INTRODUCTION

Spiders are good indicators of the environmental change. They are sensitive to habitat structure including vegetation complexity, litter depth and micro-climate characteristics (Uetz, 1991). The diversity of spiders generally increases when a greater variety of habitat types are present in field (Rosenzweig, 2007). Ecologically they were found in all habitats like at high hills, trees, bushes, plants, under stones, moist humid areas, in soil and the desert to snow places (Bultman & Uetz, 1982). Spiders are also one of the important biological control agents. They play an important role in controlling the insect pest population by feeding on insect pest such as Aphids, Thrips, flies etc.

About 47,646 valid species of spiders belonging to 4095 genera and 117 families have been reported throughout the world (World Spider Catalog, 2018). Out of which 1686 species belonging to 438 genera and 60 families have been reported from India (Keswani *et. al*., 2012). From Gujarat 415 species belonging to 169 genera and 40 families were reported (Yadav *et. al*., 2017). Thus they form one of the most ubiquitous and diverse group of organisms existing in Gujarat.

The present study was conducted in Champaner- Pavagadh and its surrounding areas. The area has forest, agriculture fields, garden and hill. The hill is surrounded by dense forest having large number of trees, shrubs, climbers and grasses. The total area 6356.98 ha of Pavagadh is covered under forest which is legally constituted as reserve forest. The major dominant plant species found in this forest area are *Tectona grandis, Writiato mentosa, W. tinctoria, Ziziphus mauritiana, Anogessus latifolia, Mitragyna parvifolia* etc.

At the base of the hill some agriculture fields are also present which is a major source of livelihood for the district. The major crops grown are pigeonpea, wheat, maize, and cotton. At the base of the Pavagadh hill a historical city Champaner is present. With the Champaner and Pavagadh it is called as Champaner- Pavagadh Archaeological Park. It was declared as world heritage site by UNESCO in July, 2004. Champaner- Pavagadh archaeological park is spread over an area of more than 1,329 hectares. This is having a public garden and v0arious monuments. The height of the Pavagadh hill is 800 meters from the sea level which is having temples, temporary residential houses and water installations such as step wells and tanks,

mosques, palaces and natural caves just below the top of the hill. In Champaner- Pavagah most of the research work have been done on its geochemical stratigraphy (Sheth & Melluso, 2008), its conservation (Modi, 2008), on its heritage study (Sinha, 2004). Some works have been done on flora by (Oza, 1961) and Alpana (2014) of Pavagadh hill. But this important heritage site remains unexplored by researchers / taxonomists for various fauna.

Hence there is a need to study various invertebrates and vertebrates of the Champaner-Pavagadh archaeological park; spiders being one of them. In Gujarat till date our knowledge about the spider diversity remains confined to the works of Patel, 2003; Patel *et. al*., 2012; Vachhani *et. al.,* 2012. Some of the works are also reported from agro ecosystem by Solanki & Kumar 2015; Trivedi, 2009; Siliwal & Kumar, 2001. Some research on spiders diversity have been done in protected areas viz., Jambughoda Wildlife Sanctuary by Solanki, 2016; Shoolpaneshwar Wildlife Sanctuary, Bhatt, 2014; Ratanmahal Sanctuary, Patel *et al.,* 2012; Gir Protected areas, Parikh *et. al.,* 2008; Vansda National Park, Patel 2003; Purna Wildlife Sanctuary Siliwal *et. al*., 2003. However there is no detailed information on the spider diversity of Champaner-Pavagadh and its surrounding areas. Thus in the present work emphasis was laid on to specify the diversity of spiders along the altitudinal gradient of Pavagadh hill and its surrounding ecological habitats.

The Elevation-gradient studies with different model organisms date back to the early days of biogeography. As examples of a strong ecological pattern, elevation gradients provide an insight into the historical and contemporary forces that shape life on earth (Rahbek, 2005). Moreover, this study helps to measure the health of ecosystems, as the organisms which form an ecosystem generally encapsulate all aspects of their environment; spiders being genuine indicators of anthropogenic disturbances. Being diverse, abundant and hypersensitive to environmental changes spiders are well known for their significance in ecology; used for monitoring ecosystem health, But growing anthropogenic activities in Gujarat the natural heritage and even protected areas is going to Urbanization, industrialization and use for agriculture. Champaner- Pavagadh archaeological park a world heritage site of Gujarat is one of them. This area is also showing negative impact of Urbanization and Industrialization.

