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RESEARCH ARTICLE

DIVERSITY AND ABUNDANCE OF DUNG BEETLES FROM CATTLE GRAZING LANDS OF PHALTAN TAHESIL DISTRICT STARA MAHARASHTRA

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ABSTRACT

A survey of dung beetles biodiversity, abundance and composition were studied from cattle grazing lands of Phaltan Tahesil, Satara, Maharashtra during June 2010 to March 2013. Seven sites were selected from Phaltan Tahesil. The beetles were collected from the dung pad and under soil by handpicking method. Dung beetles were then segregated as per species, sampling sites. The present study of dung beetle diversity of Phaltan Tahesil reveals 43 species of beetles belongs to 15 (Fifteen) Genera. The data also shows that the subfamily Coprinae was the dominant subfamily in terms of species richness (32 species) and abundance followed by Aphodiinae (7 species), Scarabaeinae (3 species) and Geotrupidae (1 species). During the study period it was observed that three to four days old dung pads shown richest dung beetle diversity. The predominant genera in this region is Onthophagus (11 species) followed by Aphodius (7 species), Gymnopleurus (6species), *Onitis* (5 species), *Catharsius* (3 species), *Heliocarpis* (2 species) and single species form each genera.

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INTRODUCTION

Dung beetles can be defined as coprophagous members of the Coleopteran families Scarabaeidae and Geotrupidae (Halffter and Matthews 1966). Species in the subfamilies Coprinae and Scarabaeinae (Scarabaeidae) are considered true dung beetles, as well as some species in the Geotrupidae and Aphodiinae (Scarabaeidae). These beetles are found in almost every part of the world and great abundance in warmer regions (Arrow, 1931). The dung beetles are beneficial insects they are actively involved in the biological control of cattle dung dropping and the dung borne dipterous files of medical and veterinary importance (Waterhouse 1974). Lindquist (1933) indicates that dung beetles fertilize the soil by burying the dung, by depositing their own excrement and by overturning the soil when they bring into the surface during the construction of their nests.

This activity of dung beetle also brings about improvement in permeability of soil to water, soil texture, humus content and degree of aeration (Fincher *et al*., 1981). Taking into account the beneficial services of these beetles to human being it is aimed to study this group of insect.

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MATERIALS AND METHODS

a) Study area

Phaltan is located at 17.98°N 74.43°E. It has an average elevation of 568 meters (1,863 feet). The climate of Phaltan is an inland climate of Maharashtra. The temperature has a relatively high range between 15 to 45 °C (59 to 113 °F). Summer in Phaltan is comparatively hot, and dry, compared to neighboring inland cities. Maximum temperatures exceed 40 °C (104 °F) every summer and typically range between 38–45 °C (100–113 °F). Lows during this season are around 25–28 °C (77–82 °F).

The dung beetles were collected during day time mainly in between 8.00 to 10.00 am. These beetles were collected from the open pasture of varies sites of Phaltan Tahesil in Satara District. During the monsoon season cattle were grazing always in these open pastures. Most of these dung beetles were collected from two to three day old buffalo dung pads in months of June to March which was abundant during this period.

The collections of dung beetles were done for two successive years (June 2010 to March 2013) from seven different pastures of Phaltan Tahesil. The selected sites were Zirapwadi, Jawali, Asu, Kapsi, Dhawal, Salpe and Chaudharwadi.

b) Sampling

The selected sites having about 20 to 30 acres of pasture area. In this area about 20 to 25 cattle were visiting regularly for grazing. In sampling area 10 dung pads of buffalo were randomly selected. The selected dung pads were then considered as sampling pads. Two or three days old dung pads, which were of approximately uniform sized were selected for sampling. Similar sampling method was adapted by earlier worker for field sampling of dung beetles (Doube and Giller, 1990; Favila M., Halffter G., 1997; and Kirk and Ridsdill-Smith, 1986). The beetles were collected from each sampling pad and under soil. Dung beetles were then segregated as per species, sampling sites. The beetle sampling was carried out at each site at an interval of 15 days for two successive years. The individual number of dung beetle species was counted at each site for every sampling. The number of individual for 10 sampling pads was taken for further study. For the preservation of these beetles formalin (5%) or 70% alcohol is used as preservative.

