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Preliminary study on composition and diversity of beetles (Order- Coleoptera) in and around Davangere University Campus, Davangere, Karnataka

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Abstract

This study is conducted to examine the diversity of Beetles (Coleoptera) inhabiting in and around Davangere University Campus, Karnataka, India. Based on the different habitat sites. The survey is carried for four months (January-April 2018) at four sites. A total of 324 beetles belonging to 29 species under 10 families were recorded. Scarabaeidae is the most dominant family with 10 species followed by Coccinellidae with 7 species, Tenebrionidae with 4 species, Histeridae with 2 species, Cerambycidae, Chrysomelidae, Curculionidae, Dynastidae, Elateridae and Hydrophilidae with 1 species each. On the basis of total number of individuals *Chilocorus nigrita* is the most dominant species and constituted 33.64% of total beetles followed by *Oniticellus cinctus* Fabricius 13.58% and *Gonocephalum granulatulum* (11.72%). Diversity index and species richness indicates good assemblage of beetles in the study area.

Keywords: Coleoptera, beetles, diversity

1. Introduction

Beetles belong to the Order Coleoptera (Gk. Koleos -sheath, ptera- wing), it is the largest group of organisms at the order level and show exceptionally diverse adaptations to a wide range of environmental conditions & habits [9]. India is rich in terms of biological diversity due to its unique biogeographic location, varied climatic conditions and enormous ecodiversity. India contributes to a diversified fauna of beetle holds about 5% of all known species of the world [1]. Approximately 15,088 species were recorded in India [8]. The majority of beetles are detritus feeders, some feed on flesh, dung, fungi, plants, pollen, flower and fruit as well as some are predatory invertebrates and some are parasites, frequently with highly specialized host ranges or life cycles [13, 11]. Beetles are not only pests but also helpful in controlling the populations of pests. One of the best, and widely known, examples is the ladybug or ladybird (family Coccinellidae) [2]. Beetles also play a critical role in the food web structure and the flow of energy, in the ecosystem [6, 14]. Beetles are considered as a biological markers to assess the effects of anthropogenic activities on the terrestrial ecosystem, because they are in close contact with toxic elements present in soil and in leaf litter. These organisms are extremely sensitive and react quickly to environmental changes. These criteria make beetles as an excellent indicator of terrestrial ecosystem [4]. Davangere district enjoys a semi arid climate, dryness in the major part of the year with hot summer. This work focuses on the composition and diversity of beetles in the Davangere University campus.

2. Material and Method

2.1 Study area: Davangere District, located in the heart of Karnataka owes its nomenclature to the term "Davana Kere" meaning "Village of Lake". Occupying an area of 5924 sq. km and stretching between the geometric coordinates of 14°28' N and 75°55' E with an altitude of 539 meters. This study was carried out for a period of 4 months (January to April 2018) at four different sites (A-D). Davangere university campus covers an area about 73 acres and located 10 Km away from Davangere city. This study is restricted to the family level of the order Coleoptera,

Based on their habitat the beetle's survey was carried out in the Davangere university campus.

Site A. Dung and dead leaf vegetation in the campus.

Site B. Soil and Sand.

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Site C. Decaying wood, under tree barks.

Site D. Trees, herbs, bushes and grass.

2.2 Sampling method and data analysis

Beetle sampling was done every day from the four sites. Two standard methods were used for good collection of specimen. In all the sites Pitfall traps, sweep net and hand picking methods were done and monitored every day. Light traps were also used specially in Site C and D. Sometimes shrubs and tree branches were shaken, so that beetles may fall on large white sheets. Identification up to the family level was done using standard identification manual. The obtained data were used to analyze for diversity indices. The diversity of beetles was evaluated by Shannon-Wiener diversity index, Simpson index, Margalef's index for species richness and Evenness Index were calculated. Graphical representation of monthly variation of beetle diversity was done using MS Excel (2007)