Hence a need to understand the spider species diversity and distribution along the elevation gradient of the Pavagadh hill. According to Maelfait, 1998 spider could be good bio indicators for evaluating the impact of anthropogenic disturbance factor on natural ecosystem.

Hence the present study was initiated with the aim to investigate the spider diversity and its ecology in Pavagadh hill along altitudinal gradient with different ecological habitats. This study has obtained the first comprehensive data of the spider fauna from Champaner-Pavagadh, which will help in assessing the status of spider diversity with its conservation.

Objectives of the study

- To study the systematics and ecological distribution of spiders in Champaner-Pavagadh and its surrounding areas.
- To explore diversity patterns for spiders along altitudinal gradient in and around Champaner-Pavagadh.
- To study the Functional Group of spiders from the study area.

MATERIALS AND METHODS

Study site

The present study was conducted in the Champaner- Pavagadh Archaeological Park and its surrounding areas. It is about 40 kms south of Godhara and 45 kms north-east of Vadodara. The Pavagadh hill is an outlier of southern Aravalli, altitude rising 800 meters above the mean sea level.The hill is about 11 kms in length from North to South with a width of study. The climate of this region is dry except in monsoon season and hot in summer. The temperature ranges between minimum 8ºC to maximum 48ºC. The rainfall is erratic and irregular. It starts from June to September which is 80 % of the total rainfall. Humidity varies from 38 % - 63 %.

Collection of Spiders

Sampling was carried along the altitude of hill and three different habitats of Champaner-Pavagadh Forest area, Agricultural fields and Garden areas were selected. For the study of Pavagadh hill the sampling sites were selected at different altitudinal gradient from base of the hill to the top of the hill. The present study was carried out for three years from June 2015 to June 2018. Random sampling was done in the selected habitats. As we know that spiders are of different habitats like foliage weavers, ground weavers, foliage hunters and ground runners. Hence to explore the diversity of spiders from different habitats of Pavagadh a single method is not enough therefore different methods were applied to collect spiders. For the collection of spiders five sampling methods were used namely Pitfall trapping (Curtis, 1980) was used for collection of ground dwelling spiders, Sweep net (Churchill & Arthur**,**, 1999) was used in the agricultural fields and the areas having long grasses to collect spiders from grassy vegetation, Active searching (Coddington *et. al*., 1991) was done after spotting the spider in the field, Vegetation beating (Cardoso, 2008) was used for spider which is inhibiting on shrub, high herb vegetation, bushes and small trees. Leaf litter used to collect the spider which is present in the moisture habitat and under the leaf litter area. Global positioning system (GPS 550) was used to determine the geographical location of specimens. Guild structures of different spiders were also observed in different habitat with collection of spiders.

Selected different habitats in Champaner - Pavagadh

Fig 1- Pavagadh hill

Fig 2- Forest habitat

Fig 3- Garden area

Fig 4- Agriculture fields

Preservation, Labelling and Photography

All collected species of spiders were preserved in 70 % alcohol and stored in clear plastic sampling vials with tightly fitted caps. Each spider was labeled individually with information: specimen number, family, sex, date of collection, locality name, altitudinal height and collector's name. In field, whenever spiders were spotted photography was done using Lumix Panasonic DMC- FZ60 with 24x optical zoom. Spider specimens after photography were collected and preserved in 70 % alcohol.

Identification of Spiders

The collected spiders were brought into the lab and taxonomic identification was done by observing specimens under stereo-zoom microscope. Accurate identification on the family, genus and species level is only feasible with adult specimen. The identification of the spider relies heavily on the genitalia. Thus identifying immature spiders to species level is considered impractical as sexual characters are needed for species level identification (Young & Edwards, 1990). Identification and classification was also done on the basis of morphometric characters of various body parts. The identification is also based on salient features like, presence of two or three claws, presence or absence of cribellum, paraxial or diaxial chelicerae and presence of one or two pairs of book lungs. A detailed taxonomic study was done on the basis of various keys and standard literatures (World Spider Catalog, 2018; Gajbe, 2008; Patel, 2003; Majumdar & Tikader, 1991; Patel & Reddy, 1989; Sethi & Tikader, 1988; Tikader, 1982, 1980; Tikader & Biswas, 1981; Pocock, R.I., 1900) and other relevant literatures. The immature species were identified up to the genus level.

