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Diversity and abundance of spider fauna at different habitats of Jahangirnagar University Campus, Bangladesh

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Abstract
Diversity, abundance and seasonal prevalence of spiders at different habitats of Jahangirnagar University campus was studied from March, 2013 to February, 2014. A total of 1690 individuals were recorded under 11 families, 49 genera and 116 species Family Salticidae was dominant with 16 genera under 42 species, whereas Araneidae ranked second with 26 species under 9 genera. Pholcidae and Uloboridae each had only one species. *Chrysilla lautau* (Salticidae), a new species, was recorded for the first time in Bangladesh. Nine different guilds of spiders were observed during the study. Jumping spiders were the most dominant, with 36.21% of the total number of spider guilds. Diversity indices of Shannon-Wiener, Simpson and Margalef were, respectively: 2.18, 0.89 and 3.39. Pielou's evenness index was 0.91.As the spiders are excellent bio-indicators, survey of their populations at regular interval may provide important biological information about the ecological condition of the study area.

Keywords: Spiders, diversity and abundance, guild structures, Jahangirnagar University Campus

Introduction
Biological indicators have great role to assess the ecological conditions. Spiders are considered as important ecological indicators like ant and dragonflies. Spiders fit to the order Araneae, which is one of the grasping animal groups [18]. Spiders occupy the seventh position in total species diversity among all other assemblages of organisms [22]. The global list of spider fauna is approximately 44906 belonging to 3935 genera and 114 families found all over the world [17]. Recent studies show that 134 genera and 412 species of spiders are available in Bangladesh [9].
It is believed that spiders play significant role in alleviating or amendable insect populations because they are one of the most abundant insectivores and display a wide variety of lifestyles and foraging approaches. They are also considered as prospective biological control agents in agro-ecosystems [19]. Spiders are considered as important food source of other animals like lizards, birds. Ground dwelling food energy can be transmitted to higher level of food energy through spiders [24]. It has been observed that various types of silks can be produced from a single spider. Spiders also produce venom which they use in their defense mechanism. Spiders play an integral part of ecosystem because they are insect controller and have important role in food source.
Jahangirnagar University campus is famous for its enriched flora and faunal record. Due to less awareness about the spiders, its diversity study at Jahangirnagar University campus remained unexplored. Therefore, the study aims to explore the spider population with their diversity and abundance in Jahangirnagar University campus.

Materials and Methods
Study Period
The study was carried out from March, 2013 to February, 2014. All surveys were conducted in the morning hours between 7.00 am to 9.00 am. Spiders were collected four times from four sites per week in each month and rest the days of the month was used up for sorting and identifying the macro-invertebrates.

Study Area
Jahangirnagar University is situated at Savar in Dhaka, 23°52′0′′E to 23°53′50′′E latitude and 90°15′20′′N to 90°16′40′′N longitude. There are a number of water bodies and open areas in

the campus. It encompasses about 697.56 acres of land with diverse ecological habitats and vegetation types. The collection site has been selected into four regions according to their vegetation type (Fig.1)

(Ref. Survey of Land based on GPS 2005)

Fig 1: Geographic location of study area of Jahangirnagar University

Insect Rearing and Experimental Stations

Insect rearing and experimental stations (IRES) is located on 23°52'32.28"N, 90°16'0.06"E. This area has a good composition of vegetables, fruits, and ornamental trees. The most dominating trees are Mango (*Mangifera indica*), jackfruit (*Artocarpus heterophyllus*), olive (*Olea europaea*), boroi (*Ziziphus mauritiana*), carambola (*Averrhoa carambola*), turmeric (*Curcuma longa*), chiko (*Manilkara zapota*), Pomegranate (*Punica granatum*), banana (*Musa acuminata*), Lemon (*Citrus limon*), Akashmoni (*Acacia catechu*), etc. Three side of this area is enclosed by water body.

Botanical garden

Botanical Garden of JU campus is enriched with various types of tress. Medicinal, beneficial, ornamental, fruit plants are most available in this area. There is a good composition of aquatic plants. The most dominating plants are Indian gooseberry (*Phyllanthus emblica*), mahogany (*Swietenia mahagoni*), jackfruit (*Artocarpus heterophyllus*), carambola (*Averrhoa carambola*), jhau (*Casuarina equisetifolia*), various types of bamboo (*Bambusa* sp.), shrubs, and herbs etc. The geographical location of this area is 23°52'22.8" N, 90° 16'414."E.

