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Community composition and microhabitat preference by Saurian fauna of MDS University campus and nearby areas of central Aravalli foothills

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Abstract
A community is composed of all the organisms that live together in a particular habitat. This paper emphasizes the occurrence and habitat utilization of the lizard community in Maharshi Dayanand Saraswati University Campus of Ajmer, Rajasthan, India. The Habitat in particular lies at the base of the Aravalli mountain ranges of semi-arid climatic conditions of Rajasthan state. The period of the study was 2 years during that 7406 individuals of 15 lizard species was observed in around 120 samplings in a total of 200 hectare area of mosaic habitats within and around the campus. The association and richness of lizard species concerning the available habitats and seasonal conditions are discussed in this paper.

Keywords: Lizard diversity, Ajmer, habitat utilization

Introduction
The species richness, taxonomical composition and local distribution of lizard fauna are poorly documented from the central Rajasthan. Increasing human disturbance has caused disturbances in the habitats (Western and Pearl 1989) [14] which directly resulted in the reduction of biological diversity (Ehrlich 1988) [5]. The preservation of components of biological diversity occurs in habitats with leas disturbances (Janzen 1998) [8]. The campus of Maharshi Dayanand Saraswati University is one of the ideal habitats with high undisturbed areas that can be a suitable habitat for a variety of organisms including mammals, birds, snakes and lizards. Lizards are one of the common living reptiles that live in different habitats of Rajasthan (Das, 2002) [4]. Microhabitats influence the presence of lizards (Brown 1992) [1] and the Distribution of lizard species in arboreal and sub arboreal habitats is mainly correlated with the structure of digital lamellae (Tikader and Sharma, 1992) [12]. Lizards are one of the important terrestrial predators in any that mainly consume a wide range of invertebrates and insects (Pinka 1986) this makes lizards one of the important species of any food web which feeds on various invertebrates and Insects and act as a food source for higher trophic species. Recently Sharma *et al* 2011 worked on the identification of the new locality records and distribution of *Hemidactylus triedrus* (Daudin, 1802) (Squamata, Gekkonidae) At the North-east Parts of Aravalli Ranges, Rajasthan, India. And later on, Sharma *et al*., (2014) [11] identified mining and encroachment as a major threat to the population of the same species. The main objective of this research is to make a checklist of Lizard species for generating a Baseline dataset of available saurian fauna present within and around the campus and to fulfil the research gap of proper assessment of saurian fauna around the Aravalli mountain ranges and semi-arid Rajasthan.

Materials and Methods
A. Study area
The following study was conducted at campus of Maharshi Dayanand Saraswati University Ajmer, Rajasthan, India (260 50" N Latitude and 74068" E longitude) situated in the lap of the central Aravalli foothills ranges spans over 200 ha of land area. This area is classified as an ecotone between Arid and Semi-Arid Rajasthan, primarily sharing characteristics of semi-arid Rajasthan. The area receives a mean annual rainfall of 565 mm and temperature ranges from 3^0C to 45^0C. The data for the presence and abundance of Lizard species were collected for two years that's it from July 2019 to October 2021 with a total of 120 surveys. During the study, the maximum temperature was recorded in the month of July 2019 and the Lowest was recorded during the month of January 2020. The highest humidity was observed during the month of August 2020 and the lowest was recorded during the month of April 2020.

B. Survey Methods
Visual encounter method as described by Campbell and Christmann (1982) [2] marking quadrates of dimention 50x50 m in the representative microhabitats. Identification of the individuals up to the species level was made based on Handbook of Indian lizards (Tikader and Sharma, 1992) [12] and available literature (Agarwal, 2018) [7].

Survey data of each sighting of lizard species observed included species, number of individuals, and type of microhabitat. The photographs of the observed species were captured using Nikon D 5300. Statistical analysis was performed using paleontological statistics software (Hammer *et al*, 2001) [6]

The microhabitats was classified as follows

a. **Leaf Litter:** Such type of microhabitats is, in general, heterogeneous and relatively complex in terms of both, chemically (cellulose and lignin) and structurally (of different types of decaying plant detritus such as leaves fruits flower seed bark fragments and twinges).
b. **Manmade Structure:** Such type of microhabitats is made by humans, it contains stones, brick and any household utensil. Ex., departmental buildings etc.
c. **Rocky terrain:** rocky habitat includes cliffs crag rocky areas, outcrops fell fields etc., rocky habitat represents lack of soil and exposures to wind and rain, flora consists of herbs and shrubs mainly.
d. **Arboreal:** Such habitats consist of older and large-size trees and also includes the roots &shoot along with the canopies, even hole within the tree trunks and small spaces between the barks and branches.
e. **Burrows:** Any types of burrows situated at the boundaries of fields, in grounds and even under large rocky structures were classified under this category.

