International Journal of Ecology and Environmental Sciences
www.ecologyjournal.in
Online ISSN: 2664-7133; Print ISSN: 2664-7125; Impact Factor: RJIF 5.28
Received: 20-09-2020; Accepted: 05-10-2020; Published: 21-10-2020
Volume 2; Issue 4; 2020; Page No. 285-288

Spider diversity and their ecological guild structure in and around Ramkrishna Mahavidyalaya, Kailashahar, Tripura

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Abstract
A survey of the spider fauna of Ramkrishna Mahavidyalaya campus and its adjacent area of Kailashahar, Unakoti District, Tripura, a part of Indo-Burma biodiversity hotspot region was carried out from July 2019 to June 2020 to assess the spider assemblages and their ecological guild structure. Methodology included active searching at all layers from ground level to tree canopy accessible for visual survey and photographic records were maintained. A total of 20 species belonging to 9 families viz. Araneidae, Thomisidae, Salticidae, Lycosidae, Sparassidae, Clubionidae, Oxyopidae, Tetragnathidae, Hersiliidae were recorded. Among these the most dominated family was Araneidae represented by 5 genera with 7 species. 5 families were represented by single species and 5 guild structures were noted. The present investigation revealed the potentiality of the study area as the reservoir of large spider diversity. The information collected may facilitate future initiatives of database preparation of these taxa for this region.

Keywords: spider, araneidae, spider diversity, ecological guild structure, tripura

Introduction
The spiders are one of the most widely recognized groups of arthropods among invertebrate animals that play a significant role in maintaining biological homeostasis of nature as one of the most varied and functionally important predators regulating the terrestrial populations [1]. They are distributed almost every ecological conditions except air, open sea and Antarctica region [2]. Thus, their high abundance and high diversity in almost all microhabitats make them effective monitoring in the environment. About 47,099 described species are known currently globally including 4,073 genera and 113 families [3]. India being a mega diverse country is rich in both flora and fauna; however there exists an extremely fragmentary knowledge about the diversity and distribution of spider fauna, most importantly north-east part of India. Pest management through spiders is one of the best strategies to reduce the use of chemical pesticides as well as the population of the insect pests. But biologists had ignored the conservational studies of spiders despite of their great role in natural ecosystem.

The North-eastern region of India lies at the conjugation of Indo-Himalayan Biodiversity hotspot, but receive less attention reference to exploration of spider faunal information. As far as spider diversity of Tripura is concerned, seldom study has been made by few workers. Ecosystem of some faunal resources in this region is under high peril of complete annihilation owing to unsustainable human activities [4, 5]. Many animals like Amphibians, Reptiles, Aves, Mammals, butterflies including spiders play important roles in the dynamics of a specific habitat and are sensitive to habitat loss, climatic change and environmental upheavals [6]. In this study emphasis was laid on to specify the status of spiders along with their ecological feeding guilds as a part of alpha diversity assessment.

Methodology
Study area
The study area Ramkrishna Mahavidyalaya and its adjoining part stretching between latitude of 24.1781^0 N and a longitude of 92.0273^0 E under under Unakoti district of Tripura and an average elevation of 28.36 meters above the sea level. The forest cover of this area has been classified as tropical semi-evergreen, moist-mixed deciduous. Dry bamboo brakes, tea plantation are found throughout the semi-evergreen and moist-mixed deciduous forests. The main river that flows through this study area is the river Manu comes from the Longtharai Valley Sub-Division and flows towards North and goes to Bangladesh. It is experienced tropical climate with distinct seasons throughout the year i,e. summer (March-May), Monsoon (June-August), winter (November-February) and autumn (September-October). Hot and humid summer with sufficient rainfall between June and October and dry winter characterize the climatic conditions.

Methods
The sampling methods included visual searching. Ground search were done under leaf litter, fallen or dry wood. Sweep netting was done for the foliage dwelling spiders and photography record were made by Redmi note 5 pro android mobile phone from July 2019 to June 2020.Micro habitat, web pattern and feeding guild characteristics were recorded for every encounter. Spiders were identified up to the species level using the identification keys [7, 8, 9, 10].