Premises of Statistical Building

Vegetation pattern of this area is mainly woodland type. Acacia, mahogany, Jackfruits are the dominant trees of this area. A lake is surrounded by the premises. The place is protected from public interference. The geographic location of this area is latitude 23°52'56.58"N, longitude 90°16'12.36"E.

North East region of JU campus

This area is mainly disturbed by human action. Vegetation type is mainly herbs, shrubs and grasslands type. The geographical location of this area is 23°53' 32.34"N, 90°16'5.46"E.

Sample Collection

As the central part of the country and situated in the sub-tropical zone, the climate is tropical monsoon. There are summer (March-May), monsoon (July-October) and winter (November-February). Random sampling was done from different habitats of Jahangirnagar University campus in all the seasons. Spiders were collected by adopting standard sampling techniques such as sweep netting, beating sheets, active searching and hand picking.

Preservation

The collected samples were brought to the entomology lab of Zoology Department, Jahangirnagar University. Spiders were anesthetized with chloroform and placed separately on vials with ethyl alcohol 75%. The collection dates, collection site, amount of spider number were recorded on each vial.

Identification

Spiders were observed under stereo zoom microscopes and specimens were identified using standard taxonomic keys [2, 4, 13, 22, 26-30]

Data Analysis

All data were recorded subject to analysis with the help of Microsoft Excel office 2010. The diversity of spiders was analyzed by following indices:

Shannon-Wiener Diversity Index

This index is an index applied to biological systems by derived from a mathematical formula used in communication area by Shannon and Wiener [23]. It's the most preferred index among the other diversity indices [11]. The index values are between 0.0 – 5.0. Results are generally between 1.5 – 3.5, and it exceeds 4.5 very rarely. The values above 3.0 indicate that the structure of habitat is stable and balanced; the values under 1.0 indicate that there are pollution and degradation of habitat structure.

$H = -\Sigma\, p_i \ln pi$

H: Shannon-Wiener Diversity Index

p_i : the relative abundance of each group of organism

Simpson Diversity Index

It's a diversity index derived by Simpson in 1949 [14]. Simpson index values (Δ) are between 0 – 1. But while calculating, final result is subtracted from 1 to correct the inverse proportion.

$$1 - \Delta = \frac{[\Sigma\, ni\ (ni - 1)]}{N\ (N-1)}$$

Δ: Simpson Diversity Index

n_i: Number of individuals belonging to i species

N: Total number of individuals

Margalef Diversity Index

It has no limit value and it shows a variation depending upon the number of species. Thus, it's used for comparison the sites [10].

$$d = \frac{(S-1)}{\ln N}$$

d: Margalef Diversity Index

S: Total number of species

N: Total number of individuals

Pielou's Evenness Index

It was derived from Shannon index by Pielou in 1966. The ratio of the observed value of Shannon index to the maximum value gives the Pielou Evenness Index result. The values are between 0–1. When the value is getting closer to 1, it means that the individuals are distributed equally [16].

$$J' = \frac{H}{H\ max}$$

J': Pielou evenness index
H: The observed value of Shannon index
H max: lnS
S: Total number of species

Results

The 1690 spiders' specimens in our samples represented 11 families (Araneidae, Clubionidae, Lycosidae, Oxyopidae, Pholcidae, Salticidae, Sparassidae, Tetragnathidae, Theridiidae, Thomsidae, Uloboridae) distributed among 49 genera and 116 species.

The richest family was Salticidae (16 genera, 42 species); while Pholcidae and Uloboridae each have one genera and one species (Table 1).

