

A PRELIMINARY REPORT ON SCARAB BEETLES (COLEOPTERA: SCARABAEIDAE AND HYBOSORIDAE) FROM SOME SELECTED DISTRICTS OF PUNJAB, INDIA

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Scarab beetles are very fascinating and unique scavengers (Hingston, 1923) found in warmer regions; they spend 95% of their life in dung or in the soil under the dung pat (Estrada and Coates-Estrada, 1991). They belong to order Coleoptera (Class- Insecta), family Scarabaeidae which is further grouped into subfamilies like Scarabaeinae (relatively large in size with bright colors, Fincher, 1981), Aphodiinae (Davis *et al.*, 2002; Scholtz *et al.*, 2009), etc. Generally, scarab beetles, also known as dung beetles or scavenger-beetles, used to feed on dung, carrion, fungi, vegetable matter, etc. (Arrow, 1931). True dung beetles belong to subfamily Scarabaeinae and Aphodiinae, whereas many species from subfamilies like Melolonthinae, Dynastinae, Rutelinae and Cetoniinae are plant feeders and agricultural pests of various crops (Chandra *et al.*, 2015).

First extensive study on dung beetles of India was carried out by Arrow (1910, 1917 and 1931) who described 1300 species from British India. Diversity of southern region of Indian dung beetle species was studied by Balthasar (1963 a,b, 1964) who wrote monographs on the two subfamilies Scarabaeinae and Aphodiinae of Palearctic and Oriental region. Comprehensive account on Scarabaeid beetles of Madhya Pradesh was given by Chandra and Ahirwar (2007) who reported 124 species/subspecies belonging to 45 genera under 11 subfamilies. Chandra and Singh (2010) reported 22 species of the scarab beetles belonging to 11 genera and 6 subfamilies from Achanakamar Wildlife Sanctuary, Chhattisgarh. Chandra and Gupta (2013) documented 43 species of the scarab beetles from Barnawapara Wildlife Sanctuary, Chhattisgarh. The scan of literature indicated that researchers across the world are working on dung beetle diversity, their ecological functions and extent of damage by some phytophagous species but an insight of Indian literature indicated that information on dung beetle diversity is lacking in many regions.

Due to lack of research on scarab beetles in Punjab state, a survey was conducted in 2019-2020 from three districts viz., Amritsar, Ferozepur and Tarn Taran.

Hence, this report summarizes preliminary results of diversity of beneficial and harmful scarab beetles from Punjab.

A total of 1,451 specimens were collected throughout the research period from different locations of Amritsar, Ferozepur and Tarn Taran. The geographical locations of Amritsar, Ferozepur and Tarn Taran district having coordinates 31.63 °N 74.87 °E, 30.9166 °N 74.6°E and 31.136325° N 74.949525° E respectively, are shown in Fig. 1.



Fig. 1. Map showing the locations of sampling areas.

The specimens were collected either by hand, pitfall traps or light traps. Adult dung beetles were collected directly from dung pats with the gloved hands or by forceps. These collected specimens were transferred to killing jars containing benzene vapors as killing agent. Afterwards, specimens were put into polybags and properly labelled with date and place of collection. The killed specimens were then brought to the laboratory and were put into water for cleaning dung, debris or soil to get clear morphological features. They were then dried, labelled and preserved in Insect Laboratory, Khalsa College Amritsar. Later on, preserved specimens were sent to the Zoological Survey of India (ZSI), Kolkata for authentic identification.

These specimens belong to families Scarabaeidae and Hybosoridae, which were further divided into 7

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subfamilies, 12 tribes and 17 genera. Amongst all the specimens, the subfamily Scarabaeinae was dominant with 864 representatives followed by Aphodiinae (459) Dynastinae (12), Cetoniinae (10), Melolonthinae (8), Rutelinae (2) and Hybosorinae (96) (Fig. 2). Data indicate that district Amritsar supports a more diverse assemblage of beetles than Ferozepur and Tarn Taran. From Amritsar, 7 subfamilies and 10 tribes were found whereas 2 subfamilies and 7 tribes from Ferozepur and 5 subfamilies and 9 Tribes from Tarn Taran were recorded (Table 1).

With regards to feeding strategies of dung beetles, dwellers count for 50%, tunnelers (47%) phytophagous (2%) and rollers (1%) of all the specimens collected. Patole (2019) studied dung beetle diversity from District Dhulia and found that Scarabaeinae was dominant in number which includes forty percent of tunnelers and rollers and remaining sixty percent were phytophagous (60%) belonging to Dynastinae, Rutelinae, Melolonthinae and Cetoniinae subfamilies. According to Vinod and Sabu (2007), dung beetles of moist forests of South Western Ghats having species composition of 86.5%, 5.4% and 10.5% of tunnelers, rollers and dwellers, respectively. Phytophagous beetles belong to subfamilies Dynastinae, Cetoniinae, Melolonthinae and Rutelinae, causing damage to the agriculture crops (Ratcliffe *et al.*, 2015) whereas dwellers belong to subfamilies Scarabaeinae, Aphodiinae and Hybosorinae. Scarabaeinae also includes rollers and tunnellers which restrictively feed on dung and carrion (Halffter and Edmonds, 1982; Hanski and Cambefort, 1991) and were mainly found in sandy loamy to clay loamy soil types (Vessby, 2003).

