BIODIVERSITY OF SPIDER FROM DIFFERENT HABITAT IN MUMBRA MAHARASHTRA- INDIA.

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ABSTRACT

Spider diversity is studied to explore the spider fauna of Mumbra. This is the attempt made for preparing a systematic list of species. Extensive search revealed 28 species belonging to ten families were recorded in Mumbra -Maharashtra. This represents 16.66 % of the total families recorded in India. Araneidae were the dominant family in this biome, which was composed of Lycosidae as next dominant family, followed by Tetragnathidae , Pholcidae Oxyopidae , Scytodidae, Theridiidae Salticidae and Philodromidae and Eutichuridae was the order of dominance of the characteristic families, of this region. Species abundance are related to grassland with waterlogged areas and mountain site with low inhabitants. Simpson diversity index showed maximum diversity with 20 species is 0.927 for spider in grassland habitat and 0.218 in mountain site. Shannon's diversity with 20 species is 2.809 in grassland and 1.743 for mountain habitat

Keywords: Spider, Mumbra, Arachnida**,** Diversity and distribution

INTRODUCTION

India is rich in both flora and fauna and is mega diverse country. Due to deforestation and overcrowding, there is destruction of natural habitat particularly of the invertebrates. Invertebrates were largely unnoticed in the assessment of biodiversity (Holloway and Stork, 1991). In the past, invertebrates were generally neglected in the design of conservation areas and were only incidentally conserved in existing parks and protected areas. Arachnids are important and second largest, contributing 8.3% of the total arthropods diversity . Among them Spiders are the most diverse and abundant invertebrate predators in terrestrial ecosystems (Wise, 1993). Yet poorly studied group among the arthropods. They play a significant role in the regulation of insect and other invertebrate populations in most ecosystems (Russell-Smith, 1999). There are many environmental factors that affect species diversity (Rosenzweig 1995).

Review of literature available reveals that the earliest contribution by Tikader (1980) Tikader, and Malhotra (1980) , More (2015) were the pioneer workers of Indian spiders made major contributions to the Indian Arachnology. Tikader (1987) published the first list of Indian spiders, which included 1067 species belonging to 249 genera in 43 families. Gajbe (2003) described 147 new spider species from different habitats of India.

Gajbe (1995a, 1987) recorded 13 species in Indravati Tiger Reserve and 14 species from Kanha Tiger Reserve, in Madhya Pradesh Chhattisgarh. Patel (2003) described 91 species belonging to 53 genera from Parabikulum Wildlife Sanctuary from Kerala, 66 genera with 116 species were recorded and from Gujarat Puma wildlife Sanctuary, by Manju Silwal et al. (2003). Sivaperuman and Rathore (2004) recorded 25 families of spiders in Desert National Park, Rajasthan. Ravindra, and Sujeeta. (2016) studied spider in Indore. As such there is no work on any aspect of Spider fauna of Mumbra , hence with the present work we will try to fill up a gap of information regarding biodiversity of Spider fauna in these areas.

AIM & OBJECTIVE

1. To provide comprehensive overview of baseline inventory of the diversity of spiders in different habitats of Mumbra
2. Study the biodiversity indices

MATERIAL AND METHODS

SAMPLING DESIGN AND TECHNIQUES

Survey was conducted from July 2017 to Jan 2018 at different sites of Mumbra located within 19.1736^{o} N, 73.0228^{o} E. Sampling was carried during morning hours between 7:00 am to 11:00 am. Spiders were sampled in localities across mountain patches, and grassland habitats type in low-lying areas, water logged and marshy in nature, that enclosed relatively homogeneous areas. Six transect of 500 m each in a month were placed with a total of forty- two transects in seven months were extensively surveyed. Transects were placed randomly within stratified vegetation types. The data was pooled for each site for quantitative analysis. Species richness was estimated for each habitat type Spiders were located , photographed and identified subjectively based on apparent differences to vegetation types.