Results and Discussion
A total of 20 species comprising of 9 families were recorded during the study period [Table 1]. Among the identified species,

7 belongs to the family Araneidae, 4 species belongs to the family Salticidae, 2 species each belongs to the family Oxypidae and Tetragnathidae. 1 species each to the family Thomisidae, Lycosidae, Sparassidae, Clubionidae and Hersiliidae [Figure 1]. Araneidae was the most predominant spider family, forming 35% of the total observation. It was followed by Salticidae 20%. Family Oxyopidae and Tetragnithidae 10% each. 5% represents each of the family Thomisidae, Lycosidae, Sparassidae, Clubionidae and Hersiliidae [Figure 1]. The spiders sampled belonging to 5 functional guild structure based on foraging behaviour in the field [11]. Among guilds orab web builder represents 45% followed by 35% foliage runner, ground runner 10%, ambusher and bark dwellers represents 5% each [Figure 2].Guild structure analysis revealed the heterogeneous environment with different level of disturbance of microhabitat. Considering of the small size of study area and its significant species richness it is presumed that the rich spider diversity may be exit in this region. The diversity of spider in the study area is mainly due to riparian ecosystem with rich vegetation complexity as vegetation plays an important role for the existence of insect fauna in a community. Study area is undergoing rapid degradation, fragmentation and loss of habitat with increase in human population. These findings are agreement with outcomes of other worker also [12, 13, 14].

Table 1: Spider species recorded in the study area

Family	Sl. No.	Species	Ecological guild
Araneidae	1	*Cyrtophora cicatrosa* (Stoliczka, 1869)	Orb web builder
	2	*Argiope pulchella* (Thorell 1881)	Orb web builder
	3	*Argiope anasuja* (Thorell, 1887)	Orb web builder
	4	*Nephila pilipes* (Fabricius 1793)	Orb web builder
	5	*Gasteracantha fornicata* (Fabricius, 1775)	Orb web builder
	6	*Gasteracantha kuhli* (C. L. Koch 1837)	Orb web builder
	7	*Neoscona sp.*	Orb web builder
Thomisidae	8	*Xysticus croceus* (Fox, 1937)	Ambusher
Salticidae	9	*Plexippus paykulli* (Audouin, 1826)	Foliage runner
	10	*Sandalodes suberbus* (Karsch, 1878)	Foliage runner
	11	*Siler semiglaucus* (Simon, 1901)	Foliage runner
	12	*Marpissa muscosa* (Clerck, 1757)	Foliage runner
Lycosidae	13	*Pandosa pseudoannulata* (Bosenberg and Strand, 1906)	Ground runner
Sparassidae	14	*Heteropoda ventoniya* (Linnaeas 1767)	Ground runner
Clubionidae	15	*Clubiona drassodes* (Cambridge 1874)	Bark dwellers
Oxyopidae	16	*Oxyopes scalaris* (Hentz, 1845)	Foliage runner
	17	*Oxyopes birmanicus* (Thorell, 1887)	Foliage runner
Tetragnathidae	18	*Tetragnatha Montana* (Simon, 1874)	Orb web builder
	19	*Opadometa fastigata* (Simon, 1877)	Orb web builder
Hersiliidae	20	*Hersilia savignyi* (Lucas, 1836)	Foliage runner