Data Analysis

The collected data were subjected to the statistical analysis namely Margalef diversity index, Shannon-Wiener diversity index and Pielou's Evenness index using PAST Statistical Software. Margalef diversity was used to analyze the species richness among different habitats. Species alpha diversity was analyzed using Shanon (H) and Simpson (D) diversity indices. Pielou's Evenness Index was used for the distribution of the relative abundance of spider species in a site. Sorenson similarity coefficient (CC) was used to measure the similarity between two habitat types.

RESULTS

The present study revealed the occurrence of 57 species of spiders belonging to 45 genera and 20 families during the survey period in different habitats forest, agriculture and garden areas of Champaner- Pavagadh, Gujarat. Among these 20 families the most dominant family was Araneidae consisting 11 sp. followed by Salticidae 10 sp. while spider species observed in other families were Lycosidae, Oxyopidae (5sp. each), Tetragnathidae, Sparacidae (3sp. each), Clubionidae, Gnaphosidae, Pholcidae , Thomisidae, Oonopidae , Scytodidae (2 sp. each). Rest of the families Corrinidae, Eresidae, Eutichuridae, Hersilidae, Palpimanidae, Philodromidae, Uloboridae and Zodariidae were represented by single species (Table 1 and Graph 1). The maximum generic diversity was observed in forest habitat (41 genera, 50 species) followed by Agriculture (33 genera, 42 species) and Garden areas (31 genera, 37 species).The highest percent family distribution was Araneidae 19.30 % followed by Salticidae 17.54%, Lycosidae, Oxyopidae 8.77% (Table 2).

Statistical analysis was done of the recorded data with the help of Shannon diversity index. It was found that species diversity indices differ among three different habitats. Diversity indices for forest area are higher (3.892) as compared to Agriculture fields (3.738) and lowest index recorded on Garden area (3.611) (Table 4). Similarity index was calculated using Sorenson Coefficient index between two habitats. The highest similarity index was found between forest and agriculture habitats which indicate that highest no of common species were present in these habitats. The low similarity index was between Agriculture and Garden areas (0.65) and between forest and garden areas (0.62) (Table 6). Evenness value was different for all the three habitats. Evenness value for garden areas were found maximum (0.65) among the three habitats. While forest areas have less value (0.62) and Agriculture fields have moderate value (0.64) (Table 8).

Spider diversity along altitudinal gradient of Pavagadh hill

A total of 80 species belonging to 22 families and 53 genera are identified till now from different elevation points (from base to top) of Pavagadh hill. Among these 22 families the most dominant family was Araneidae consisting (9 genera & 16 species) followed by family Salticidae (9 genera & 10 species), Lycosidae (4 genera & 8 species), Oxyopidae (2 genera and 6 species) rest of the families Corrinidae, Eresidae, Eutichuridae, Hersiliidae, Philodromidae, Palpimanidae, Scytodidae, Uloboridae and Zodariidae were represented by

one species (Table 3). Araneidae was the most dominant family may be due to the presence of mixed type of vegetation.

Relative contribution of various Genera

Relative contribution of various genera shows that genus Araneidae recorded highest number of species (16 species) showing maximum contribution of 20.00% followed by Salticidae10 species (12.50%), Lycosidae with 8 species (10.00%) Oxyopidae 6 species (7.50%), Gnaphocidae with 5 species (5.00%), Clubionidae, Corrinidae, Pholcidae, Scytodidae, Sparassidae, Tetragnathidae, Thomisidae with 3 species (3.75%), Eresidae, Eutichuridae, Hersiliidae, Oonopidae, Zodariidae with 2 species (2.50%), Oecobidae, Palpimanidae, Philodromidae, Uloboridae with one species were observed (Table 3).

The Shannon diversity index for lower altitude and higher altitude is also calculated. The Lower altitude shows highest diversity index by (4. 248) and for higher altitude (3.664) was recorded (Table 9). Similarity index was calculated using Sorenson Coefficient index between two different altitudes. The similarity index found between lower and higher altitude was (0.72) (Table 10). Evenness value for Lower and higher altitudes was same (1) (Table 11).