FORMULA FOR CALCULATION

$$\text{Relative density} = \frac{\text{Number of individuals of a species}}{\text{Number of individuals of all species}} \times 100$$

$$\text{Simpson Index } D = \frac{\sum nx(n-1)}{NX(N-1)}$$

Simpson Index of Diversity=1-D

Shannon index of Diversity = -1x -∑ pi xln pi

OBSERVATION

Out of the 60 families recorded in the Indian region (Sebastian and Peter, 2009).Off which 10 families were recorded at Mumbra, Maharashtra-India. This represents 16.66 % of the total families recorded in India. Araneidae being the dominant family in this biome, composed of seven genera with (14 species). Neoscona genera of Araneidae family was dominant with greater no of species then as compared to other genera. Where as Argiopae showed maximum population in term of relative abundance (Table1, Fig2, Fig3). Lycosidae was the next dominant family with three genera with (01species) each, Tetragnathidae with two genera and (03 species), Pholcidae with two genera with (01 species) each, followed by, Oxyopidae (01 species), Scytodidae(01 species), Theridiidae (01species) Salticidae (01species), and Philodromidae (01species) Eutichuridae (01 species) was the order of dominance of the families in this ecosystem (Table 1 , Fig 2, Fig 3, Fig 4). Off the 28 species recorded during the study period , 06 were abundant, 10 Common and 12 Rare (Table 1, Fig 1). Distribution in different habitats was observed to be 20 in grassland 8 in mountain patches (Table 1 , Fig5). In the present study Simpson Diversity index was found to be 0.71 which is indicative of moderate diversity in community but for habitat it was observed to be 0.927 for grassland and 0.218 for mountain habitat (Table 3a, 3b , 3c). The value for Shannon index for 20 species is 2.809 in grassland and 1.743 for mountain habitat (Table 3b , 3c).

DISCUSSION

The primary factor for the growth of spider population is the availability of food in any ecosystem. However during the present studies 28 species were recorded among the 10 families, wherein the largest family was Araneidae with seven genera with (14 species) while the smallest families were, Oxyopidae (01 species), Scytodidae(01species), Theridiidae (01species) Salticidae (01species), and Philodromidae (01species) Eutichuridae (01 species) each. Perhaps the diversity differences may be due to differences in the habitat (Van, Hook. 1971, Farzana, Perveen et al 2012, Milind, V. S. and Amrita M. S. 2017, Magare, S. R 2017). It also exhibits 16.66% of spiders species with moderate diversity. It is important to note that spider fauna is abiquitous in nature and their diversity cannot be explained by quantifying one aspect of the environment (Mansoor Ahmead et al 2015). Spider in forest contributes to maintain insect fauna at equilibrium as the distribution of species are significantly influenced by environmental condition (Ziesche and Roth, 2008). Spider have received little attention from the conservation community. This may be related to negative public attitudes towards spiders (Kellert, 1989).

In the present study Simpson Diversity indices value is 0.71 indicative of moderate diversity with high abundance within the community, among the 20 species it was 0.927 in grassland and 0.218 in mountain habitat. Shannon index value is 2.809 for grassland habitat and 1.743 for mountain , indicative of maximum diversity in grassland habitat is more favorable due to humus soil with moderate diversity (Magare, S. R 2017). More species in the sample the richer the area. This index helps us to know how the abundance of the species is dispersed among all the species in the community.

In comparison to other ecologically important zones, there is no previous work carried out in this area to compare the spider diversity. Moderate diversity in the study area indicates the need for further study in this area. The study provides information on spider community in different ecosystem as well as help to understand the anthropogenic impacts on distribution of these spiders.