Table 1: Species list and number of Spiders collected from different ecological sites of Jahangirnagar University campus

Species name	Name of Ecological site									
	IRES	% of Sp.	Botanical gardem	% of SP.	Premises of statistical building	% of Sp.	North east region	% of Sp.	Grand Total	% of total Sp.
Araneus inustus (C.L. koch, 1871)	2	0.12	0	0	0	0	0	0	2	0.12
Argiope ansuja (Thorell, 1887)	0	0	5	0.30	1	0.06	0	0	6	0.36
*Argiope catenulate (*Doleschall,1859)	3	0.18	4	0.24	6	0.36	0	0	13	0.77
Argiope luzona (Walckenaer, 1841)	0	0	1	0.06	5	0.30	0	0	6	0.36
Argiope pulchella (Thorell, 1881)	56	3.31	59	3.49	51	3.02	18	1.07	184	10.89
Argiope sapoa (Barrion and Litsinger, 1995)	0	0	1	0.06	0	0	0	0	1	0.06
Argyrodes argentatus (O. P. Cambridge, 1880)	27	1.60	8	0.47	4	0.24	15	0.89	54	3.20
Argyrodes gazingensis (Tikader, 1970)	1	0.06	0	0	0	0	0	0	1	0.06
Artema Atlanta (Walckenear, 1837)	5	0.30	3	0.18	19	1.12	16	0.95	43	2.54
Bianor hotingchieh (Schenkel, 1963)	7	0.41	0	0	0	0	4	0.24	11	0.65
Bomis bengalensis (Tikader, 1962)	2	0.12	1	0.06	0	0	0	0	3	0.18
Castianeira nigricephalis (Biswas, 2006)	0	0	0	0	0	0	1	0.06	1	0.06
Cheiracanthium tagorei (Biswas and Raychaudhuri, 2003)	5	0.30	1	0.06	5	0.30	1	0.06	12	0.71
Chrysilla lauta (Thorell, 1887)	39	2.31	21	1.24	18	1.07	23	1.36	101	5.98
Clubiona analis (Thorell, 1895)	7	0.41	7	0.41	5	0.30	10	0.59	29	1.72
Clubiona anwarae (Biswas and Raychaudhuri, 1994)	0	0.00	3	0.18	0	0	3	0.18	6	0.36
Clubiona drassodes (Cambridge, 1874)	3	0.18	0	0	0	0	0	0	3	0.18
Clubiona filicata(Cambridge, 1874)	1	0.06	3	0.18	0	0	0	0	4	0.24
Clubiona mujibari (Biswas and raychaudhuri, 1994)	1	0.06	0	0	0	0	0	0	1	0.06
Coleosoma blandum (O.P. Cambridge, 1882)	3	0.18	0	0	0	0	0	0	3	0.18
Cubiona analis (Thorell, 1895)	0	0.00	0	0	0	0	3	0.18	3	0.18
Cyclosa bifida (Doleschall, 1859)	1	0.06	1	0.06	0	0	0	0	2	0.12
Cyclosa elongate(Biswas and Raychaudhuri, 1998)	1	0.06	0	0	0	0	0	0	1	0.06
Cyclosa parangtarugoa (Barrion and Litsinger, 1995)	5	0.30	4	0.24	0	0	0	0	9	0.53
Cyrtophora lahirii (Biswas and Raychaudhuri, 1998)	0	0.00	2	0.12	0	0	0	0	2	0.12
Cyrtophora nareshi (Biswas and Raychaudhuri, 1998)	1	0.06	0	0	0	0	0	0	1	0.06
Diaea variabilis (Thorell, 1869)	1	0.06	1	0.06	0	0	0	0	2	0.12
Enoplognatha tuybaana (Barrion and Litsinger, 1995)	0	0.00	0	0	0	0	1	0.06	1	0.06
Epeus minutus (Biswas, 2007)	0	0.00	2	0.12	0	0	0	0	2	0.12
Eriovixia laglazei (Simon, 1877)	1	0.06	9	0.53	0	0	0	0	10	0.59
Gasteracantha hasselti (C.L.Koch, 1838)	15	0.89	6	0.36	0	0	0	0	21	1.24
Hasarius adansoni (Audouin,1827)	6	0.36	1	0.06	1	0.06	1	0.06	9	0.53
Heteropoda buxa (Saha, BIswas and Raycahudhuri, 1995)	1	0.06	0	0	0	0	0	0	1	0.06
Hippasa pantherina (Pocock, 1899)	0	0.00	1	0.06	0	0	0	0	1	0.06
Leucauge decorate (Blackwall, 1864)	65	3.85	105	6.21	68	4.02	59	3.49	297	17.57
Lycosa chaperi (Simon, 1885)	0	0	0	0	0	0	1	0.06	1	0.06
Lycosa choudhuryi (Tikader and Malhotra, 1980)	0	0	0	0	0	0	1	0.06	1	0.06
Lycosa pseudoannulata (Bosenberg and strand, 1906)	2	0.12	0	0	0	0	0	0	2	0.12
Marpissa andamanensis (Tikader, 1977)	1	0.06	0	0	0	0	0	0	1	0.06
Marpissa bengalensis (Tikader, 1977)	7	0.41	7	0.41	5	0.30	4	0.24	23	1.36
Marpissa bijoni (Biswas, 2007)	2	0.12	2	0.12	0	0	0	0	4	0.24
Marpissa calcuttaensis (Tikader, 1974)	2	0.12	5	0.30	0	0	0	0	7	0.41
Marpissa decorate(Tikader, 1974)	1	0.06	0	0	0	0	2	0.12	3	0.18
Marpissa dhakuriensis (Tikader, 1974)	2	0.12	0	0	0	0	0	0	2	0.12
Marpissa gajebo (Biswas, 2007)	3	0.18	0	0	0	0	0	0	3	0.18
Marpissa ludhianaensis (Tikader, 1974)	2	0.12	3	0.18	0	0	3	0.18	8	0.47
Marpissa majumderi (Biswas, 2007)	5	0.30	1	0.06	2	0.12	1	0.06	9	0.53
Marpissa minutus (Biswas, 2007)	22	1.30	17	1.01	18	1.07	19	1.12	76	4.50
Marpissa mondali (Tikader, 1974)	7	0.41	14	0.83	2	0.12	8	0.47	31	1.83
Marpissa sannyali (Biswas, 2007)	11	0.65	3	0.18	0	0	3	0.18	17	1.01
Menemerus bivittatus (Dufour, 1831)	30	1.78	4	0.24	0	0	0	0	34	2.01
Mossuria laterotuberculate (Biswas, 2007)	2	0.12	1	0.06	2	0.12	0	0	5	0.30
Myrmarachne plataleoides (O.P. Cambridge, 1869)	0	0	1	0.06	0	0	0	0	1	0.06
Myrmarachne elongate (Szombathy, 1915)	3	0.18	1	0.06	2	0.12	0	0	6	0.36