3. Result

In the present survey a total of 324 individuals belonging to order Coleoptera were collected. A total of 10 families belonging to Coleoptera were recorded. And all the collected individuals were identified, which was depicted in the table 1; figure A, B and C. Among the recorded species 10 were belong the Scarabaeidae, which was the most dominant family contributes 34.48% of the relative number of species, which was followed by the Coccinellidae 24.13% with 7 species and Tenebrionidae 13.79% with 4 species. Histeridae contributes 6.89% with 2 representatives. Cerambycoidae, Chrysomelidae, Curculionidae, Dynastidae, Elateridae and Hydrophilidae contributes 3.44% of each (table 2 and Graph 1). Table 3-6 represents the site wise (study site A-D) distribution of species abundance along with the family. Highest number of individuals were observed in the site-D (143) followed by site-A (123). In the site-B, 49 individuals were identified and least numbers were observed at the site-C. Beetles community showed a significant variation along different habitat sites, site-A of dung and dead vegetation had 12 different species followed by site-D of trees, herbs, bushes and grass with 9 species and site-B of sand and soil and site-C of decaying wood, tree barks, ground and plants with 4 species each. On the basis of total number of individuals

Chilocorus nigrita was the most abundant species and constituted 33.6% of total beetles followed by *Oniticellus cinctus Fabricius* (13.5%) and *Gonocephalum granulatum* (11.7%). This study indicated that the diversity index, species richness and evenness of Coleoptera fauna in and around Davangere university campus was 2.44(Shannon index), 0.05 (simpson index), equitability index 0.8 and 4.82 Margalef Richness Index respectively (Table 7). Graph 2 and table 8 shows the monthly wise distribution of species in the study area. Monthly wise fluctuation was recorded. Lowest number of species were observed in the month of January (9) followed by the March, (14). Highest number of species were recorded in month of and February and April (19).

4. Discussion

Insects are the most diverse and dominant organisms on Earth. Scarabaeidae, was the most dominant family observed in this study, which accords to the previous study^[16,12]. Earlier study suggests that most species of Scarabaeinae occur throughout the year and they help in performing at various ecological functioning like seed dispersal, nutrient cycle and bioturbation^[7, 3]. Coccinellidae was the second dominant (24.13%) coleopteran reported in the present study. Coccinellidae is a well-known beetle family, distributed worldwide^[15]. Most of the coccinellids are predatory despite from their prey of choice, they also include other non-prey diet like honeydew, pollen, sap, nectar and various fungi^[10]. This strategy provides sufficient energy to compensate for metabolic losses whenever the preferred prey or essential food, is scarce^[5]. Tenebrionidae found to be third dominant (13.79%) coleopteran in this study. Earlier studies by Thakkar (2016) reported that 7.9% in Gujarat and suggest that due to the food choice on various plant origin, including decaying matter, wood, leaf litter, pollen, as well as fungal and algal matt, they may show better assemblage^[12]. Other groups like Cerambycoidae, Chrysomelidae, Curculionidae, Dynastidae, Elateridae Hydrophilidae and Histeridae found to be less in their assemblage in our study. Further a long term regional study can be carried out in all seasons for better results. Hence, the present survey will provide baseline data for better understanding their interaction with the environmental changes.

Table 1: Family wise distribution with the species abundance

Sl no.	Family	Species name	Species abundance	% Contribution of Species
01.	Chrysomelidae	<i>Aulacophora foveicollis</i>	01	0.3
02.	Coccinellidae	<i>Cheilomenes sexmaculata</i>	11	3.3
		<i>Coccinella septempunctata</i>	02	0.6
		<i>Coccinella transversalis</i>	07	2.1
		<i>Illeis cincta</i>	04	1.2
		<i>Chilocorus nigrita</i>	109	33.6
		<i>Coccinella hieroglyphica</i>	01	0.3
		<i>Harmonia octomaculata</i>	03	0.9
03.	Cerambycoidae	<i>Xystrocera globosa</i>	01	0.3
04.	Curculionidae	<i>Myloccerus discolor</i>	05	1.5
05.	Dynastidae	<i>Oryctes rhinoceros</i>	03	0.9
06.	Elateridae	<i>Elater abruptus</i>	03	0.9
07.	Histeridae	<i>Hister coenosus</i>	25	7.7
		<i>Atholus bimaculatus</i>	04	1.2
08.	Hydrophilidae	<i>Hydrophilus piceus</i>	02	0.6
09.	Scarabaeidae	<i>Oniticellus cinctus Fabricius</i>	44	13.5
		<i>Liatongus rhadamistus</i>	01	0.3
		<i>Scaptodera rhadamistus</i>	08	2.4
		<i>Onthophagus Taurus</i>	07	2.1