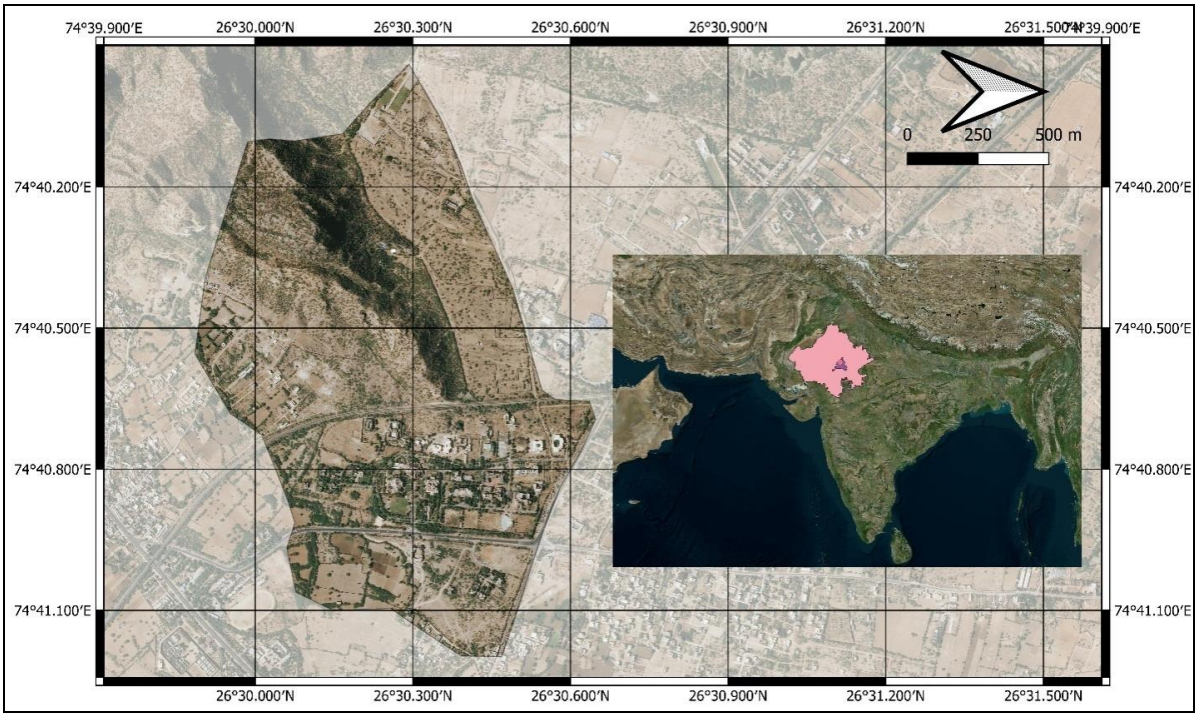

Fig 1: Study area map

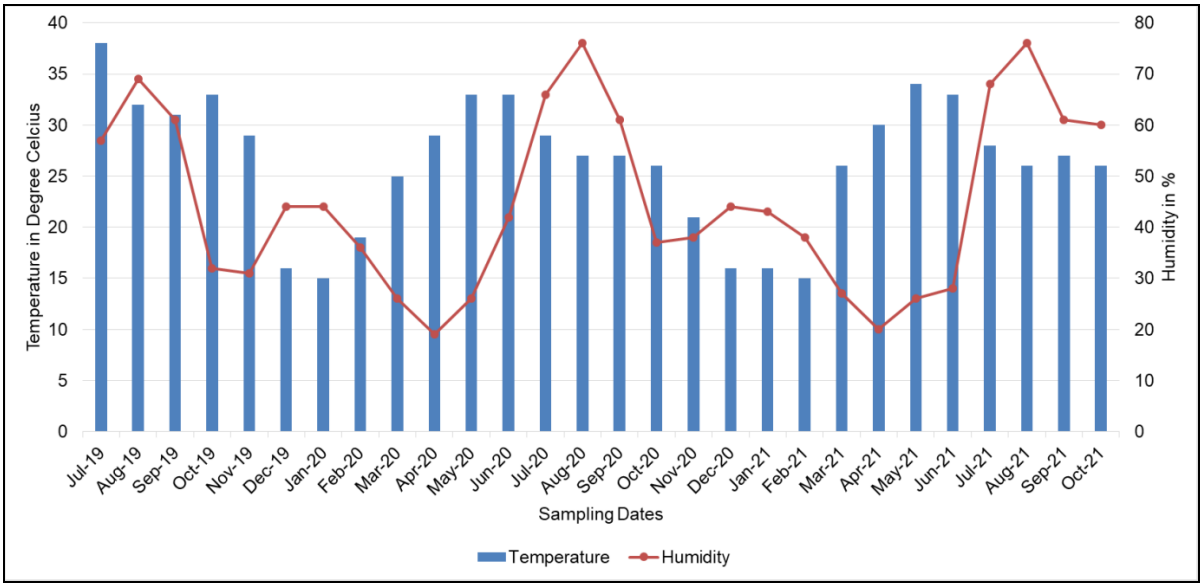

Fig 2: Climate graph of study area.

Results and Observations

Table 1: Checklist of observed lizard species along with occurrence in classified microhabitats.

S. No	Family	Species Name	Man-Made Structure	Rocky Terrain	Leaf Litter	Arboreal	Burrows	Total Species Wise	Total Family Wise	Rdi%
1	Gekkonidae	*Hemidactylus flaviviridis*	849	83	35	154	106	1227	2783	37.57
2		*Hemidactylus brooki*	313	74	36	96	79	598		
3		*Hemidactylus leschenaultii*	101	239	3	125	48	516		
4		*Hemidactylus triedrus*	0	37	0	0	0	37		
5		*Cyrtopodionscabrum*	0	395	0	0	10	405		
6	Agamidae	*Sitanaponticeriana*	0	367	0	0	74	441	1091	14.73
7		*Calotes versicolor*	124	23	76	367	60	650		
8	Varanidae	*Varanus bengalensis*	72	0	4	222	67	365	365	4.92
9	Scincidae	*Eutropismaculariа*	0	9	870	0	1	880	2029	27.39
10		*Eutropisdissimilis*	0	2	133	0	0	135		
11		*Eutropiscarinata*	0	10	792	0	0	802		
12		*Lygosoma punctata*	0	5	207	0	0	212		
13	Lacertidae	*Ophisopsjerdonii*	0	376	0	0	91	467	1138	15.36
14		*Ophisopspushkarensis*	0	429	0	0	73	502		
15		*Acanthodactylus cantoris*	0	0	0	0	169	169		
		Total	**1459**	**2049**	**2147**	**973**	**778**	**7406**	**7406**	**100%**

Table 2: Statistical analysis of observed data.