Myrmarachne legon (Wanless, 1978)	4	0.24	0	0	0	0	0	0	4	0.24
Myrmarachne Maratha (Tikader, 1973)	0	0	1	0.06	1	0.06	0	0	2	0.12
Myrmarachne orientalis (Tikader, 1973)	1	0.06	0	0	0	0	0	0	1	0.06
Myrmarachne ovalo abdominalis (Biswas, 2007)	0	0	6	0.36	7	0.41	0	0	13	0.77
Myrmarachne pictocephalis (Biswas, 2007)	3	0.18	1	0.06	3	0.18	0	0	7	0.41
Myrmarachne poonaensis (Tikader, 1973)	1	0.06	0	0	0	0	0	0	1	0.06
Myrmarachne radhamadhabi (Biswas, 2007)	4	0.24	0	0	0	0	0	0	4	0.24
Neoscona brownius (Biswas, 2007)	12	0.71	19	1.12	10	0.59	14	0.83	55	3.25
Neoscona dorsonigra (Biswas, 2007)	2	0.12	2	0.12	0	0	0	0	4	0.24
Neoscona dostinikea (BIswas, 2007)	1	0.06	0	0	0	0	0	0	1	0.06
Neoscona elliptica (Tikader and Bal, 1981)	2	0.12	0	0	0	0	0	0	2	0.12
Neoscona laglazei (Simon, 1877)	0	0	0	0	0	0	1	0.06	1	0.06
Neoscona molemensis (Tikader and Bal, 1981)	6	0.36	4	0.24	2	0.12	0	0	12	0.71
Neoscona nautical (L. Koch, 1875)	3	0.18	3	0.18	1	0.06	0	0	7	0.41
Neoscona oriemindoroana (Barrion and litsinger, 1995)	1	0.06	0	0	0	0	0	0	1	0.06
Neoscona ovate (Biswas, 2007)	1	0.06	1	0.06	0	0	0	0	2	0.12
Neoscona theis (Walckenaer, 1841)	0	0	1	0.06	0	0	0	0	1	0.06
Neoscona yptinika (Barrion and Litsinger, 1995)	0	0	0	0	1	0.06	0	0	1	0.06
Nephila maculata (Fabricius, 1793)	0	0	6	0.36	6	0.36	0	0	12	0.71
Olios gravelyi ((Sethi and Tikader, 1988)	11	0.651	14	0.83	36	2.13	9	0.53	70	4.14
Olios hampsoni (Pocock, 1901)	0	0	1	0.06	0	0	0	0	1	0.06
Oxyopes assamensis (Tikader, 1969)	0	0	0	0	4	0.24	0	0	4	0.24
Oxyopes bikakaeus (Barrion and Litsinger, 1995)	0	0	0	0	0	0	1	0.06	1	0.06
Oxyopes birmanicus (Thorell, 1887)	3	0.18	1	0.06	12	0.71	6	0.36	22	1.30
Oxyopes javanus (Thorell, 1887)	11	0.65	14	0.83	18	1.07	22	1.30	65	3.85
Oxyopes ratnae (Tikader, 1970)	0	0	2	0.12	0	0	1	0.06	3	0.18
Oxyopes salticus (Hentz, 1845)	1	0.06	0	0	0	0	0	0	1	0.06
Oxyopes shweta (Tikader, 1970)	0	0	3	0.18	1	0.06	0	0	4	0.24
Pancorius magnus (Zabka, 1985)	1	0.06	1	0.06	0	0	1	0.06	3	0.18
Parawixia dehaani (Doleschall, 1859)	2	0.12	1	0.06	0	0	0	0	3	0.18
Pardosa ladakhensis (Tikader, 1977)	0	0	1	0.06	0	0	0	0	1	0.06
Pardosa pseudoannulata (Boesenberg and Strand, 1906)	0	0	2	0.12	2	0.12	0	0	4	0.24