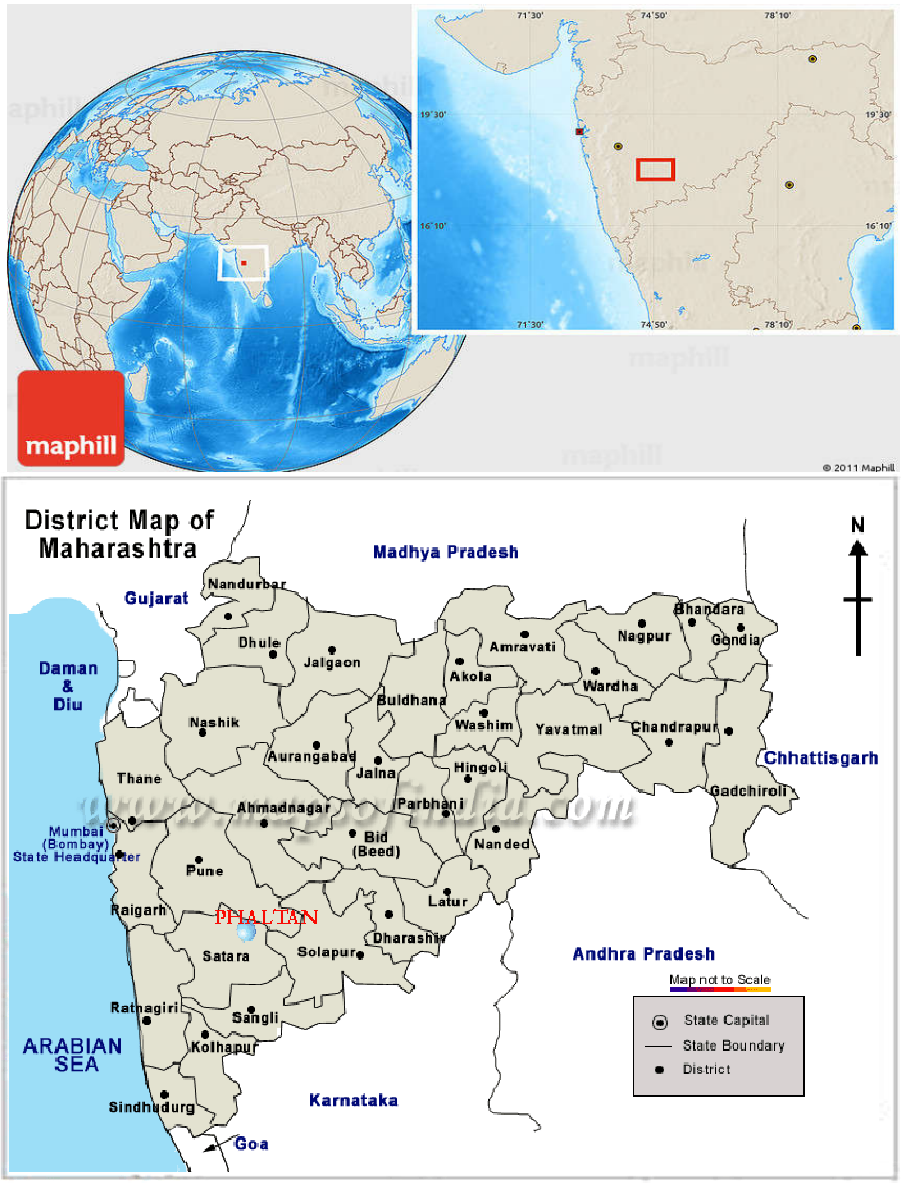
c) Identification

Collected insects are sorted into different groups according to their morphological characters. Beetles are identified from the comparison of photographs of beetles which are available on internet and from literature (Arrow, 1931; Arrow, 1932; Chatterjee, 2010; Mittal, 2005). Several morphological characteristics such as antennal segmentation, head shape, horn, ventral sclerites of the abdomen, elytra, claws of tarsi, body shape, middle and posterior tibiae, mesotibia, pygidium, were used for species identification (Borror *et al*., 1989; Booth *et al*., 1990).

OBSERVATION AND DISCUSSION

The present record of dung beetle diversity is made on the basis of actual collection of the beetles from different sites selected from Phaltan Tahesil. To study biodiversity of the dung beetles, seven different cattle grazing lands were selected from Phaltan Tahesil for collection beetles.

Geographical location of study area



The present study of dung beetle diversity of Phaltan Tahesil reveals 43 species of beetles belongs to 15 (Fifteen) Genera. (Table 1) The data in Table 1 also shows that of the subfamily Coprinae was the dominant subfamily in terms of species richness (32 species) and abundance followed by Aphodiinae (7species), Scarabaeinae (3 species) and Geotrupidae (1 species).