	Man-Made Structure	Rocky Terrain	Leaf Litter	Arboreal	Burrows
Taxa_S	5	13	9	5	11
Individuals	1459	2049	2156	964	778
Dominance_D	0.3991	0.1638	0.3126	0.2502	0.1249
Simpson_1-D	0.6009	0.8362	0.6874	0.7498	0.8751
Shannon_H	1.188	1.958	1.405	1.493	2.177
Evenness_e^H/S	0.6562	0.5453	0.4528	0.8905	0.8022
Berger-Parker	0.5819	0.2094	0.4035	0.3807	0.2172

Table 3: Whittaker diversity index and Jaccard similarity index values of observed microhabitats

		Jaccard similarity index				
		Man-Made Structure	Rocky Terrain	Leaf Litter	Arboreal	Burrows
	Man-Made Structure	0	0.285	0.555	1	0.454
	Rocky Terrain	0.55556	0	0.571	0.285	0.6
Whittaker diversity index	Leaf Litter	0.28571	0.27273	0	0.555	0.428
	Arboreal	0	0.55556	0.28571	0	0.454
	Burrows	0.375	0.25	0.4	0.375	0
	Highly diverse					
	Highly similar					

A total of fifteen species of lizards belonging to five families were recorded from the various microhabitats of the Maharshi Dayanand Saraswati University campus Ajmer. The individuals of these 15 species were recorded 7406 times during this study, with Gekkonidae Family was observed 2783 times making it 37.57% of total

observations followed by Family Scincidae with 27.39%, Family Lacertidae with 15.36%, Family Agamidae with 14.73% and Family Varanidae with 4.92%.