Peucetia viridans (Stoliczka, 1869)	1	0.06	5	0.30	0	0	0	0	6	0.36
Phidippus bengalensis (Tikader, 1977)	2	0.12	2	0.12	9	0.53	3	0.18	16	0.95
Phidippus majumderi (Biswas, 1999)	1	0.06	2	0.12	0	0	0	0	3	0.18
Phidippus pateli (Tikader, 1974)	1	0.06	0	0	0	0	0	0	1	0.06
Phintella rampalensis (BIswas, 2007)	1	0.06	1	0.06	1	0.06	0	0	3	0.18
Phintella vittata (C.L. Koch, 1864)	9	0.53	0	0	0	0	0	0	9	0.53
Plexippus paykulli (Savigny and Audouin, 1827)	0	0	1	0.06	0	0	0	0	1	0.06
Plexippus petersi (Karsch, 1878)	1	0.06	10	0.59	6	0.36	2	0.12	19	1.12
Plexippus wesolowski (Biswas and Raychaudhuri, 1997)	4	0.24	4	0.24	0	0	0	0	8	0.47
Plexippus zabkai (BIswas, 1999)	1	0.06	0	0	1	0.06	0	0	2	0.12
Rhene kustiaensis (Biswas, 2007)	1	0.06	0	0	0	0	0	0	1	0.06
Salticus minutus (BIswas, 2007)	1	0.06	3	0.18	4	0.24	0	0	8	0.47
Sphingius barkudaensis (Gravely, 1931)	0	0	0	0	2	0.12	0	0	2	0.12
Telamonia dimidiata (Thorell, 1887)	2	0.12	7	0.41	1	0.06	0	0	10	0.59
Tetragnatha andamanensis (Tikader, 1977)	1	0.059172	4	0.24	0	0	2	0.12	7	0.41
Tetragnatha fletcheri (Gravely, 1921)	1	0.06	4	0.24	2	0.12	3	0.18	10	0.59
Tetragnatha hasselti (Thorell, 1890)	0	0	2	0.12	0	0	0	0	2	0.12
Tetragnatha jaculator (Tullgren,1910)	0	0	0	0	2	0.12	7	0.41	9	0.53
Tetragnatha javana (Thorell, 1890)	5	0.30	16	0.95	0	0	0	0	21	1.24
Tetragnatha mandibulata (Walckenaer, 1841)	1	0.06	0	0	0	0	0	0	1	0.06
Tetragnatha nitens (Audouin, 1826)	1	0.06	1	0.06	1	0.06	0	0	3	0.18
Tetragnatha vermiformes (Emerotn, 1884)	1	0.06	0	0	0	0	0	0	1	0.06
Tetragnatha virescens (Okuma, 1979)	0	0	1	0.06	0	0	0	0	1	0.06
Theriodon ovatus (Biswas, 2007)	0	0	0	0	0	0	1	0.06	1	0.06
Thiania bhamoensis (Thorell, 1887)	18	1.07	43	2.5	22	1.30	19	1.12	102	6.04
Thomsius projectus (Tikader, 1960)	1	0.06	0	0	0	0	0	0	1	0.06
Thomsius pugilis (Stolickzka, 1960)	1	0.06	0	0	0	0	0	0	1	0.06
Uloborus danolius (Tikader, 1969)	2	0.12	11	0.65	11	0.65	5	0.30	29	1.72
Xysticus minutus (Tikader, 1960)	0	0	1	0.06	8	0.47	0	0	9	0.53
Zygiella muriae (BIswas, 2007)	1	0.06	4	0.24	0	0	2	0.12	7	0.41
Zygoballus narmadaensis (Tikader, 1975)	2	0.12	0	0	0	0	0	0	2	0.12
Zygoballus pashanensis (Tikader, 1975)	1	0.06	0	0	0	0	0	0	1	0.06
Total	492	29.11	514	30.41	388	22.96	296	17.51	1690	100