		<i>Onthophagus gazella</i>	04	1.2
		<i>Apogonia apogonia</i>	01	0.3
		<i>Anomala varicolor</i>	05	1.5
		<i>Anomala pallida</i>	08	2.4
		<i>Digitonthophagus gazella</i>	13	4.0
		<i>Holotrichia serrata</i>	03	0.9
10.	Tenebrionidae	<i>Gonocephalum granulatum</i>	38	11.7
		<i>Luprops orientalis</i>	05	1.5
		<i>Dendarus orientalis</i>	01	0.3
		<i>Pachycera tagenoides</i>	05	1.5
		Total	324	

Table 2: Percentage contribution of relative number of species of different families of order Coleoptera recorded during the study period

Sl. no	Family	Percentage (%) Contribution
01.	Cerambycidae	3.44
02.	Chrysomelidae	3.44
03.	Coccinellidae	24.13
04.	Curculionidae	3.44
05.	Dynastidae	3.44
06.	Elateridae	3.44
07.	Histeridae	6.89
08.	Hydrophilidae	3.44
09.	Scarabaeidae	34.48
10.	Tenebrionidae	13.79

Table 3: Species found in site-A (dung and dead vegetation)

Sl no.	Species name	Family	No. of individuals
04.	<i>Atholus bimaculatus</i>	Histeridae	04
06.	<i>Hister coenosus</i>	Histeridae	25
01.	<i>Anomala pallida</i>	Scarabaeidae	08
02.	<i>Anomala varicolor</i>	Scarabaeidae	05
03.	<i>Apogonia apogonia</i>	Scarabaeidae	01
05.	<i>Digitonthophagus gazella</i>	Scarabaeidae	13
07.	<i>Holotrichia serrata</i>	Scarabaeidae	03
08.	<i>Liatongus rhadamistus</i>	Scarabaeidae	01
09.	<i>Oniticellus cinctus Fabricius</i>	Scarabaeidae	44
10.	<i>Onthophagus gazelle</i>	Scarabaeidae	04
11.	<i>Onthophagus Taurus</i>	Scarabaeidae	07
12.	<i>Scaptodera rhadamistus</i>	Scarabaeidae	08
Total			123

Table 4: Species found in site-B (soil and sand)