Guild structure composition from different habitats of Champaner-Pavagadh

On the basis of their foraging behavior in the field spiders are divided into six functional groups (Uetz *et. al*., 1999). The dominant guild structure was of ground runner (Chart 1) and it comprises 35 % species of spiders. Spider of the Salticidae, Gnaphocidae, Lycosidae, Oonopidae, Zodariidae comes in this group. Foliage runners 30 % were the second largest dominant guild in the field. Orb web weaver (13 %), Ambusher and scattered line weaver were having (9 %), Sheet web weaver were (4 %) guild structure.

Table 1: List of spider species from different habitats of Champaner- Pavagadh

Sr. No.	Family	Species	Forest areas	Agriculture fields	Garden areas
1.	Araneidae	*Argiope aemula* (Walckenaer, 1841)	+	+	-
2.		*Argiope anasuja* Thorell, 1887	+	+	+
3.		*Chorizopes* sp.	+	+	-
4.		*Cyclosa hexatuberculata* Tikader, 1982	+	+	+
5.		*Cyrtophora cicatrosa* (Stoliczka, 1869)	+	+	+
6.		*Cyrtophora citricola* (Forsskål, 1775)	+	+	+
7.		*Eriovixia excelsa* (Simon, 1889)	-	+	+
8.		*Gasteracantha hasselti* C. L. Koch, 1837	+	+	+
9.		*Neoscona mukerje* Tikader, 1980	+	-	+
10.		*Neoscona nautica* (L. Koch, 1875)	+	+	-
11.		*Neoscona theisi* (Walckenaer, 1841)	+	+	-
12.	Clubionidae	*Clubiona drassodes* O. Pickard-Cambridge, 1874	-	+	+
13.		*Clubiona* sp.	+		+
14.	Corrinidae	*Castianeira* sp.	+	+	
15.	Eresidae	*Stegodyphus sarasinorum* Karsch, 1892	+	+	+
16.	Eutichuridae	*Cheiracanthium* sp.	+		
17.	Gnaphosidae	*Haplodrassus* sp.	+	+	+
18.		*Zelotes mandae* Tikader&Gajbe, 1979	+	-	-
19.	Hersiliidae	*Hersilia savignyi* Lucas, 1836	+	+	+

Sr. No.	Family	Species	Forest areas	Agriculture fields	Garden areas
20.	Lycosidae	*Evippa* sp.	+	-	+
21.		*Hippasa pisaurina* Pocock, 1900	+	+	+
22.		*Lycosa* sp.	+	+	+
23.		*Pardosa birmanica* Simon, 1884	+	+	+
24.		*Pardosa sumatrana* (Thorell, 1890)	+	+	+
25.	Oonopidae	*Ischnothyreus* sp.	+	-	+
26.		*Orchestina* sp.	+	-	-
27.	Oxyopidae	*Oxyopes bharatae* Gajbe, 1999	-	+	+
28.		*Oxyopes gujaratensis* Gajbe, 1999	+	+	+
29.		*Oxyope skamalae* Gajbe, 1999		+	+
30.		*Oxyopes shweta* Tikader, 1970	+	+	+
31.		*Peucetia* sp.	+		+
32.	Palpimanidae	*Otiothopsnamratae*Pillai, 2006	+	-	-
33.	Philodromidae	*Philodromus* sp.	+	-	-
34.	Pholcidae	*Crossopriza lyoni* (Blackwall, 1867)	+	+	+
35.		*Pholcus* sp.	+	-	-
36.	Salticidae	*Asemonea tenuipes* (O. Pickard-Cambridge, 1869)	+	+	+
37.		*Bianor punjabicus* Logunov, 2001	+	+	+
38.		*Hasarius adansoni* (Audouin, 1826)	+	+	-
39.		*Hyllus semicupreus* (Simon, 1885)	+	+	+
40.		*Myrmarachne* sp.	+	+	+

