



Diversity and abundance of skin beetles (Coleoptera: Dermestidae) in Jhunjhunu district of Rajasthan, India

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Abstract

The diversity and abundance of skin beetles in Jhunjhunu district of Rajasthan, India was studied from January 2021 to December 2022. A total of 8 species belonging to 5 genera under 4 subfamilies of the family *Dermestidae* were recorded from four selected study sites in the Jhunjhunu district. The most abundant subfamily subfamily *Dermestinae* was comprised of the highest number of species (3 species), followed by *Attageninae* and *Megatominae* (2 species each) and *Anthreninae* (1 species). As compared to number of individuals, again *Dermestinae* was the most abundant subfamily (51.47% of the total individuals), followed by *Attageninae* (22.05%), *Megatominae* (16.17%) and *Anthreninae* (10.29%). Various diversity measures calculated for *Dermestidae* family fauna in the study area have been provided as Shannon-weiner diversity index (H^x) was 1.975, Simpson index (D^x) was 0.156, Margalef's richness index (M^x) was 1.659 and Pielou's evenness index (J^x) was 0.949. The present study indicates a great diversity of dermestid beetles in the study area and provides preliminary data for future works.

Keywords: Diversity, abundance, dermestidae, jhunjhunu

Introduction

Coleoptera is the biggest insect order in the Kingdom Animalia, with around 3,86,500 known live species divided into 177 families, accounting for 40% of all known insects worldwide (Zhang, 2013 ^[15] and Stork, 2018) ^[13]. India has 22,334 Coleopteran species divided into 114 families (ZSI, 2012 and Chandra *et al.*, 2018) ^[4]. Skin beetles, which belong primarily to the family *Dermestidae*, are a fascinating and diverse group of beetles known for their ability to digest keratin, chitin, and other tough animal materials. This family includes many species that play important ecological roles in decomposition, forensics, and even museum pest control (Kalinovic, 2016) ^[12]. The world catalogue of *Dermestidae* comprises 45 genera with 12 tribes (Hava 2003). Hava (2004) created a global key to the *Dermestidae* (Coleoptera) genera and subgenera, complete with descriptions, nomenclature, and distributional data. Veer *et al.*, (2004) ^[14] described a new species of *Thaumaglossa Indiana* from Dehradun, Uttaranchal, India. The family *Dermestidae* included 1300 species worldwide according to Hava (2008). Hava and Mifsud (2006) listed 19 species of dermestid beetle from the Maltese Islands. Hava and Pierre (2008) reported 12 species of dermestid beetles from Qatar. Hava *et al.*, (2013) enlisted 23 species of dermestid beetles belonging to the *Dermestidae* family. Bulak *et al.*, (2013) ^[3] collected 28 species belonging to 6 genera under 3 subfamilies *viz.*, *Attageninae*, *Megatominae* and *Dermestinae* of family *Dermestidae* from Turkey. Hava *et al.*, (2020) described 3 dermestid species from Bali Island, Indonesia. Five new species of dermestid beetles from the Oriental region were described by Hava (2021). Similarly, Hava *et al.*, (2021) identified 17 dermestid species from different localities of the world.

Material and Methods

Jhunjhunu district (Photo Plate- 1), located between latitudes 27°38' to 28°31' North and longitudes 75°02' to 76°06' East, covers a geographical area of 5,926 sq. km. The region experiences extreme temperatures, reaching up to 48°C in the summer and dropping below 0°C in the winter. The district's altitude ranges from 312 to 368 meters above sea level. Rainfall in the area varies between 350 and 500 mm, predominantly occurring during the monsoon season from July to September.

For the present study, four sampling sites were selected: agricultural lands (Site-A), plains dominated by grasses and herbs (Site-B), rocky areas (Site-C), and water body banks (Site-D). The geographic coordinates for these sites are as follows: Site-A is located at 28°19'N, 75°31'E; Site-B at 27°89'N, 75°01'E; Site-C at 28°02'N, 75°63'E; and Site-D at 27°65'N, 75°41'E. Field surveys were conducted from January 2021 to December 2022 at the chosen sites, with sampling carried out once a month during both morning and evening hours throughout the study period.

Dermestid beetles were collected using sweep nets, hand picking, pitfall trap and light traps. After collection, the beetles were transported to the laboratory at the Department of Zoology, SRRM Govt. College, Jhunjhunu. The specimens were then pinned, stretched, and dried before being preserved in insect boxes with Paradichlorobenzene. The collected beetles were identified to the species level using a Stereo Zoom Binocular Microscope (Magnus MSZ-Bi), following taxonomic keys by Beal (2003) ^[11], Biggs *et al.*, (2022) ^[2]. The skin beetles were also photographed for future reference.