During the study period it was observed that three to four days old dung pads shown richest dung beetle diversity.

Table 1. List of dung beetles recorded from seven sites of Phaltan tahesil

Subfamily	*Genera*	*Species*
Scarabaeinae	*1.Catharsius*	*1. Catharsius pithecius*
		2. Catharsius molossus
		3.Catharsius birmanensi
	1.Chironitis	*1.Chironitis indicus*
	2.Gymnopleurus	1.Gymnopleurus parvus
		2.Gymnopleurus spilotus
		3.Gymnopleurus bombayensis
		4.Gymnopleurus miliaris
		5.Gymnopleurus cyaneus
		6.Gymnopleurus flagellatus
	3.Liatongus	*1.Liatongus rhadamistus*
Coprinae	4.*Onitis*	*1.Onitis philemon*
		2.Onitis humerous
		3.Onitis falcatus
		4.Onitis lama
		5.Onitis siva
	5.Onthophagus	*1.Onthophagus pectolus*
		2.Onthophagus catta
		3.Onthophagus gagates
		4.Onthophagus seniculus
		5.Onthophagus rudis
		6.Onthophagus acuticollis
		7.Onthophagus amplexus
		8.Onthophagus dana
		9.Onthophagus agnus
		10.Onthophagus unifasciatus
		11.Onthophagus scarvus
	6.Sisyphus	*1.Sisyphus neglectus*
	7. Heliocarpis	*1.Heliocarpis tyrannus*
	7. Heliocarpis	*2. Heliocarpis bucephalus*
	8.Copris	*1. Copris repertus*
Coprinae	*9.Phalops*	*1.Phalops divisus*
	10.Synapsis	*1.Synapsis gilleti*
	11.Scarabaeus	*1.Scarabaeus sacer*
	12.Drepanocerus	*1. Drepanocerus setosus*
	1.Aphodius	*1.Aphodius rufipes*
Aphodiinae		*2.Aphodius contaminates*
		3.Aphodius borealis
		4.Aphodius definition
		5.Aphodius obliteratus
		6.Aphodius stictius
		7.Aphodius granarius
Geotrupinae	*1.Geotrupes*	*1.Geotrupes blackburnii*
Total=04	*15*	*43*

Table 2. Species diversity of dung beetles in Phaltan Tahesil

Genera	*Species*	
	No.	*%*
Onthophagus	11	25.58
Aphodius	07	16.27
Gymnopleurus	06	13.95
Onitis	05	11.62
Catharsius	03	6.97
Heliocarpis	02	4.65

Present observations and analysis of dung beetles diversity indicating the predominant genera in this region is Onthophagus (11 species) followed by Aphodius (7 species), Gymnopleurus (6species), *Onitis* (5 species), *Catharsius* (3 species), *Heliocarpis* (2 species) and single species form each genera. From selected site 10 dung pads were assessed for individual species population. The data indicates that *Onthophagus catta* is a predominant dung beetle species which shown highest individuals in the sampling dung pads. It is followed by *Onitis philemon*, *Chironitis indicus*, *Aphodius rufipes* and *Liatongus rhadamistus.*

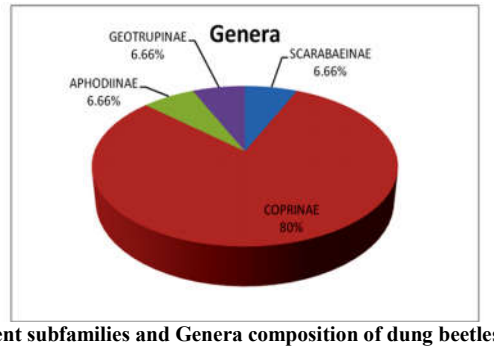
Table 3. Species population of major dung beetles in 10 sampling dung pads from different sites

Species	Number of individuals recovered in 10 sampling dung pads						
	Zirp.	Sal.	Dhaw.	Kapsi	Jawali	Asu	Chaudh.
Onthophagus catta	77	52	47	32	30	26	24
Onitis philemon	46	31	25	20	13	9	7
Chironitis indicus	37	39	26	19	11	5	-----
Aphodius rufipes	35	17	21	19	13	6	9
Liatongus rhadamistus	23	11	----	5	----	----	3
Onthophagus gagates	16	9	13	9	11	7	7
Aphodius granarius	11	14	7	5	----	4	2
Catharsius pithecius	08	3	----	----	2	----	----