CONCLUSION

Spiders can be used as ecological indicators of forests, this study serves as a baseline for future study of spiders in these ecosystems. This study was conducted only for seven months. So seasonal variation in diversity and abundance of spider fauna needs to be studied. Since the value of Shannon indices is 2.8 indicative of richness in grassland habitat. It also emphasizes the need for conservation of this ecosystem by characterizing species diversity and highlighting rare and endemic species in this ecosystem. Since spider play important role as diverse and abundant invertebrate predators in terrestrial ecosystems. Further study is necessary to confer.

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Table 1. Check list of spider found in Mumbra

Sr No	Family	Genera	Species	Total count	Total observed Species in Family	Occurrence	Relative abundance
1	raneidae	Argiope (M)	Argiope sp 1(M)	28		Abundant	9.82
			Argiope sp 2 (G)	22		Abundant	7.72
			Argiope sp 3(M)	15		Abundant	5.26
			Argiope sp 4 (M)	08		Common	2.81
		Cyclosa (M)	Cyclosa sp 1 (M)	07		Common	2.45
		Nephila (G)	Nephila sp 1 (G)	04		Rare	1.40
		Gasteracentha (G)	Gastrecentha sp 1	01		Rare	0.35
		Larinia (G)	Larinia sp 1 (G)	06	14	Common	2.10
		Araneus (M)	Araneus sp 1 (M)	12		Abundant	4.21
		Neoscona(M)	Neoscona sp 1 (G)	05		Rare	1.75
			Neoscona sp 2(G)	04		Rare	1.40
			Neoscona sp 3(M)	07		Common	2.45
			Neoscona sp 4 (G)	06		Common	2.10
			Neoscona sp 5(M)	09		Common	3.15
2	Lycosidae	Hippasa (M)	Hippasa sp 1	43		Abundant	15.08
		Pardosa (M)	Pardosa sp 1	02	3	Common	0.70
		Alopecosa (M)	Alopecosa sp 1	05		Common	1.75
3	Oxyopidae	Oxyopes (G)	Oxyopes sp 1	03	1	Rare	1.05
4	Pholcidae	Crossopriza (G)	Crossopriza sp 1	14	2	Rare	4.91
		Pholcus (G)	Pholcus sp 1	08		Common	2.80
5	Scytodidae	Scytodes (G)	Scytodes sp 1	08	1	Rare	2.80
6	Tetragnathidae	Leucauge (M)	Leucauge sp 1	04		Rare	1.40
		Tetragnatha (G)	Tetragnatha sp 1	18	03	Common	6.31
			Tetragnatha sp 2	15		Abundant	5.26
7	Theridiidae	Steatoda (G)	Steatoda sp 1	08	1	Rare	2.80
8	Salticidae	Hyllus (G)	Hyllus sp 1	04	1	Rare	1.40
9	Philodromidae	Tibellus(M)	Tibellus sp 1	14	1	Rare	4.91
10	Eutichuridae	Cheiracanthium (G)	Cheiracanthium sp 1	02	1	Rare	0.70
				285	28		

M= Mountain patches , G= Grasslands

Table 2: % Occurrences of spider species

Distribution	% Occurrences	Total no of Species
Abundance	21.4	06
Common	35.71	10
Rare	42.85	12

Table 3a: Distribution spider family

Sr No	Family	No of species (n)
1	raneidae	14
2	Lycosidae	03
3	Oxyopidae	01
4	Pholcidae	02
5	Scytodidae	01
6	Tetragnathidae	03
7	Theridiidae	01
8	Salticidae	01
9	Philodromidae	01
10	Eutichuridae	01
	Total	N= 28
	Simpson Index of Diversity	0.71