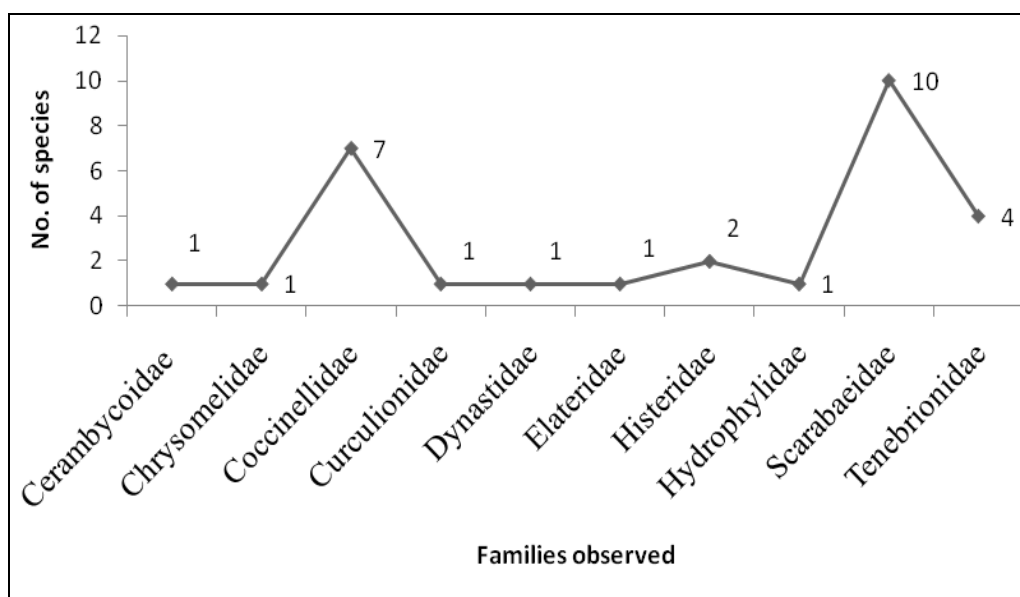
Sl no.	Species name	Family	No. of individuals
01.	<i>Dendarus orientalis</i>	Tenebrionidae	01
02.	<i>Gonocephalum granulatum</i>	Tenebrionidae	38
03.	<i>Luprops orientalis</i>	Tenebrionidae	05
04.	<i>Pachycera tagenoides</i>	Tenebrionidae	05
Total			49

Table 5: Species found in site-C (decaying wood, under tree barks, on ground and on plants)

Sl no.	Species name	family	No. of individuals
01.	<i>Elater abruptus</i>	Elateridae	03
02.	<i>Hydrophilus piceus</i>	Hydrophilidae	02
03.	<i>Oryctes rhinoceros</i>	Dynastidae	03
04.	<i>Xystrocera globosa</i>	Cerambycidae	01
Total			9

Table 6: Species found in site-D (trees, herbs, bushes and grass)

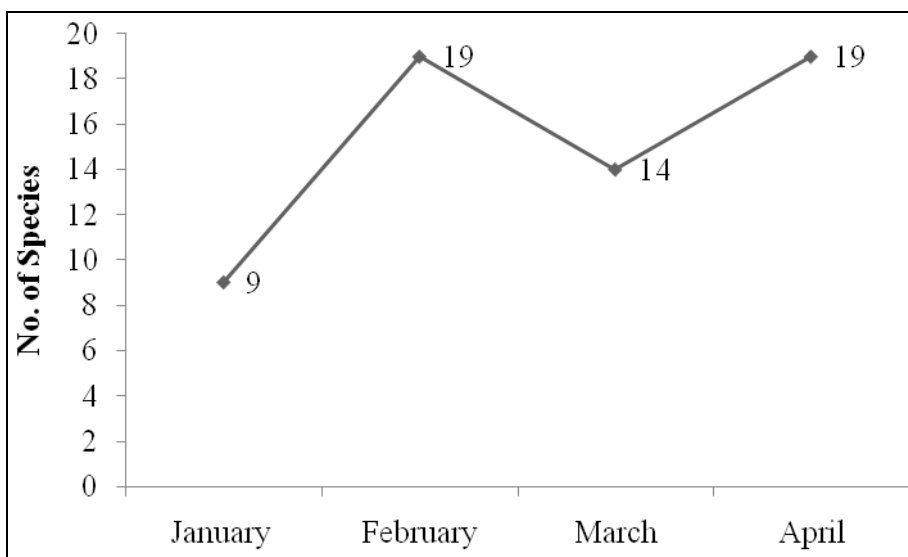
Sl no.	Species name	Family	No. of individuals
01.	<i>Aulacophora foveicollis</i>	Chrysomelidae	01
02.	<i>Cheilomenes sexmaculata</i>	Coccinellidae	11
03.	<i>Chilocorus nigrita</i>	Coccinellidae	109
04.	<i>Coccinella hieroglyphica</i>	Coccinellidae	01
05.	<i>Coccinella septempunctata</i>	Coccinellidae	02
06.	<i>Coccinella transversalis</i>	Coccinellidae	07
08.	<i>Illeis cincta</i>	Coccinellidae	04
07.	<i>Harmonia octomaculata</i>	Coccinillidae	03
09.	<i>Myloccerus discolour</i>	Curculionidae	05
Total			143