In the case of species wise observations, the highest number was observed in *Hemidectylus flavivirids* with a total of 1227 observations followed by *Eutropis macularia* with 880 observations and *Calotes versicolor* with a total of 650 observations.

Hemidactylus flaviviridis, Hemidactylus brooki, Hemidactylus leschenaultia, and *Calotes versicolor* was among the generalist species which was observed in all type of classified microhabitats. While *Acanthodactylus cantoris* which was observed in only one type of *microhabitat can be said to be specialist species.*

The maximum observations were recorded during the summer and monsoon seasons and least during late monsoon and winter seasons as the summer season was the breeding period for most of the observed species.

The number of individuals of Bengal Monitor Lizard (*Varanus bengalensis)* that is considered as Near Threatened species (Cota *et al*. 2021) was observed 365 times holding a percentage of 4.92% of total observations and *Ophisops pushkarensis* classified as Endangered species (Vyas *et al*. 2021) according to IUCN was observed for 502 times holding a percentage of 6.77%.

In the case of microhabitat selection and utilization, a total of 13 species out of 15 was recorded from Rocky terrain making it the most suitable habitat for most of the observed species followed by Burrows with 11 species, Leaf litter with 9 species and Man-made structures and Arboreal microhabitats with 5 species each. The highest number of observations for individuals of lizard species was made on Leaf litters with a total of 2147 observations followed by Rocky tarren with 2049 observations, Man-Made structures with 1459 observations, Arboreal microhabitats with 973 observations and Burrows with 778 observations. The Dominance index which ranges from 0-1 indicating that any habitat is dominated by a particular species was recorded highest in Man-made structure microhabitat with the value of 0.3991 indicating that a particular species dominates the microhabitat, *Hemidactylus flaviviridis* making an observation of 58.19% in the habitat was dominant for it. Dominance followed by Leaf Litter with a dominance value of 0.3126, Arboreal with dominance value of 0.2502, Rocky terrain with the value of 0.1638 and Burrows with a value of 0.1249 was observed as microhabitat with least dominance. Similarly, the Berger-Parker index shows the dominance by most common species was higher for Man-made structures. Shannon Index in which observed value less than 1 is marked as a habitat with low diversity and value greater than 3 marked as a habitat with high diversity, the highest value was observed in Burrows with a value of 2.177 made as microhabitat with Moderate diversity and the least was observed in Man-made structures with a value of 1.188. Evenness which indicates the stability of the lizard community the value ranges from 0-1 and was observed highest in the community of Arboreal microhabitat with a value of 0.8905 followed by burrows with a value of 0.8022 and the least was observed in the community of Leaf litter with a value of 0.4528.

When comparing the Diversity and Similarity between the microhabitats using the Whittaker diversity Index and Jaccard Similarity Index it was observed that Rocky Tarren and Man-Made Structures are highly diversified with Each other in terms of Lizard communities and Arboreal and Man-made structures are Highly similar in terms of Lizard species present in both the habitats

Discussion

This study concludes the presence of 15 species in the study area out of that 13 species belong to the Least concern category of IUCN and 2 species belongs to the Threatened category of IUCN. Bengal Monitor Lizard (*Varanus bengalensis*) a Near Threatened species Pushkar Small-scaled Snake-eye (*Ophisops pushkarensis*) an Endangered species which have the extent only on Aravalli hill range from Mt Abu, Rajasthan to Ajmer, Rajasthan. This observation makes the Aravalli Hill Range one of the habitats with conservation concerns. Regular Mining activities on Aravalli is still the major threat to the Flora and Fauna of the Aravalli Ecosystem including the threat to Endangered *Ophisops pushkarensis.* Another key observation of the study was justification to the part of the introduction stating that Increased human disturbance has a negative impact on lizard diversity and community. It was observed that Man Mad Structures in the campus which includes the university buildings etc the microhabitat with the highest human disturbance has relatively low diversity compared to all other habitats, High dominance index indicating the presence of individuals of one species, Similarly high Berger-Parker Value for dominance of one single species Lowest Shannon Index value indicating Low diversity compared to other microhabitats and also that Arboreal habitat was closely associated with Man mad structures, Trees being a part of arboreal habitat are associated with paths and building which are used by humans. The overall results of this study are crucial as baseline data for various Environmental Impact Assessments

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