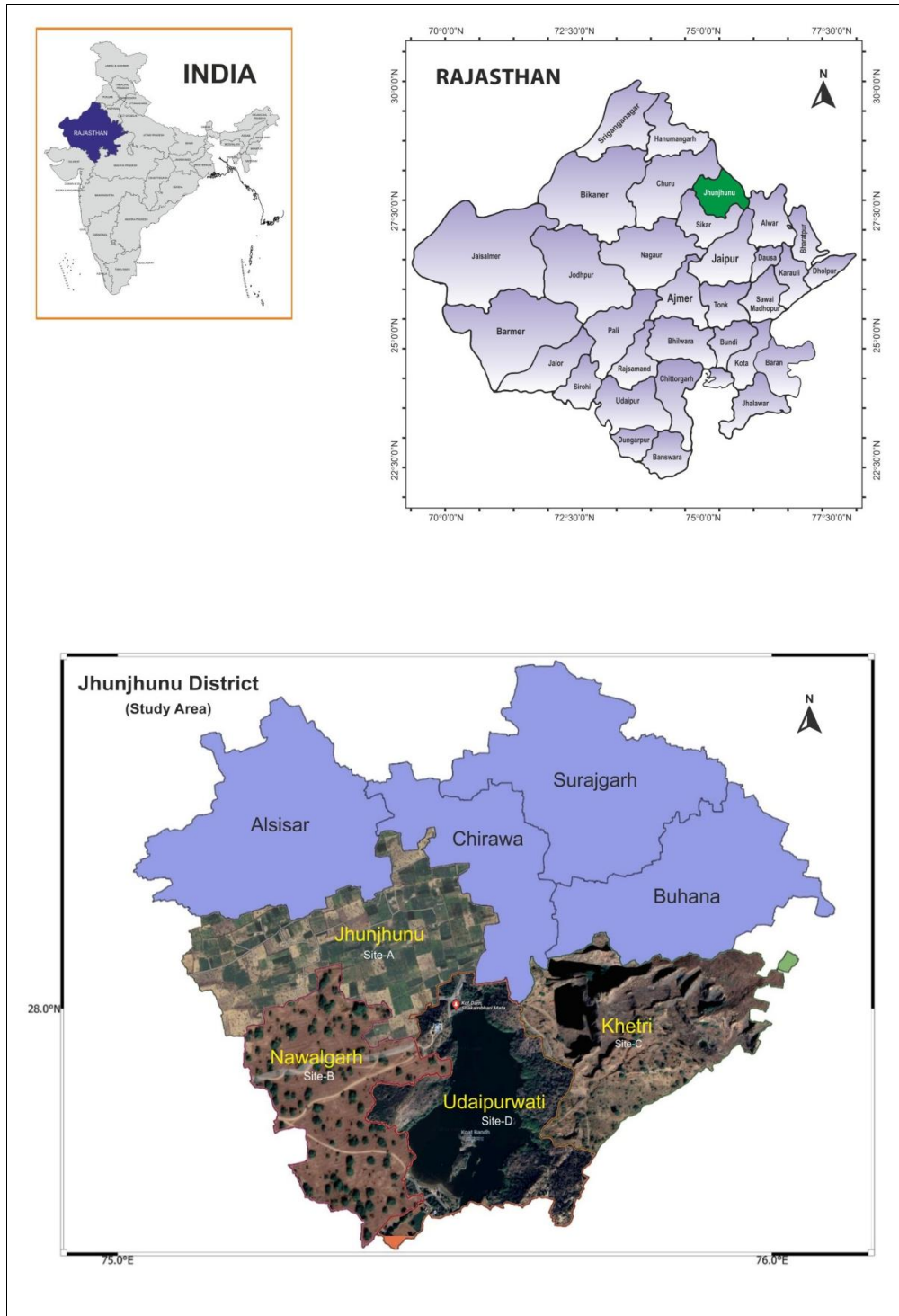


Photo Plate 1: Location of Jhunjhunu district with sampling sites

Result

A total of 8 species belonging to 5 genera under 4 subfamilies of the family *Dermestidae* were recorded from January 2021 to December 2022 from four study sites selected in the Jhunjhunu district. As evident from species richness and abundance of different subfamilies (Table 1&2), subfamily Dermestinae was comprised of the highest number of species (3 species), followed by Attageninae and Megatominae (2 species each) and Anthreninae (1 species) (Fig 1). As compared to number of individuals, again Dermestinae was the most abundant subfamily (51.47% of the total individuals), followed by Attageninae (22.05%), Megatominae (16.17%) and Anthreninae (10.29%) (Fig 1).