Sr. No.	Family	Species	Forest areas	Agriculture fields	Garden areas
41.		*Phintella* sp.	-	+	-
42.		*Plexippus paykulli* (Audouin, 1826)	+	-	+
43.		*Rhene albigera* (C.L. Koch, 1846)	+	+	-
44.		*Stenaelurillus albus* Sebastian et al., 2015	+	-	+
45.		*Telamonia dimidiata* (Simon, 1899)	+	+	+
46.	Scytodidae	*Scytodes thoracica* (Latreille,1802)	+	+	+
47.		*Scytodes fusca* Walckenaer, 1837	+	+	-
48.	Sparassidae	*Heteropoda* sp.	+	+	+
49.		*Olios gravely* sethi & Tikader, 1988	-	+	-
50.		*Olios milleti* (Pocock, 1901)	+	+	+
51.	Tetragnathidae	*Guizygiella* sp.	+	-	-
52.		*Leucauge decorata* (Blackwall, 1864)	+	+	+
53.		*Tetragnatha*sp.	+	+	+
54.	Thomisidae	*Indoxysticus minutus* (Tikader, 1960)	+	-	-
55.		*Thomisus* sp.	-	+	+
56.	Uloboridae	*Uloborus* sp.	+	+	-
57.	Zodariidae	*Asceua sp.*	+	+	-
	Total		50	42	37

(+): Species present (-): Species absent

Table 2: Percent family distribution & Guild structure of spiders from different habitats of Champaner- Pavagadh

Family	Family distribution (%)	Guild structure
Araneidae	19.30%	Orb-web weaver
Clubionidae	3.51%	Foliage hunter
Corrinidae	1.75%	Ground runner
Eresidae	1.75%	Sheet-web builder
Eutichuridae	1.75%	Foliage runner
Gnaphosidae	3.51%	Ground runner
Hersiliidae	1.75%	Foliage hunter
Lycosidae	8.77%	Ground runner
Oonopidae	3.51%	Ground runner
Oxyopidae	8.77%	Stalker
Palpimanidae	1.75%	Ground runner
Philodromidae	1.75%	Ambusher
Pholcidae	3.51%	Scatter line weaver
Salticidae	17.54%	Stalker
Scytodidae	3.51%	Ground runner
Sparassidae	5.26%	Ground runner
Tetragnathidae	5.26%	Orb-web weaver
Thomisidae	3.51%	Ambusher
Uloboridae	1.75%	Orb-web weaver
Zodaridae	1.75%	Ground runner
Total	**100**	

Table 3: Total number & percentage of genera and species along the altitude of Pavagadh hill

Sr. No.	Family	Genera		Species	
		No. of Genera	%	No. of Species	%
1	Araneidae	9	16.36%	16	20.00%
2	Clubionidae	1	1.81%	3	3.75%
3	Corrinidae	2	3.63%	3	3.75%
4	Eresidae	1	1.81%	2	2.50%
5	Eutichuridae	1	1.81%	2	2.50%
6	Gnaphosidae	3	5.45%	4	5.00%
7	Hersiliidae	2	3.63%	2	2.50%
8	Lycosidae	4	7.27%	8	10.00%
9	Oecobidae	1	1.81%	1	1.25%
10	Oonopidae	2	3.63%	2	2.50%
11	Oxyopidae	2	3.63%	6	7.50%
12	Palpimanidae	1	1.81%	1	1.25%
13	Philodromidae	1	1.81%	1	1.25%
14	Pholcidae	2	3.63%	3	3.75%
15	Salticidae	9	16.36%	10	12.50%
16	Scytodidae	1	1.81%	3	3.75%
17	Sparassidae	2	3.63%	3	3.75%
18	Stenochilidae	1	1.81%	1	1.25%
19	Tetragnathidae	3	5.45%	3	3.75%
20	Thomisidae	2	3.63%	3	3.75%
21	Uloboridae	1	1.81%	1	1.25%
22	Zodaridae	2	3.63%	2	2.50%
Total		**53**	**100.00%**	**80**	**100.00%**

Table 4: Percentage of Species distribution in three different habitats of Champaner-Pavagadh

Sr. No	Habitats	No. of Species	Percentage
1	Forest area	50	87.71 %
2	Agriculture field	42	73. 68 %
3	Garden area	37	64.91 %

Table 5: Shannon diversity indices for different habitats of Champaner-Pavagadh

Application	Agriculture fields	Forest area	Garden area
Diversity index (H)	3.738	3.892	3.611

Table 6: Sorenson Similarity Coefficient between habitats

Sr. No.	Three different habitats (Forest, Agriculture & Garden areas)	Similarity Index
1	Similarity index between forest & agriculture fields	0.76
2	Similarity index between agriculture & garden areas	0.65
3	Similarity index between forest & garden areas	0.62