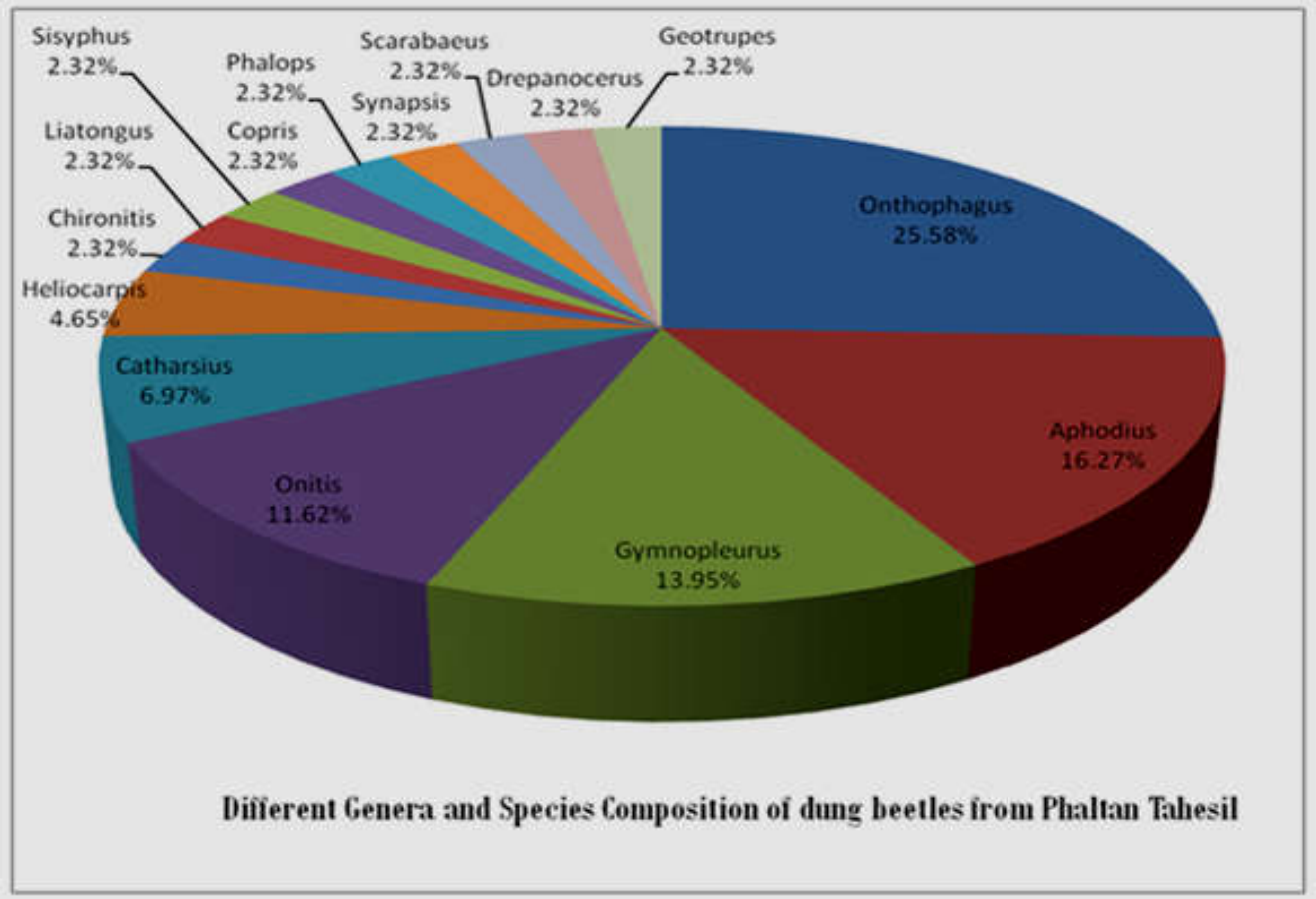
Present study also reveals that of seven cattle grazing sites which were selected from Phaltan Tahesil, Zirapwadi site showed maximum number of dung beetles of various genera and species from 10 sampling dung pads followed by Salpe, Dhawal and minimum number of dung beetles were recovered from Chaudharwadi site. This indicates that Zirapwadi cattle grazing land is most suitable habitat for dung beetles. This may be due to the type of soil which helps the beetles for excavating the tunnels under the dung pad. Zirapwadi site is having porous sand mixed clay soil which may be helpful for dung beetle population.

