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RESEARCH ARTICLE

Diversity of Spiders in Kukrail Reserve Forest, Lucknow, Uttar Pradesh, India

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ABSTRACT

Spiders belong to order Araneae of Class Arachnida and phylum Arthropoda. The present study was carried out to investigate the diversity of spiders in Kukrail Reserve Forest, located in Lucknow, Uttar Pradesh, India. Kukrail Reserve is a subtropical dry deciduous forest, covering an area of 5,000 hectare, located on the co-ordinates N-26°54' 399', E-080 59' 046'. The study was conducted from December 2013 to September 2014. During the study a total of 61 Spider species were identified belonging to 45 genera & 16 families. Out of this, majority of spiders were belonging to family Salticidae followed by Araneidae. Total species reported here represents about 25% of total spider families found in India.

1) INTRODUCTION

Spiders are octopod creatures which belong to phylum Arthropoda, class Arachnida and the order Araneae. Spider classification is based on the morphometric parameters which depend on the structure of the eye arrangements, spinnerets, chelicerae, labium and tarsal claws. Arachnids are an important albeit poorly studied group of Arthropoda that play a significant role in the regulation of decomposer populations and influence the food chain in most of ecosystem. A world without spiders would have tremendous effect on the food chain and cause imbalance in the ecosystem; moreover their study has been always remain neglected by people as they are considered as poisonous creatures.

Spiders play a pivotal role being dominant predators of insects, pest population, birds and other animals. They are helpful in maintaining the dynamics interaction of the ecological units in a micro level food web and could serve as an important component in IPM (Integrated pest management) processes and regulated the ill effect of overdoses of pesticides and other insecticides. Spiders could be used as biological indicators to observe the health of an ecosystem as they can be easily identified and evaluating the impact of anthropogenic disturbance on natural ecosystem [1].

Spiders have been marginalised when it comes to mainstream documentation, research and conservation. Their great copiousness and high diversity in almost all microhabitats, and foraging strategies coupled with the advantage of easy collection allow for their actual monitoring in the atmosphere [2]. Availability of prey density determines the diversity of spiders, prey density is generally depends upon seasonal variation and vegetation structure which may keep changing throughout the year in turn regulating spiders diversity and abundance. The first detailed account of Indian spiders was

provided by Pocock [3] who listed 216 spider species under 17 families. Spiders are abundant, diverse and largest group of invertebrates, which comprises 46408 species belonging to 4027 genera and 113 families [4], of which 1685 spider species from 438 genera and 60 families are reported from India [5]. Area-specific studies on the Indian araneae have been conducted by naturalists like Pocock [3], Tikader [6, 7, 8, 9], Tikader & Biswas [10] and Gajbe & Rane [11].

Spiders generally have a range within the specific humidity and temperature preferences areas according to their "physiological tolerances" which make them ideal candidates for land conservation studies [12]. Therefore, documenting spider diversity patterns in this Kukrail forest ecosystem can provide important information to justify the conservation and management of this ecosystem.

2) STUDY AREA

Kukrail Reserve is a Sub Tropical Dry Deciduous Forest, covering an area of 5,000 hectares, located on the co-ordinates N-26°54' 399', E-080 59' 046' (Figure 1). This Reserve is world famous for Gharial (*Gavialis*) Breeding and Rehabilitation Program. The Centre at Kukrail came up in the year 1978, which was funded by the Uttar Pradesh forest department in collaboration Ministry of Environment and Forests India. This effort marked the beginning of state government's efforts towards conservation of crocodiles at a time when only 300 of them were left. The Reserve harbours a variety of flora and fauna and a large water body (Kukrail canal).

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3) MATERIALS AND METHODS

The study was conducted from December 2013 to September 2014, covering three seasons viz, winter, summer and rain respectively. Five 20 x 20 m quadrates were taken for extensive surveys. Sampling was based on Line transect and Quadrate methods and was carried out in the morning and afternoon between 8 A.M. to 3 P.M. Spiders were collected by adopting standard sampling techniques such as sweep netting, beating sheets, active searching and hand picking and Umbrella collection. Collected spiders were photographed in live condition identified and then released to their natural habitat. Few spiders were observed under microscope for identification and study of some morphological characteristics. All specimens were identified using the taxonomic keys for Indian spiders given by Tikader [13], Biswas and Biswas [14], Barrion and Listsinger [15], Gajbe [16], Sebastian and Peter [17].