Table 7: Evenness Value for three different habitats of Champaner-Pavagadh

Sr. No	Habitats	Evenness
1	Forest area	0.62
2	Agriculture fields	0.64
3	Garden area	0.65

Table 8: Number of species distribution in lower and higher altitude of Pavagadh hill

Sr. No.	Habitats	No. of Species
1	Lower altitude	69
2	Higher altitude	40

Table 9: Shannon diversity index for Lower and higher altitude of Pavagadh hill

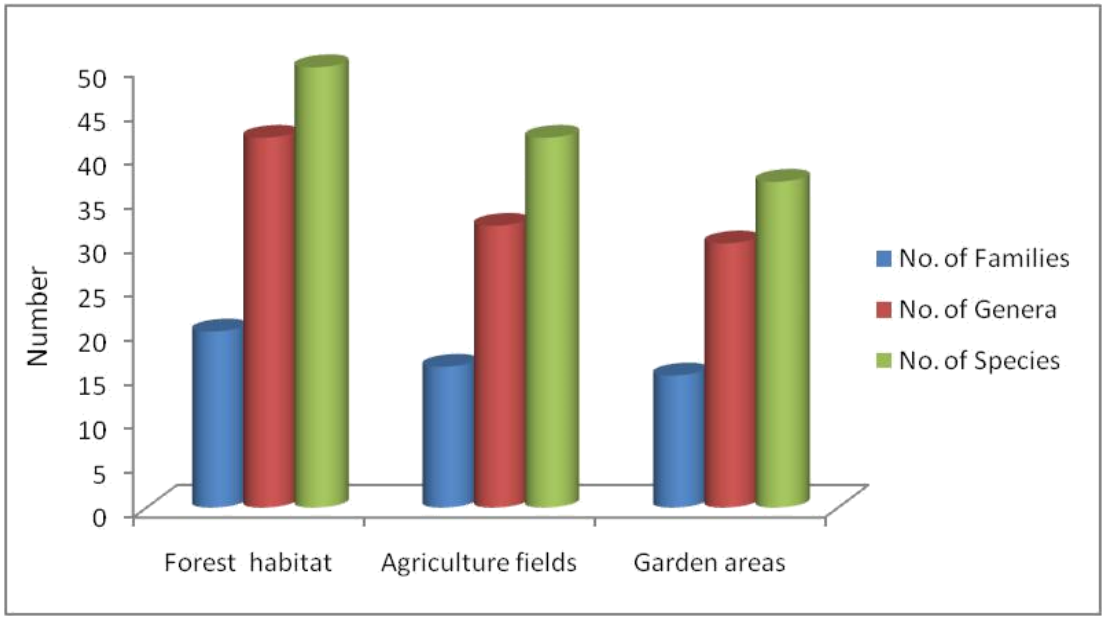
Application	Lower altitude	Higher altitude
Diversity index (H)	4.248	3.664

Table 10: Sorenson Similarity Coefficient between Lower and higher altitude

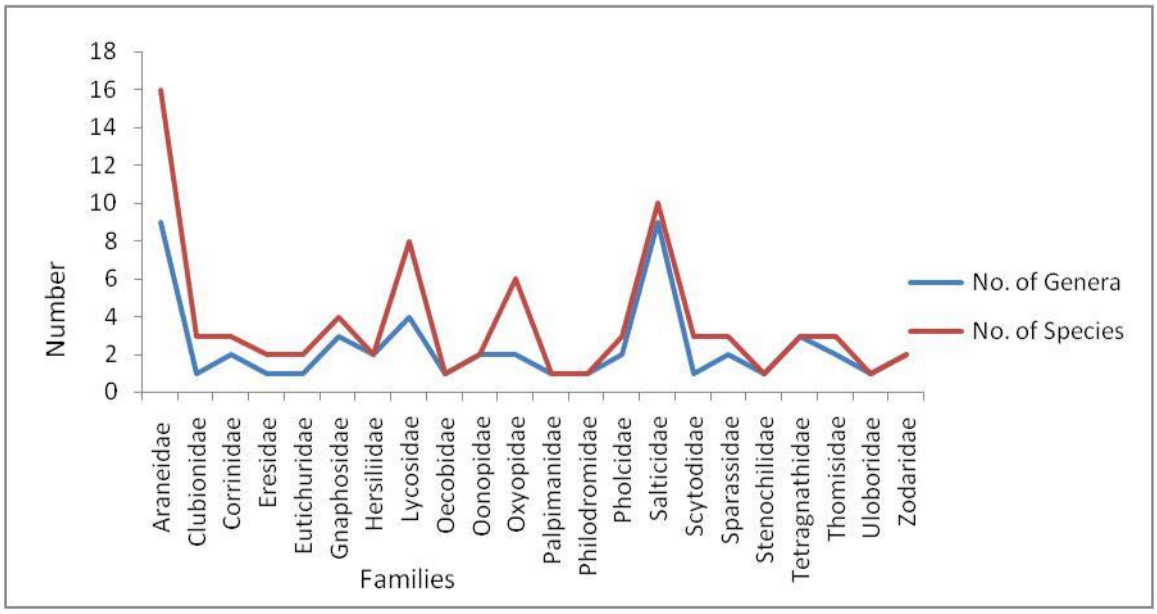
Sr. No.	Ecosystems	Similarity Index
1	Similarity index between Lower and Higher altitude	0.72