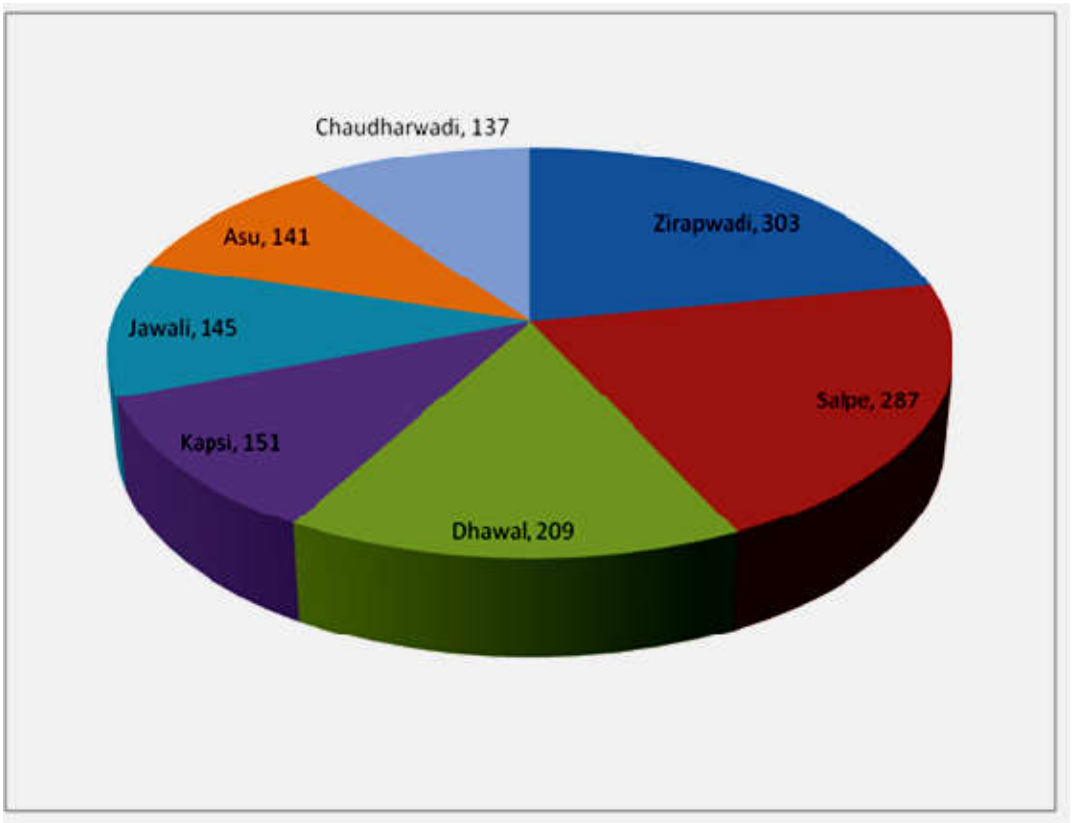
Table 4. Number of beetles recovered from 10 sampling dung pads from seven sites

Site	No. Of beetles recovered
Zirapwadi	303
Salpe	287
Dhawal	209
Kapsi	151
Jawali	145
Asu	141
Chaudharwadi	137



Different subfamilies and Genera composition of dung beetles from Phaltan Tahesil





Number of beetles recovered from 10 sampling dung pads from Seven sites

Plate No.1

1. Catharsius pithecius

2. Gymnopleurus. flagellates

3 G. spilotus

4 G. miliaris

5. Liantongus rhadamistus

Plate No.2


6. Onitis philemon


7. Heliocopris dominus male

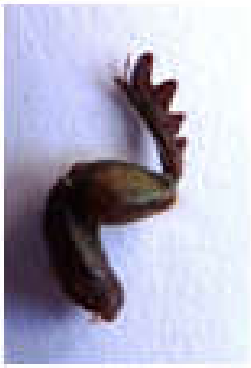

8. Scarabaeus sacer

Plate No.2

9. Chironitis indicus

10.1 Head and clypeus

10.2 Prothoracic leg male



10.3 Prothoracic leg female

***10. Chironitis* legs and head**

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