
BSI, WRC, Pune	18.540°N & 73.885°E, elevation 556m
ZSI, WRC, Pune	18.648°N & 73.760°E, elevation 580m
Satara	17.229°N & 73.952°E, elevation 731m
Karjat	18.932°N & 73.325°E, elevation 49m
Law College Hill	18.514°N & 73.828°E, elevation 580m
Dhule	21.039°N & 74.207°E, elevation 497m
Gaganbawda	16.552°N & 73.846°E, elevation 601m
Palghar	19.758°N & 73.347°E, elevation 518m
Charholi, Pune	18.653°N & 73.907°E

2. *Onthophagus (Gibbonthophagus) duporti* Boucomont, 1914 (Image 1 C–D)

Onthophagus duporti Boucomont, 1914; Annali del Museo civico di storia naturale di Genova, XLVI: 228.

Onthophagus (Gibbonthophagus) duporti; Sathiandran et al. 2015; Journal of Threatened Taxa 7(15): 8250–8258.

Specimen examined: ZSI-WRC, ENT-1/3264, 27.viii.2018, 01 ex., ZSI, WRC, Pune, Maharashtra (18.648°N & 73.760°E, 580m), coll. B. Mukhopadhyay.

Description (Image 1 C): Length, 7mm., width, 4mm. Dark brown, smooth and shining, oval and convex. Clypeus feebly produced, front margin rounded and strongly reflexed, separated from forehead by a short transverse carina. Near inner margin of each eye, a short, erect, blunt, conical horn present. Pronotum with three small tubercle, one just behind the front margin in the middle and a pair positioned between the front and hind margins, the space between these tubercles slightly depressed but not smooth. Elytra testaceous-yellow, with brown-black bands at the inner and outer margins, which usually more or less fused together in the middle line. The pygidium and the femora are yellow,



Image 1. *Onthophagus* (*Onthophagus*) *madoqua* Arrow, 1931: A—adult | B—genitalia | *Onthophagus* (*Gibbonthophagus*) *duporti* Boucomont, 1914: C—adult | D—genitalia. Scale bar = 2mm (A & C); 0.5mm (B & D).

with minute setae.

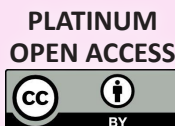
Male genitalia (Image 1 D): Phallobase larger than the parameres, broader and tubular. Parameres roughly triangular, broad at the base, acuminate towards the tip, rounded tip, curved ventrally. Maximum length, about 2.01 mm; maximum width, about 0.967mm.

Known distribution until this study: India (Arunachal Pradesh, Bihar, Karnataka, Tamil Nadu (Nilgiri Hills), Kerala, West Bengal), China, Indo-China, Laos, Myanmar, Thailand, Tonkin, Vietnam.

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Communications

Diversity and distribution of snakes in Trashigang Territorial Forest Division, eastern Bhutan

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