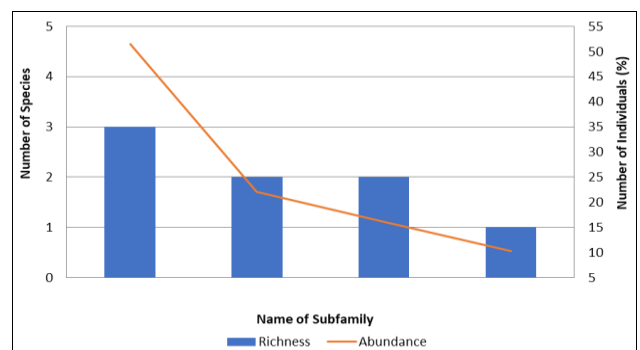


Fig 1: Species richness and abundance of *Dermestidae* family in the study area from January 2021 to December 2022.

During the first year of study, maximum number of species belonged to the subfamily Dermestinae constituting 3 species, followed by Attageninae and Megatominae (2 species each) and Anthreninae (1 species) (Table 2). On the other hand, again maximum number of individuals belonged to the subfamily Dermestinae which constituted 62.06% of the total individuals, followed by Attageninae (17.24%), Megatominae (13.79%) and Anthreninae (6.89%).

During the second year of study, maximum number of species belonged to the subfamily Dermestinae constituting 3 species, followed by by Attageninae and Megatominae (2 species each) and Anthreninae (1 species) (Table 2). On the other hand, again maximum number of individuals belonged to the subfamily Dermestinae which constituted 43.58% of the total individuals, followed by Attageninae (25.64%), Megatominae (17.94%) and Anthreninae (12.82%).

Table 1: Dermestid beetles recorded from different study sites selected in the Jhunjhunu district from January 2021 to December 2022.

S.No.	Family	Subfamily	Species
1	Dermestidae	Dermestinae	<i>Dermestes maculatus</i>
2			<i>Dermestes peruvianus</i>
3			<i>Dermestes</i> sp.
4		Attageninae	<i>Attagenus trifasciatus</i>
5			<i>Attagenus lobatus</i>
6		Megatominae	<i>Phradonoma nobile</i>
7			<i>Anthrenus coloratus</i>
8		Anthreninae	<i>Trogoderma megatomoides</i>

Table 2: Species richness and abundance of different subfamilies under the family Dermestidae recorded from the study area from January 2021 to December 2022.

Dermestidae	2021		2022		2021-22	
	Richness	Abundance	Richness	Abundance	Richness	Abundance
Dermestinae	3	18	3	17	3	35
Attageninae	2	5	2	10	2	15
Megatominae	2	4	2	7	2	11
Anthreninae	1	2	1	5	1	7
Total	8	29	8	39	8	68

Various diversity measures calculated for Dermestidae family fauna in the study area have been provided in Table 3. During two consecutive years of sampling period (from January 2021 to December 2022), Shannon-weiner diversity index (H^x) was 1.975, Simpson index (D^x) was 0.156, Margalef’s richness index (M^x) was 1.659 and Pielou’s evenness index (J^x) was 0.949.

Table 3: Values of diversity indices for Dermestidae family fauna recorded from the study area from January 2021 to December 2022.

Diversity measures	2021	2022	2021-22
Shannon-weiner diversity index (H^x)	1.859	2.021	1.975
Simpson index (D^x)	0.191	0.141	0.156
Margalef’s richness index (M^x)	2.079	1.911	1.659
Pielou’s evenness index (J^x)	0.894	0.972	0.949