Amritsar

Diversity of the dung beetles was more in this district than other districts with the presence of specimens 7 subfamilies viz. Cetoniinae, Dynastinae, Rutelinae, Melolonthinae, Hybosorinae, Aphodiinae and Scarabaeinae. Phytophagous beetles belonging to Subfamilies Cetoniinae, Dynastinae, Rutelinae and Melolonthinae were less in abundance as compared to other subfamilies Hybosorinae, Aphodiinae and Scarabaeinae which were more in abundance due to a more significant number of specimens.

Ferozepur

From this district, the specimens from the two subfamilies, namely Dynastinae and Scarabaeinae, were observed during the period of investigation. Subfamily Scarabaeinae was dominant throughout the period of observation due to a greater number of specimens. The collected specimens from this subfamily were mainly dwellers and tunnellers and subfamily Dynastinae being phytophagous were pests of agriculture crops.

Tarn Taran

The specimens from all the subfamilies were present in this district except Cetoniinae and Dynastinae. The abundance of the specimens from these subfamilies were more evenly distributed as compared to the other two districts and were also very less in abundance (Table 1).

In conclusion, a total of 1451 specimens represented by 17 genera, 12 tribes, 7 subfamilies

Table 1. Distribution and abundance in three selected districts of Punjab.

Feeding Strategy	Subfamily	Tribe	Site names		
			Amritsar	Ferozepur	Tarn Taran
Phytophagous	Cetoniinae	Cetoniini	+	-	-
	Dynastinae	Phileurini	+	+	-
		Pentodontini			
	Rutelinae	Anomalini	+	-	+
	Melolonthinae	Melolonthini	+	-	+
Dwellers	Hybosorinae	Hybosorini	++	-	+
	Aphodiinae	Aphodiini	++	-	+
	Scarabaeninae	Oniticellini	++	++	+
Tunnellers		Coprini			
		Onitini			
		Onthophagini			
Rollers		Gymnopleurini			

+ Abundance, ++ More abundance, - No abundance

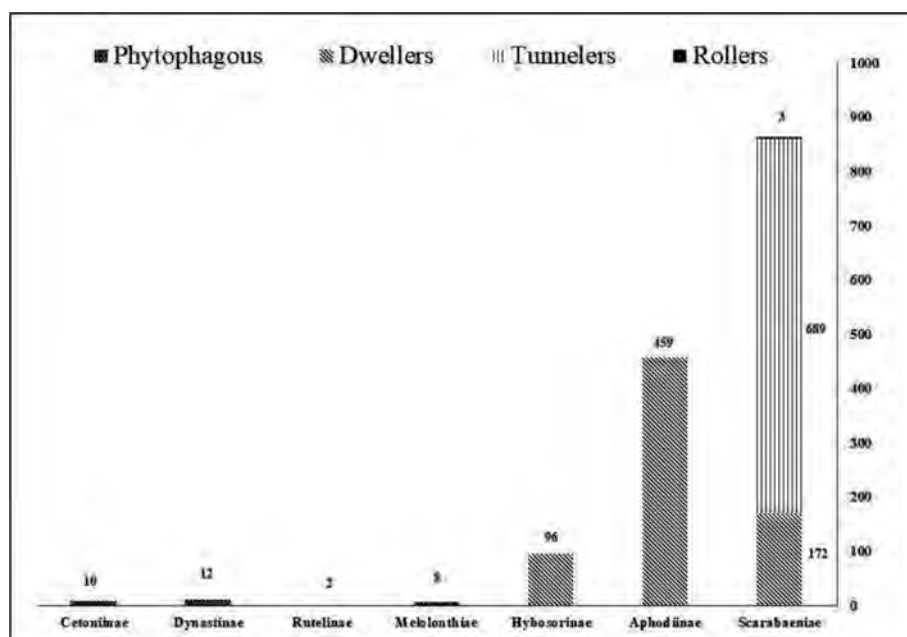


Fig. 2. Abundance of dung beetles of Scarabaeoidea from districts of Punjab.

belonging to Scarabaeinae, Cetoniinae, Dynastinae, Rutelinae, Melolonthinae, Aphodiinae and Hybosorinae were recorded from surveys. From these specimens, fewer number of phytophagous beetles were recorded from Punjab which are causing damage to agricultural crops whereas the ecological functional groups of beetles, such as dwellers and tunnelers, were higher in number but rollers were reported in very lower count. Scarabaeinae being dominant sub-family having dwellers dominantly feeding on dung and hence enhanced soil fertility.

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