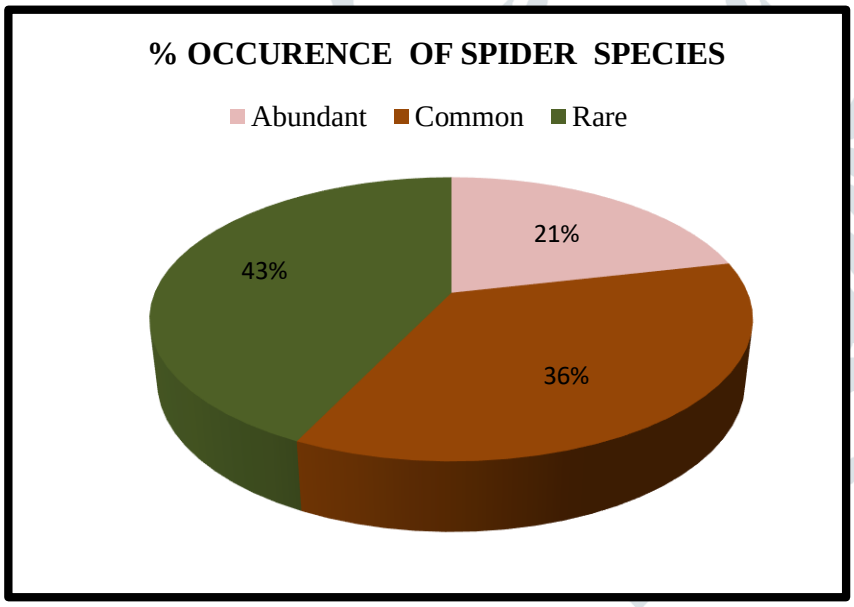
Table 3b Diversity index of Spider species in grassland habitat

Sr No		No of species (n)
1	Argiope sp 1	28
2	Argiope sp 3(M)	15
3	Argiope sp 4 (M)	08
4	Nephila sp 1 (G)	4
5	Gastrecentha sp 1	1
6	Larinia sp 1 (G)	06
7	Neoscona sp 1 (G)	05
8	Neoscona sp 2(G)	04
9	Neoscona sp 4 (G)	06
10	Pardosa sp 1	02
11	Oxyopes sp 1	03
12	Crossopriza sp 1	14
13	Pholcus sp 1	08
14	Scytodes sp 1	08
15	Tetragnatha sp 1	18
16	Tetragnatha sp 2	15
17	Steatoda sp 1	08
18	Hyllus sp 1	04
19	Tibellus sp 1	14
20	Cheiracanthium sp 1	02
	Total	N= 173
	Simpson Index	0.927
	Shannon Index	2.809

Table 3c: Diversity index of spider Species in mountain habitat

Sr No		**No of species (n)**
1	Argiope sp 2 (G)	22
2	Cyclosa sp 1 (M)	7
3	Araneus sp 1(M)	12
4	Neoscona sp 3(M)	07
5	Neoscona sp 5(M)	09
6	Hippasa sp 1	43
7	Alopecosa sp 1	05
8	Leucauge sp 1	04
	Total	N= 109
	Simpson Index	0.218
	Shannon Index	1.743