Graph 1: Species numbers of different families of order Coleoptera recorded during the study period

Table 7: Diversity index in the study area

Shannon Index	Simpson Index	Equitability (evenness) Index	Margalef Richness Index
2.44	6.42	0.72	4.84



Graph 2: Monthly wise distribution of species observed in the study area

Table 8: monthly wise distribution of species in the study are

Sl. No	Species name	January	February	March	April
01	<i>Aulacophora foveicollis</i>	-	+	-	-
02	<i>Cheilomenes sexmaculata</i>	-	+	+	+
03	<i>Coccinella septempunctata</i>	-	+	-	-
04	<i>Coccinella transversalis</i>	+	+	+	+
05	<i>Illeis cincta</i>	-	+	-	-
06	<i>Chilocorus nigrita</i>	+	+	-	+
07	<i>Coccinella hieroglyphica</i>	-	-	+	-
08	<i>Harmonia octomaculata</i>	-	+	-	-
09	<i>Xystrocera globosa</i>	-	+	-	+
10	<i>Myllocerus discolor</i>	-	+	+	+
11	<i>Oryctes rhinoceros</i>	+	+	-	+
12	<i>Elater abruptus</i>	-	-	+	-
13	<i>Hister coenosus</i>	+	+	+	+
14	<i>Atholus bimaculatus</i>	+	+	-	-
15	<i>Hydrophilus piceus</i>	-	-	+	+
16	<i>Oniticellus cinctus Fabricius</i>	+	+	+	+
17	<i>Liatongus rhadamistus</i>	-	+	-	-
18	<i>Scaptodera rhadamistus</i>	+	+	-	+
19	<i>Onthophagus Taurus</i>	+	+	-	+
20	<i>Onthophagus gazella</i>	-	+	-	+
21	<i>Apogonia apogonia</i>	-	-	+	-
22	<i>Anomala varicolor</i>	-	-	+	+
23	<i>Anomala pallida</i>	-	-	-	+
24	<i>Digitonthophagus gazella</i>	-	-	-	+
25	<i>Holotrichia serrata</i>	-	-	-	+
26	<i>Gonocephalum granulatum</i>	+	+	+	+
27	<i>Luprops orientalis</i>	-	-	+	+
28	<i>Dendarus orientalis</i>	-	-	+	-
29	<i>Pachycera tagenoides</i>	-	+	+	+



Fig A: 1: *Aulacophora foveicollis*, 2: *Xystrocera globosa*, 3: *Myllocerus discolour*, 4: *Oryctes rhinoceros*, 5: *Elater abruptus*, 6: *Hydrophilus piceus*, 7: *Hister coenosus*, 8: *Atholus bimaculatus*, 9: *Gonocephalum granulatum*, 10: *Luprops orientalis*, 11: *Dendaru sorientalis*, 12: *Pachycera tagenoides*



Fig B: 1: *Cheilomenes sexmaculata*, 2: *Coccinella septempunctata*, 3: *Coccinella transversalis*, 4: *Illeis cincta*, 5: *Chilocorus nigrita*, 6: *Coccinella hieroglyphica*, 7: *Harmonia octomaculata*.