Table11: Evenness Value for Lower and higher altitude of Pavagadh hill

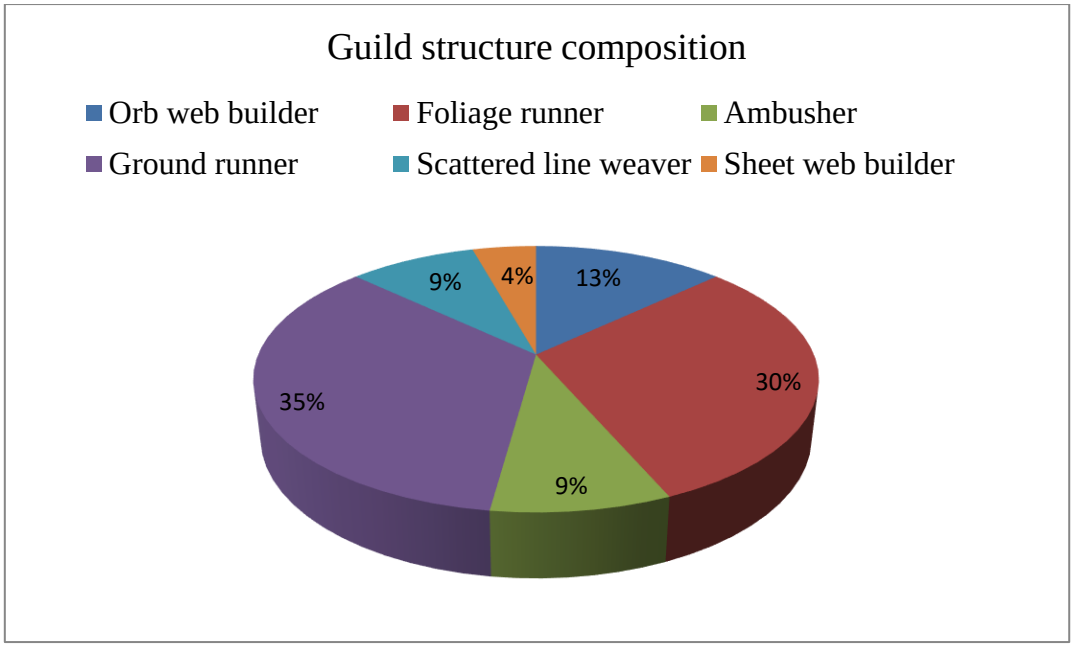
Sr. No	Habitats	Evenness
1	Lower altitude	1
2	Higher altitude	1



Graph1: Family, Genera and Species wise distribution of Spiders from three different habitats of Champaner- Pavagdh



Graph 2: Family wise distribution of Genera and Species of spiders along altitude of Pavagadh hil



Graph 3: Guild structure composition (%) of spiders from different habitats of Champaner- Pavagadh

REPRESENTATIVE PHOTOGRAPHS OF SOME OF THE SPIDER FAMILIES

	
Argiope anasuja Thorell, 1887	*Stegodyphus sarasinorum* Karsch, 1892
	
Olios milleti (Pocock, 1901)	*Scytodes pallida* Doleschall, 1859
	
Neoscona mukerjei Tikader, 1980	*Neoscona theisi* (L. Koch, 1875)