Fig 1: OCCURRENCE OF SPIDER SPECIES IN MUMBRA



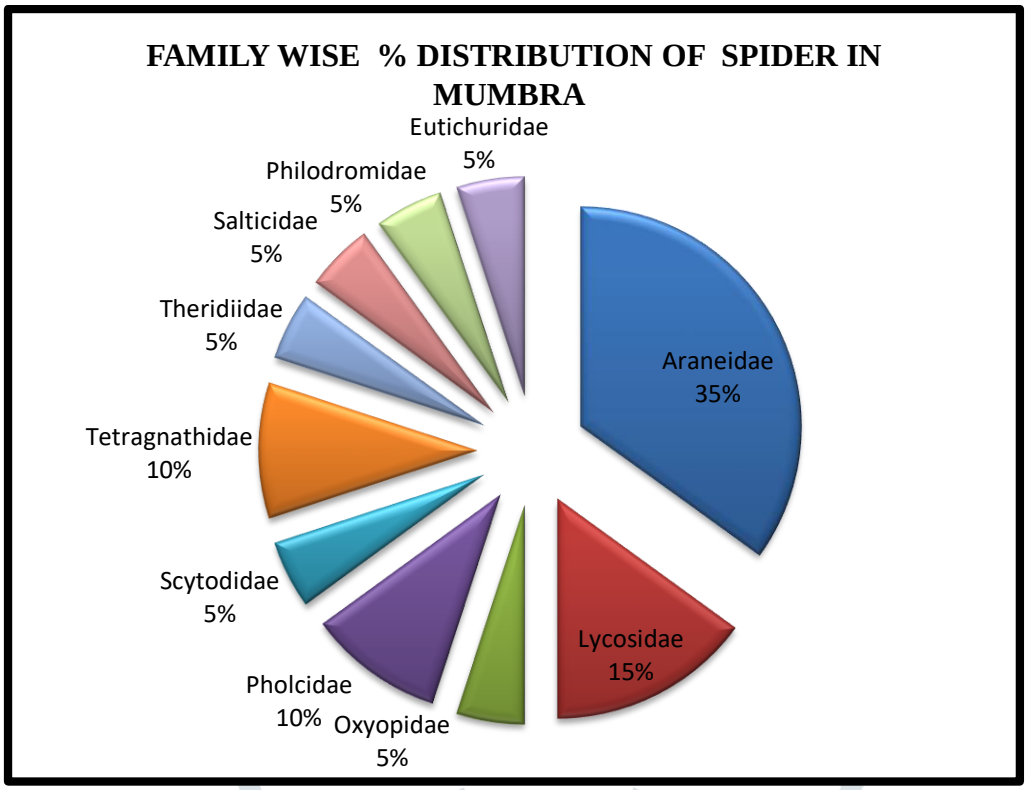


Fig 2: Showing percentage distribution of spider species in Mumbra

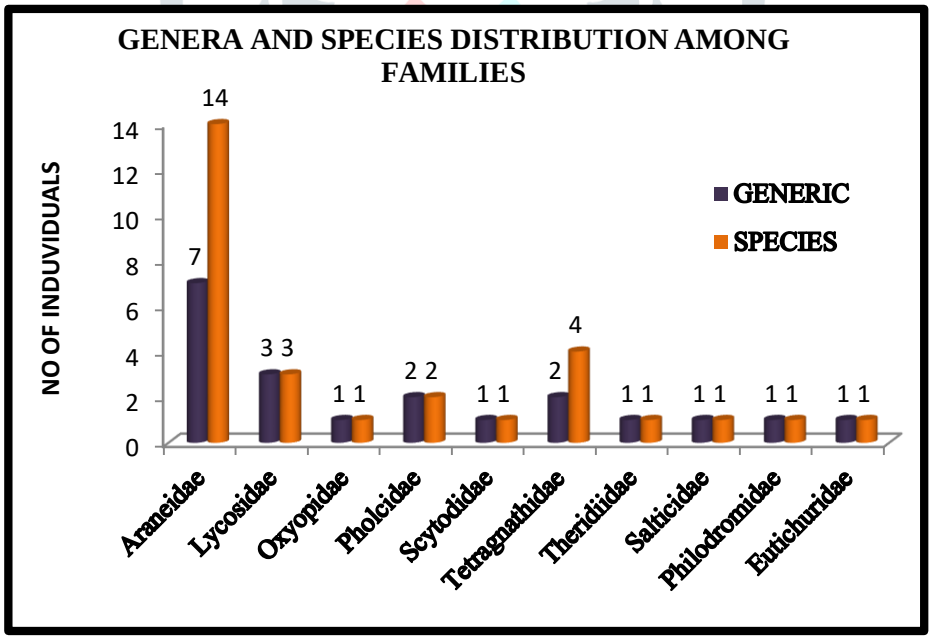


Fig 3 Distribution of Genera and species among the spiders families in Mumbra