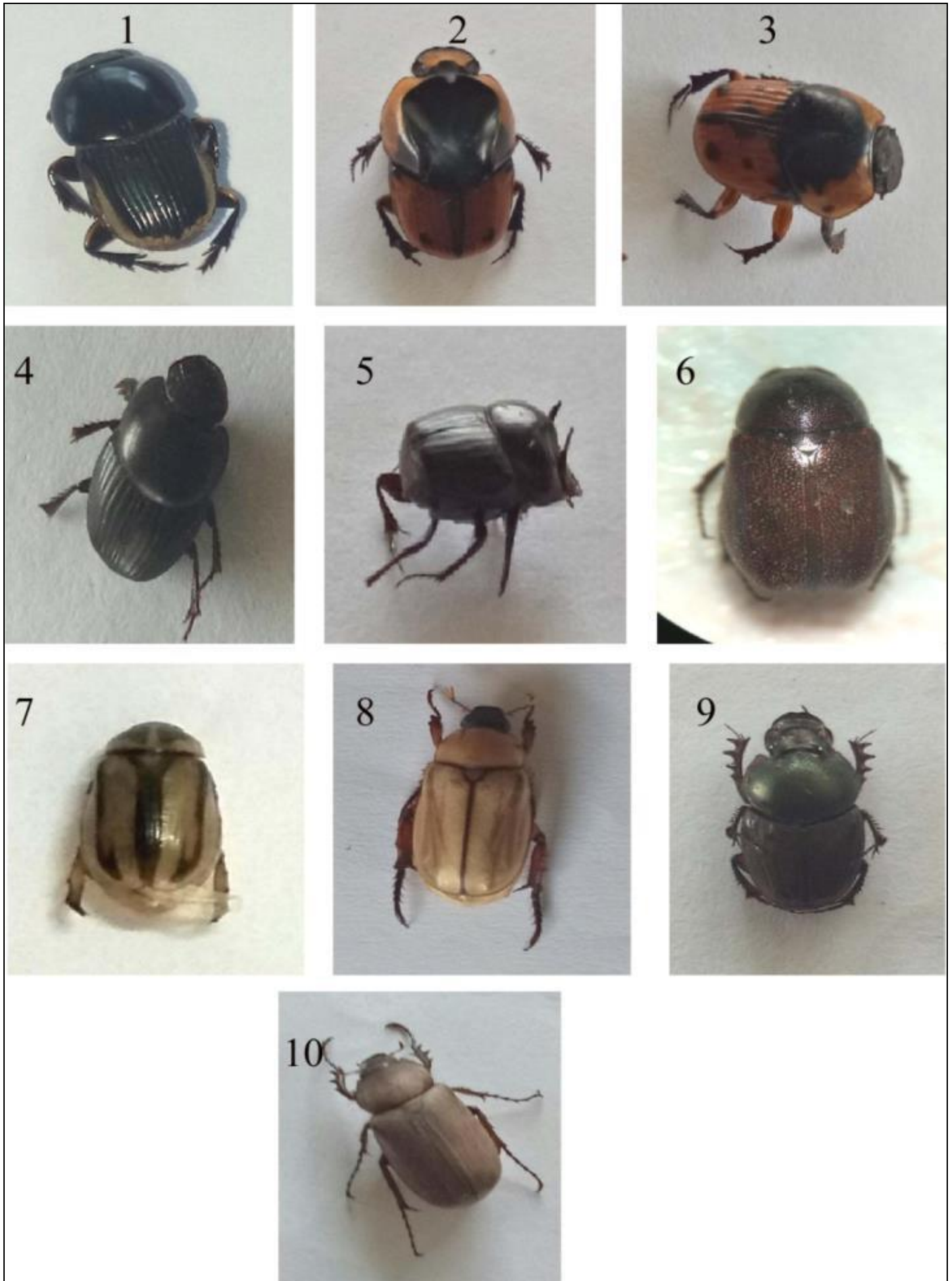


Fig C: 1 *Oniticellus cinctus fabricius*, 2 *Liatongus rhadamistus*, 3 *Scaptodera rhadamistus*, 4 *Onthophagus taurus*, 5 *Onthophagus gazelle*, 6 *Apogonia apogonia*, 7 *Anomala varicolor*, 8 *Anomala pallida*, 9 *Digitonthophagus gazelle*, 10 *Holotrichia serrate*

5. Conclusion

This preliminary survey confirms good aggregation of beetle in and around Davangere university campus. Davangere is surrounded by numerous of water bodies with large agricultural land, which can provide preferable host and provide favorable conditions for beetles. Further long term regional study should be carried out for better understanding of beetles composition and diversity in the different regions of Davangere, India.

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