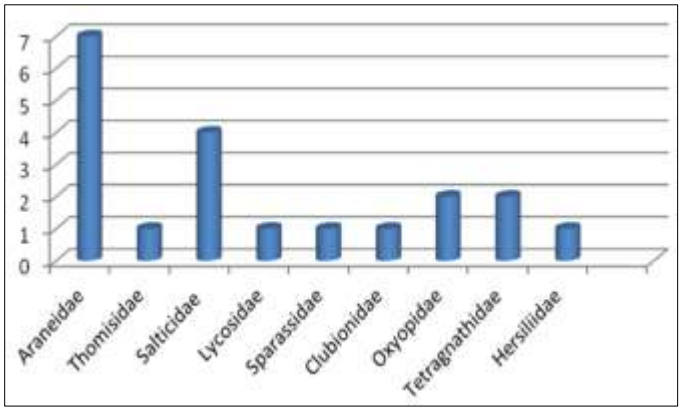

Fig 1: Representation of family-wise species composition

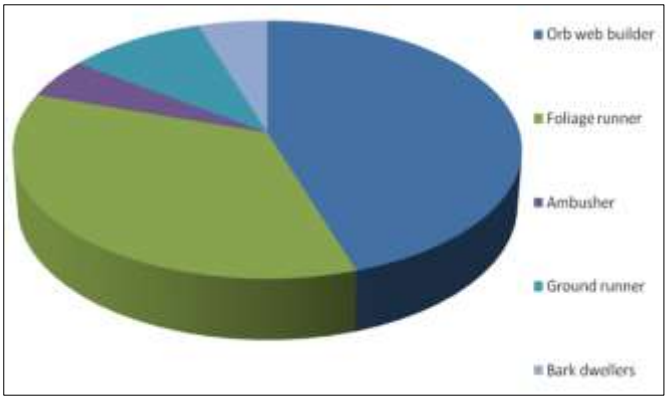

Fig 2: Representation of ecological guild structure recorded during study

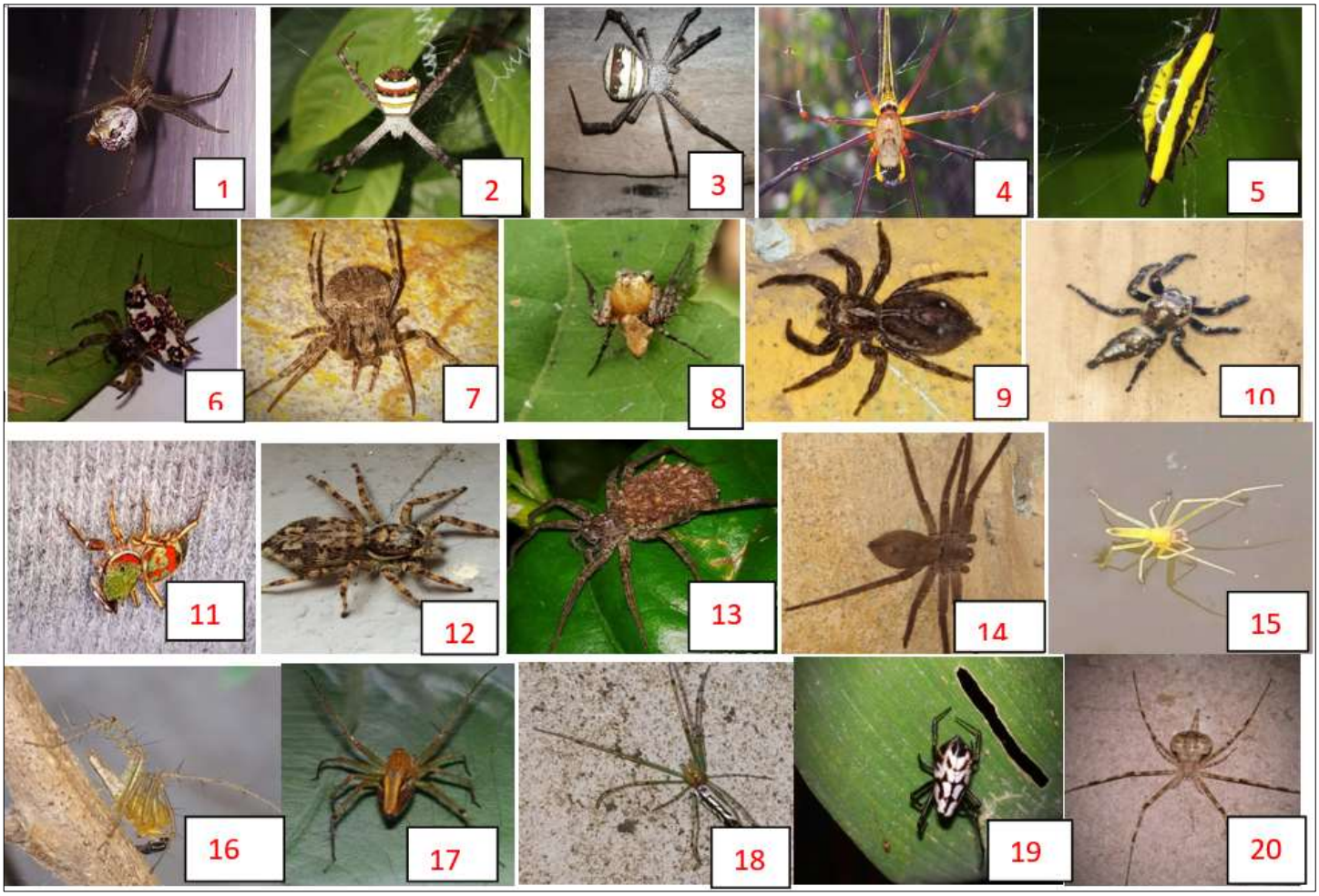

Fig 3

Photo plate of identified spider species and each number corresponded to species depicted in the table 1.

Conclusion

Present study provide the baseline information over the diversity status, habitat preference etc. which is important to identify the threat faced by the spider species and taking appropriate mitigation measures from conservation point of view. As spider often prefer diverse landscape and use several habitat type, structurally more complex herbs and shrubs can support a more diverse spider community. They are maintaining ecological equilibrium by suppressing insect pest. The pesticides used in the tea plantation are seen to be a death factor of the spiders that resides in or around the tea plantations of the study area. As they are generalist predator, they are of immense economic importance to man because of their ability to suppress pest abundance in agro ecosystems. Being hilly area with riparian heterogeneous ecosystem the study area is interestingly diverse in spider fauna. It is also important to note that spider is ubiquitous in nature and their diversity does depend on many other factors for conservation of its diversity in the study area.

Acknowledgements

The Authors are thankful to Ex-Professor Durgadas Ghosh, Department of Zoology, Tripura University for valuable suggestion during entire study and college authority of Ramkrishna Mahavidyalaya, Kailashahar, Tripura for providing necessary research facility.

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