4) RESULT AND DISCUSSION

During this study a total of 61 Spider species were identified belonging to 45 genera & 16 families (Table 1). Out of this,

majority of spiders belong to family Salticidae (23%) followed by Araneidae (20%), Thomisidae (10%), Lycosidae (7%), Linyphillidae (7%), Nephilidae (7%), Pholcidae (5%) Tetragnathidae (5%), Philodromidae (3%), Pissauridae (3%), Sparassidae (3%), Eresidae, Hersiliidae, Selenopidae and Uloboridae each having 1 species (2%) Figure 2. Similar studies have been done by Wankhade et al., [18] in University of Pune, Adarsh & Nameer [19] in Chinnar Wildlife Sanctuary, Singh & Singh [20] in Northeastern Uttar Pradesh, Deshmukh and Raut [21] in Salbardi Forest, Satpura, A.P. Sawane [22] from Chandrapur district, Maharashtra and Dhali et al., [23] in Ranthambore National Park Rajasthan. Occurrence of high diversity of spiders could be due to mixed vegetation of the forest which provides ample space to build web of different size and protection from their predators [24]. Total species reported here represents about 25% of total spider families found in India. During the study, species richness of different families found changing with the change in season.

Table 1: Total number of families, genera, species and functional guild of spider from Kukrail Reserve Forest

S.N.	Guild	Family	No. of Genera	No. of Species
1.	Orb weavers	Araenidae (Simon, 1895)	08	(12) <i>Argiopeanasuja</i> (Thorell, 1887), <i>Argiopepulchella</i> (Thorell, 1881), <i>Cyclosaconfra</i> (Thorell, 1892) <i>Cyclosaainsulana</i> (Costa, 1834) <i>Cyrtophorabidentia</i> (Tikader 1970) <i>Eriophora sp.1</i> <i>Neoscomamukerji</i> (Tikader, 1980) <i>Neoscomatheisi</i> (Walckenaer, 1841) <i>Araneusmitificus</i> (Simon, 1860), <i>Araneus sp.1</i> <i>Parawixiadehaani</i> (Daleschall, 1859) <i>Cyrtarachne sp.1</i>
2.	Space web builders	Eresidae (Koch, 1851)	01	(01) <i>Stegodyphus sp.sarasinorum</i> (Karsch, 1891)
3.	Ambushers	Hersiliidae (Thorell, 1870)	01	(01) <i>Hersiliasp.1</i> (Audouin, 1826)
4.	Ground runners	Lycosidae (Sundevall, 1833)	04	(04) <i>Hippasaagelenoides</i> (Simon, 1884) <i>Lycosatista</i> (Tikader, 1970) <i>Pardosasumatrana</i> (Thorell, 1890) <i>Trochosa sp. 1</i>
5.	Sheet web builders	Linyphillidae (Blackwall, 1859)	03	(04) <i>Erigone sp.1</i> , <i>Linyphia sp.1</i> <i>Linyphia sp. 2</i> <i>Atypena sp.1</i>
6.	Orb weavers	Nephilidae (Simon, 1894)	01	(01) <i>Nephilaclavata</i> (Koch, 1878)
7.	Stalkers	Oxyopidae (Thorell, 1870)	03	(04) <i>Oxyopesjavanus</i> (Thorell, 1887) <i>Oxyopesbirmanicus</i> (Thorell, 1887) <i>Peucetia sp.1</i> <i>Hamatalwia sp.1</i>
8.	Space web builders	Pholcidae (C. L. Koch, 1851)	02	(03) <i>Crossoprizalyoni</i> (Blackwall 1867) <i>Pholcusphalangiodes</i> (Fuesslin, 1775) <i>Artemasp.1</i>
9.	Ambushers	Philodromidae (Thorell, 1870)	01	(02) <i>Philodromus sp. 1</i> <i>Philodromus sp. 2</i>
10.	Ambushers	Pissauridae (Simon, 1890)	02	(02) <i>Pisaura sp.1</i> , <i>Thalassius sp.1</i>
11.	Stalkers	Salticidae (Blackwall, 1841)	09	(14) <i>Plexippuspaykulli</i> (Audouin, 1826) <i>Plexippus sp. 1</i> , <i>Phintellasp.1</i> , <i>Siler sp. 1</i> , <i>Siler sp. 2</i> <i>Rhene flavigera</i> (C. L. Koch, 1846) <i>Rhene sp. 1</i> <i>Rhene sp. 2</i> , <i>Thianiasp.1</i> , <i>Salticussp.1</i> <i>Phelgrasp.1</i> , <i>Myrmachneorientalis</i> , (Tikader, 1973), <i>Carrhotus sp.1</i> , <i>Carrhotus sp. 2</i>
12.	Ground runners	Selenopidae (Simon, 1897)	01	(01) <i>Selenopsradiatus</i> (Latreille, 1819)
13.	Foliage runners	Sparassidae (Bertkau, 1872)	01	(02) <i>Heteropodavenatoria</i> (Latreille, 1804) <i>Heteropoda sp.1</i>
14.	Orb weavers	Tetragnathidae (Menge, 1866)	02	(03) <i>Leucauge decorate</i> (Blackwall, 1864) <i>Leucaugecelebesiana</i> (Walckenaer, 1841) <i>Tetragnathamandibulata</i> (Walckenaer, 1842)
15.	Ambushers	Thomisidae (Sundevall, 1833)	05	(06) <i>Misumenavatia</i> (Clerck, 1757) <i>Camarius sp.1</i> , <i>Xysticus minutes</i> (Tikader 1960) <i>Xysticus sp.1</i> , <i>Thomisus sp.1</i> , <i>Lysiteles sp.1</i>
16.	Orb weavers	Uloboridae (Thorell, 1869)	01	(01) <i>Zosisgeniculatus</i> (Opell, 1979)