The most abundant families were, respectively: Salticidae (36.71%), Araneidae (23.41%), Tetragnathidae 9.48%, Oxyopidae (6.90%) and Clubionidae (5.83%) (Fig. 2 & 3).

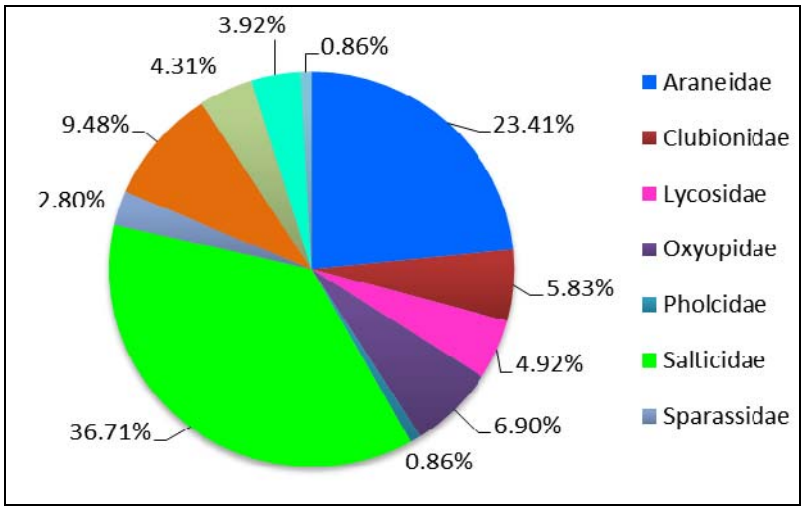

Fig 2: Percentages of spider families at Jahangirnagar University campus

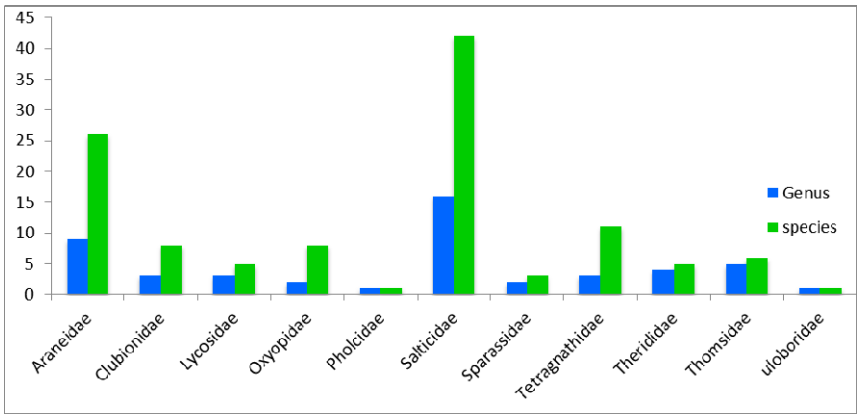

Fig 3: Family wise number of genera and species of Spider fauna

Spider species belonging to nine different guilds: orb web spiders, sac spiders, jumping spiders, plant spiders, tangle web spiders, wandering spiders, Foliage spiders, ground spiders and zunk web spiders. The jumping spiders were the dominant guild (36.21%), followed by the orb web spiders (32.75%). The lowest record was found in zunk web spiders which comprises 0.86% of the guild structure (Fig. 4)