REPRESENTATIVE PHOTOGRAPHS OF SOME OF THE SPIDER FAMILIES

	
Gasteracantha hasselti C. L. Koch, 1837	*Plexippus paykulli* (Audouin, 1826)
	
Lycosa poonaensis Tikader & Malhotra,1980	*Castianeira zetes* Simon, 1897
	
Hersilia savignyi Lucas, 1836	*Otiothops namratae* Pillai, 2006

DISCUSSION

In the present study Pavagadh and its surrounding areas were explored. Three habitats were taken at the foot hill namely forest area, agriculture fields and garden area and altitudinal studies were also taken up on the hill. Out of the three habitats forest area had maximum spider species i.e. a total of fifty. The reason could be forest habitat being natural and undisturbed, having mixed type of vegetation viz; trees shrubs, climbers, grasses giving enough space for making different Orb webs. Maximum spiders in forest area were from the family Araneidae making orb-webs. This undisturbed forest gave enough space to orb web spiders. Mixed type of plant vegetation provides enough space to build the web of different sizes. The common Salticids, Lycosids, Gnaphosids, Corrinids etc. (Table 2) were also present as they are ground spiders found in leaf litter. For Ground spiders, Foliage runner, there are more retreats and hiding places in the forest. Leaf litters were providing shelter to make the retreat. The temperature and humidity of the forest area was good enough for the ground spiders to flourish. Solanki 2016 has also reported the presence of high diversity of orb web and ground spiders in the dry deciduous forest of Gujarat. Sudhikumar *et. al.,* 2005, also reported Araneidae, Tetragnathidae, Salticidae families had t maximum diversity in the forest habitat of the Mannavan Shola forest of Kerala. Agriculture fields also have good number of spider diversity (42 species) as the fields are present near the forest providing alternative habitats to the spiders when the fields are disturbed by intercropping or due to pesticide spray. Solanki & Kumar, 2015 worked from different agricultural fields of Jambughoda wildlife sanctuary and observed that families Araneidae, Salticidae and Lycosidae were having maximum species. The lowest spider diversity was hosted from garden areas (37 species) as gardens are disturbed habitats frequently visited by people and with less vegetation compared to forest and agriculture areas. From all the three habitats Araneidae was reported to be the most dominant family followed by the families Salticidae and Lycosidae. Wankhede *et. al.,* 2012 worked on various gardens of Pune University and reported Araneidae as the most dominant family exploring 35% of species.

Along the altitude in the hill of Pavagadh 80 species belonging to 53 genera and 22 families were recorded. Amongst the 22 families; the most abundant was Araneidae, having a diversity of 9 genera and 16 species (Table 3). This family is widely distributed in all geographic regions. As the study areas recorded highest number of species from Araneidae.

They can be categorized as generalist. Hence Araneids are coming in generalized functional group. They have high potential to survive in different habitats, and environmental condition. Quasin and Uniyal, 2011 worked on spider diversity along the altitudinal gradient in Nandadevi bioshphere, Uttarakhand and reported Araneidae, Salticidae and Lycosidae as the dominant families. The compiled data were analyzed for species richness, evenness, and diversity index. Amongst all the three habitats of Champaner-Pavagadh the maximum spider richness was calculated from forest habitat (3.892) followed by agriculture fields 3.738 and garden areas 3.611 (Table 5).This indicates that forest area has maximum diversity as compared to agriculture and garden areas. The Similarity index between forest and agriculture fields is higher 0.76 in comparison to agriculture and garden areas 0.65 and forest and garden area which is 0.62. This indicates that forest and agriculture areas have more similarities, compared to agriculture and garden areas.

The Functional group

This result shows that diversity and density of spiders is closely related to structural complexity of the environment. The soil dwelling spiders were observed where the leaf litter is found because of more retreats and hiding places with moderate temperature and humidity. Maximum spiders were observed from July to December months because of the moist habitat. Some rare species such as Palpimanidae, Oonopidae, Zodariidae were collected during the study. However there are good numbers of species that probably are new to science. This indicates that Champaner -Pavagadh has rich diversity of spider fauna. As Spiders are good indicators of healthy ecosystem and maintain ecological balance by feeding on various insect pests the information on their diversity and ecology studies would be helpful in conserving the ecosystem. This study indicates that the spider fauna in the Champaner-Pavagadh is moderately rich.

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