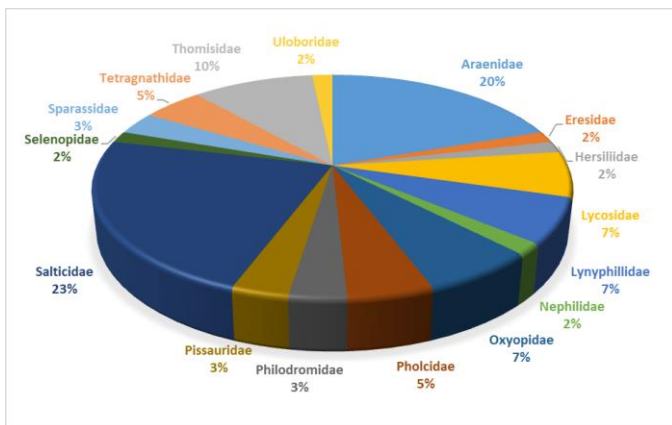


Fig 2: Family wise Percentage composition of Spiders species of Kukrail Reserve Forest

The spiders of Kukrail Reserve Forest can be divided into 7 feeding guilds based on the foraging behavior. They are the orb weavers (17 species), stalkers (18 species), ground runners (5 species), foliage runners (2 species), sheet web builders (4 species), space web builders (4 species) and ambushers (11 species). The dominant guild was stalkers with 18 species followed by orb weavers with 17 species and guild foliage runners was the very scarce with 2 species. Overview of taxonomic status and feeding modes of spiders of Kukrail is given in Table 2 and figure 3. Uetz et al., [25] studied the guild structure of spiders in major crops (1999).

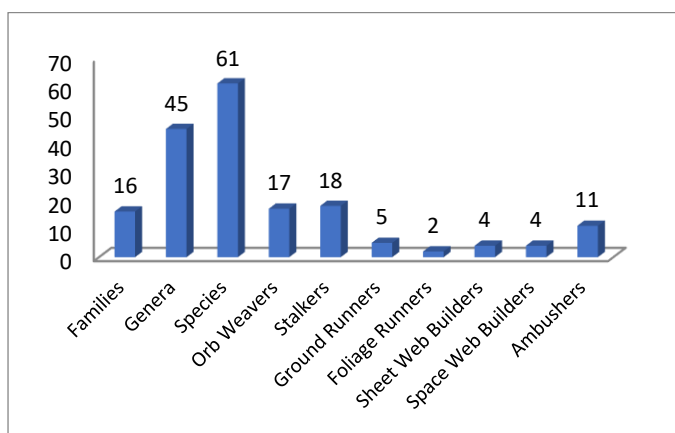


Fig.3: Overview of taxonomic status and feeding diversity of spiders in Kukrail Reserve Forest

There is no previous work in this area to compare the spider diversity. This indicates the need for further study in this area. Because of the intricate interaction of various climatic factors like rainfall, temperature, availability of water source nearby this area may hold many smaller but diverse environmental niches.

5) CONCLUSION

Studies on spiders in Uttar Pradesh are sparse and no checklist of spiders of this state has so far been prepared. Thus, this study provides baseline information about species diversity of one of the Reserve Forests of U.P. The study will help to work for the conservation of the species and specify the hidden benefits in them. In this study various threats to spiders were

also identified which include habitat destruction, human encroachment for habitation, terrestrial and water pollution, excessive use of synthetic pesticides etc. Thus efforts can be laid to rear and conserve spiders and use them in various ways such as bio control agents, their webs and venom may be used for medical and research purposes.

The study recommends for the conservation of habitat, pollution control, check on human activities for keeping the environment fit for natural growth of spiders including other flora and fauna. Organization of mass awareness programs for local people of the study area should be done to conserve the spider species.

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