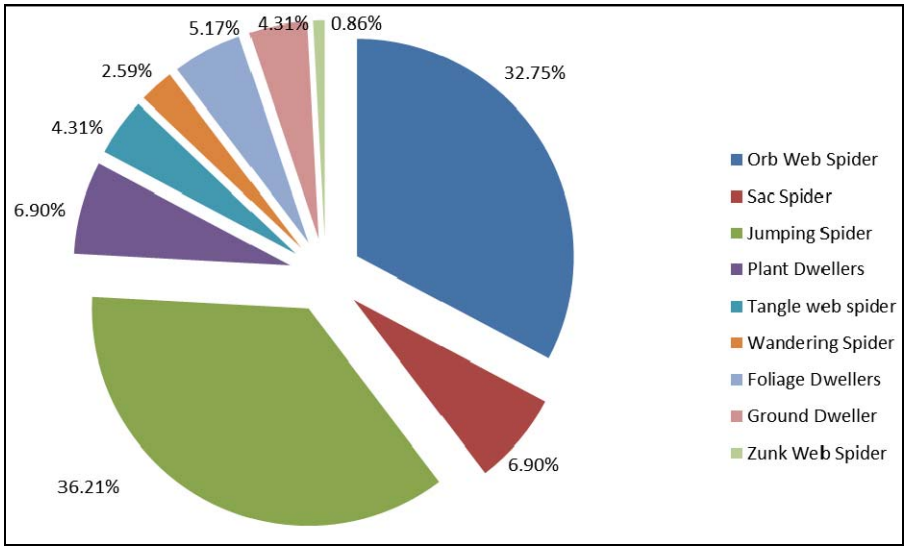

Fig 4: Composition of guild structure of spiders in Jahangirnagar University campus

All diversity and richness indices of spider in Jahangirnagar University campus

The value of Shannon-Wiener diversity index 2.18, the Value of Simpson diversity index 0.89, and the Margalef diversity index was 3.39.Spiders evenness estimated by Pielou's evenness index which was 0.89 (Figure 5).

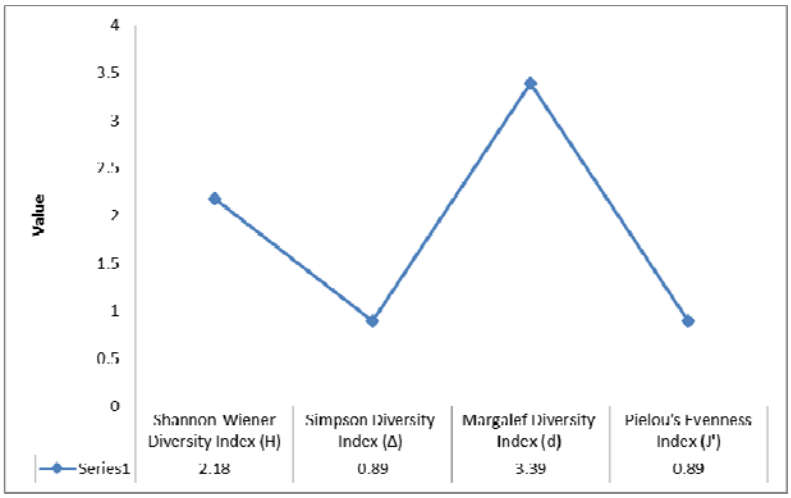

Fig 5: Diversity and richness indices of spider fauna in JU campus

Discussion

A total of 11 spider families distributed among 49 genera and 116 species were reordered in the Jahangirnagar University campus. The richest in species were Araneidae, Salticidae, Oxyopidae and Tetragnathidae, while Pholcidae and Uloboridae were the rarest in species.