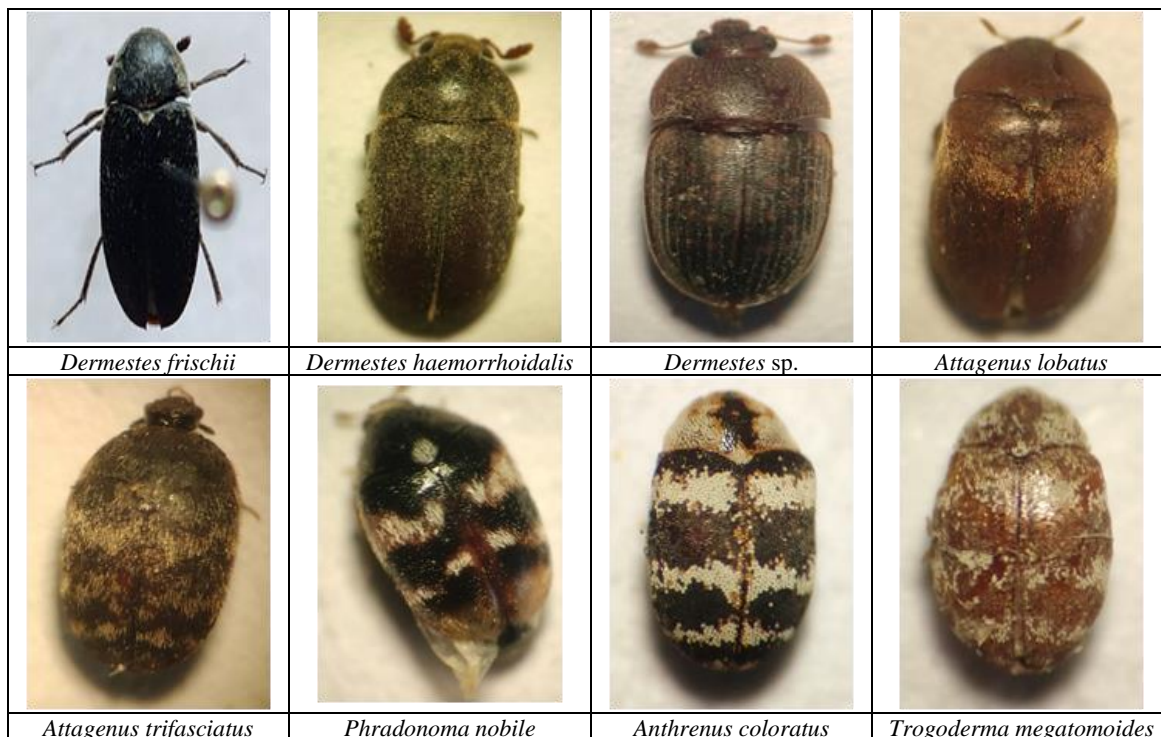


Photo Plate 2: Family- Dermestidae

Discussion

The *Dermestidae* family, known as dermestid beetles or skin beetles, is a diverse group of insects belonging to the order Coleoptera. The Dermestidae family is relatively large and diverse, with over 1000 described species worldwide (Háva, 2015). They are named for their tendency to feed on animal remains, including skin, hair, feathers, and other organic matter. The world catalogue of Dermestidae comprises 45 genera with 12 tribes (Hava, 2003). Hava (2004) created a global key to the Dermestidae (Coleoptera) genera and subgenera, complete with descriptions, nomenclature, and distributional data.

As compared to previous studies on dermestid beetle diversity from various regions of world, the present study recorded 8 species of dermestid beetles related to 5 genera under 4 subfamilies viz., *Dermestinae*, *Attageninae*, *Megatominae* and *Anthreninae* from the Jhunjhunu district. Whereas, Hava and Mifsud (2006) listed 19 species of dermestid beetle from the Maltese Islands. Likewise, Hava and Pierre (2008) reported 12 species of dermestid beetles from Qatar. Similarly, Hava *et al.*, (2013) enlisted 23 species of dermestid beetles belonging to the Dermestidae family. Consonantly, Bulak *et al.*, (2013) ^[3] collected 28 species belonging to 6 genera under 3 subfamilies viz., *Attageninae*, *Megatominae* and *Dermestinae* of the family Dermestidae from Turkey. Similarly, Hava *et al.*, (2021) identified 17 dermestid species from different localities of the world. However, Hava *et al.*, (2020) described 3 dermestid species from Bali Island, Indonesia which is in accordance with the present findings. Similarly, 5 new species of dermestid beetles from the Oriental region were described by Hava (2021).

Conclusion

The diversity and abundance of dermestid beetles in Jhunjhunu, Rajasthan showed the adaptability and ecological significance in arid and semi-arid environments. This type of dry climate supported many dermestid species, especially those adapted to arid conditions, including commonly found genera like *Dermestes*, *Anthrenus*, *Trogoderma*, and *Attagenus*. The Dermestid beetle community in the study area was moderately diverse, had a good number of species, and individuals were quite evenly spread among those species. These beetles helped break down dead animals and recycle nutrients. In general, the dermestid beetles in Rajasthan showed both rich variety and practical importance. More studies and careful watching were needed to manage them well.

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