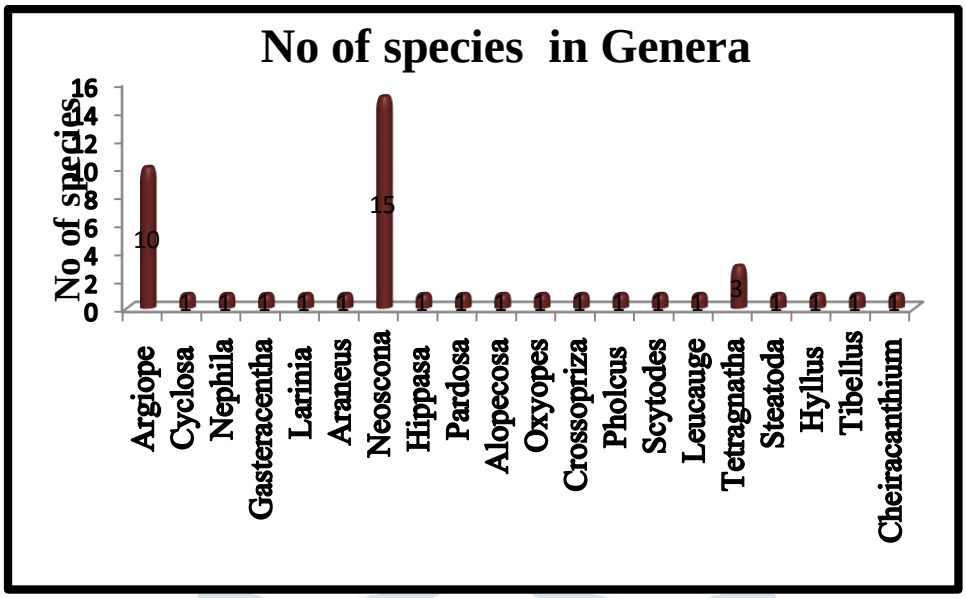


Fig 4: Distribution of species in Genera among the spiders families in Mumbra

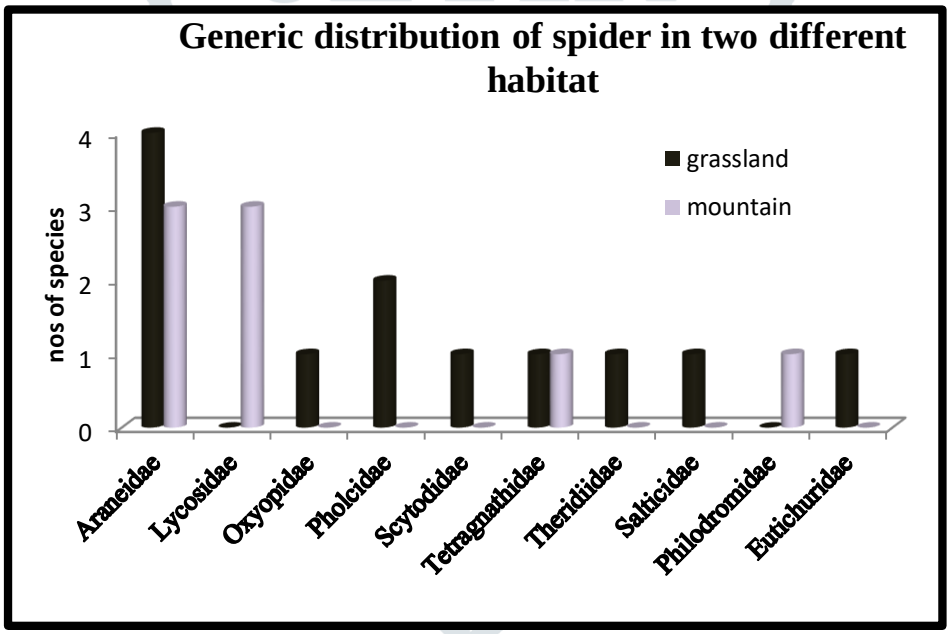


Fig 5: Generic Distribution of Spiders in two different habitat in Mumbra