There is no previous work in Jahangirnagar University campus to compare the spider diversity. Past studies have shown that different strategies tend to complement one another [6, 20]. In Pakistan, 18 species of spider fauna under 13 genera and 8 families were reported [1]. 232 species of spiders from the four forest communities in Bangladesh [8]. Out of 21 families of spiders recorded Uloboridae, Theridiidae, Tetragnathidae, Araneidae, Oxyopidae, Thomisidae and Salticidae constituted about 91% of the total fauna. The other 16 families constituted only about 9% of total populations. Comparatively highest number of species was recorded under Theridiidae, Tetragnathidae, Araneidae, Thomisidae and Salticidae. The other 16 families were represented by 1-8 species. Highest number of species (60 species) was recorded under Araneidae, followed by Salticidae, Theridiidae, Tetragnathidae and Thomisidae represented by 47, 25, 24 and 18 species, respectively. Among the rest, Oxyopidae and Sparassidae were represented by 8 species for each, Clubionidae by 7 species, Linyphiidae, Lycosidae and Gnaphosidae by 5 species for each, Philodromidae by 4 species; Pholcidae and Uloboridae by 3 species for each, Scytodidae, Hersiliidae, Pisauridae and Corinnidae by 2 species for each, and Oonopidae and Agelenidae by one species for each. 377 genera and 60 families of 1520 spider species were recorded in India [22]. 32 species under 17 genera and 7 families during their six month survey in India [31].

The spider checklist of Bangladesh contains 412 [9]. The present research found 116 spider species in Jahangirnagar University campus, a new species *Chrysilla lauta* has been recorded under the family Salticidae for the very first time in Bangladesh.

The perception of species diversity generally consists of two components, namely species richness and species evenness. In this research, species richness was computed by using Shannon-Wiener diversity index, Simpson diversity index, Margalef diversity index. In present study, Shannon-Wiener diversity index is 2.18. Green recorded that Shannon-Wiener diversity index was between 1.42-2.48 [7]. Bhat *et al*. found Shannon-Wiener diversity index for spiders of 2.03 [5]. Wankhade *et al*. recorded Shannon diversity index 2.61 which are in agreement with present study [31]. Mahalakshmi and Jeyaparvathi found Shannon diversity index in range of 2.965- 3.147 [12]. This value varies from our present research because of the variation in number of spider species. The Simpson diversity index was 0.89. The result of this index and the result of Shannon index were found highly resemble to each other. Bhat *et al*. recorded Simpson diversity index for spider was 0.82 [5]. The Simpson diversity index range was between 0.89-0.90 recorded by Mahalakshmi and Jeyaparvathi which resembles with the present study [12]. Green recorded that Simpson diversity index for spider species 0.02-0.99 [7]. This result is similar with our present research. The Margalef index was 3.39. Mahalakshmi & Jeyaparvathi found the Margalef index of 4.12-4.98 [12].

Variation in spider number is the main reason for differences in values of Margalef Diversity Index. The value of Pielou's Evenness Index was 0.89. The values tend to be zero indicates that the species become more dominant in a community. Bhat *et al*. recorded evenness 0.83 for spider [5]. The observed result of the present research's value is getting closer to 1, it means that the entities are distributed similarly. Nobre *et al*. recorded spider evenness range between 0.89-0.95 [15].

All the diversity indices and evenness indices results were generally close and highly resemble to each other, and thus all of these indices can be used in this type of studies carrying out in uninterrupted zones. During the study period, we found that each diversity indices had their individual diverse commitments and it is not conceivable to govern which one has an effective practice in this kind of studies, because each diversity indices based on various parameters like number of species, number of individuals etc.

Conclusion

Study on spiders is completely untouched in Jahangirnagar University campus, although this area is enriched with flora and fauna. The study is the baseline information over the ecology, and importance of spider species. The rich floral and faunal diversity in the Jahangirnagar University campus is the key to build the microhabitats of different species. The study will also support the effort for the conservation of the species and specify the hidden benefits in them.

The result of the present study showed that, great variety of spider exists in the study areas. One can undertake research work on individual species as the climatic conditions

supports the spider fauna to multiply as there is little human interference in their habitats. Research work on the biology of spiders including their web construction, food and feeding habitats, physiology, reproduction and life history can be done here that may lead new door for the conservation of spider species.

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