International Journal of Ecology and Environmental Sciences
www.ecologyjournal.in
Online ISSN: 2664-7133, Print ISSN: 2664-7125
Received: 24-02-2022, Accepted: 09-03-2022, Published: 25-03-2022
Volume 4, Issue 1, 2022, Page No. 149-153

Diversity of spiders (Arachnida: Araneae) in tropical butterfly conservatory, Tiruchirappalli, Tamil Nadu, South India

M V Gayathri[1], Horne Iona Averval[2*]
[1] Research Scholar, Department of Zoology, Holy Cross College, Tiruchirappalli**,** Tamil Nadu, India
[2] Associate Professor, Department of Zoology, Holy Cross College, Tiruchirappalli, Tamil Nadu, India
[*]Corresponding Author: Horne Iona Averval

Abstract
Spiders are key components of all ecosystems in which they live and considered to be useful indicators of the overall species richness, health of terrestrial communities, Natural Pest Control, Good friend of Farmers. The present study is an attempt to investigate the spider faunal diversity in the selected habitats of Tropical butterfly conservatory (Butterfly Park), Tiruchirappalli, India. Guild structure analysis of the collected spiders revealed seven functional groups viz. stalkers, orb-web builders, ambushers, space-web builder, ground runners, foliage runners and sheet-web builders. The knowledge generated from the present study gives valuable and updated information on diversity of species of Tropical butterfly conservatory (Butterfly Park), Tiruchirappalli and the data can be used for future research on spider fauna.

Keywords: natural pest control, good friend of farmers, indicators, guild

Introduction
The term biodiversity briefly describe the enormous variety of life on Earth more specifically refers to all of the species (all living thing, including plants, bacteria, animals and humans) in one region or ecosystem. Biodiversity is the total sum of variety of the living organisms which includes genetic diversity and their assemblage (Walker, 1992) [1] and the protection of biodiversity is one of the most relevant issues in global conservation.

Insect diversity and its role in the environment
Insects create the biological foundation for all terrestrial ecosystems. Insects are important because of their diversity, ecological role, and influence on agriculture, human health and natural resources. They cycle nutrients, pollinate plants, disperse seeds, maintain soil structure and fertility, control populations of other organisms and provide a major food source for other taxa. Insects have evolved unique features in the animal world.

Insects and Arachnida
Spiders (mainly prey on insects) are an important component of arthropod and they are one of the most important diverse groups of organisms belonging to the largest order Araneae of the class Arachnida. This is the most diverse, the largest entirely carnivorous group of animals on the planet. Spiders are female dominated and entirely predatory order in the arthropod world. They rank seventh position in total species diversity among all other animals on this planet earth (Ayyar, 1964; Basavarajappa, S.2018) [2, 3].
Spiders occur in all Ecosystems excepting in Antarctica and becomes part of various food chains and food webs amidst different ecosystems. Around 46, 960 species of spiders which belong to 112 families are recorded at different parts of the world. In India, the number of spider species known from India have risen steadily from 1067 species (Tikader, 1987) [4], 1442 species, 1520 species (Sebastian & Peter, 2009) [5] to 1686 species. Presently, 1855 species under 477 genera in 61 families are known. This list has been updated in accordance with the latest version of the World Spider Catalog.
Like all arachnids, spiders have just two body parts, a cephalothorax and an abdomen. The abdomen is soft and unsegmented while the cephalothorax is harder and includes the eight legs that characterize spiders. Arachnids lack wings and antennae (Oyeniyi Abiola Oyewole., 2014) [6].
Spiders are polyphagous and feed on a variety of available prey. They do not prey on adult insect pests but also feed on their eggs and larvae. Most arachnids are carnivorous, typically preying on insects and other terrestrial organisms (Bennett RG, 2001) [7]. Spiders can only consume liquids, as they lack chewing mouthparts. They use chelicerae; pointed appendages at the front of the cephalothorax, to grasp prey and inject venom where the prey was digesting by Digestive juices to break the food down into liquid.
Spiders play a pivotal role at different tropic levels; They are good friends of farmers as they control all types of pests on the crop. Arachnids provide an important service (biological control of insects) as they are keeping

insect populations under control (without spiders some insects would have reached pest proportions) and they are successful biological indicators to assess the ecosystem health as they can be easily identified and are differently responsive to natural and anthropogenic disturbances (Pearce and Venier, 2006) [8].

Materials and Methods

Study Area

Tiruchirappalli, the fourth largest city in the state of Tamil Nadu Situated on the banks of river Kaveri. Tropical butterfly conservatory (Butterfly Park), Tiruchirappalli is Consider as one of the biggest butterfly park in Asia. It's located in the Upper Anaicut Reserve Forest, sandwiched between the Cauvery and Kollidam rivers in Tiruchirappalli and spreads over 35 acres. This Tropical butterfly conservatory is rich in flora and fauna diversity with 298 plant species, 125 butterfly species,101 species of birds,13 species of Dragonflies,10 different species of spiders, 8 different species of Mammals, 20 species of Reptiles and 6 species of Amphibians. The Nakshatravanam and Rasivanam are a part of the park, Which has 27 number of trees / plants species corresponding to 27 stars and 12 trees / plants of corresponding 12 zodiac signs of Indian astrology. The idea was to encourage people to grow a tree associated to their star, near their homes. The park is located with 78.637202°lat. 10.877862°lon. And has low temperature then the city.The present study explored the diversity of spiders in different habitats of Butterfly park, Tiruchirappalli .The spiders were collected during the study period from different zone of Butterfly park. The following methods were used to collect samples.

Collection Method

Visual Search Method

This method is also called hand collection method. The spiders and their stages were spotted and collected from the flowers, folded leaves, under the leaflets, ground, shrubs and on the bark. Spiders were easily collected by driving them into a dry container. Collections of most web-building species were made early in the morning. Keen observation is essential for the visual search method.

Inverted Umbrella Method:

In this method, an inverted umbrella was placed below flowering plants and shrubs and the branches were shaken thoroughly where spiders along with the other insects fell into the inverted umbrella. Spiders were transferred into collecting vials after removing other insects from the umbrella.

Kerchief Method:

This method was used for collecting running and wandering spiders, especially those belonging to the families Lycosidae and Salticidae. An open kerchief was thrown over the running spider, which was then carefully caught in the folds of kerchief.

Sweep Net Method:

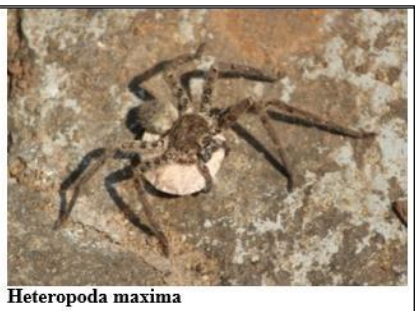
This is one of the simplest methods followed to collect spiders. The ideal habitat for using sweep net was one with grasses and flowers. The habitats were swept as many times as necessary to get a good sample. Spiders that fell into the net were collected before they were escaped Small specimens were photographed by using a stereo zoom microscope and large specimens were photographed by D 3100 Camera.

Identification

The specimens were identified with the help of experts in spider taxonomy and taxonomic keys of spiders (Tikader, 1987; Murphy and Murphy, 2000; Dippenaar, 2002) [4, 9-10].

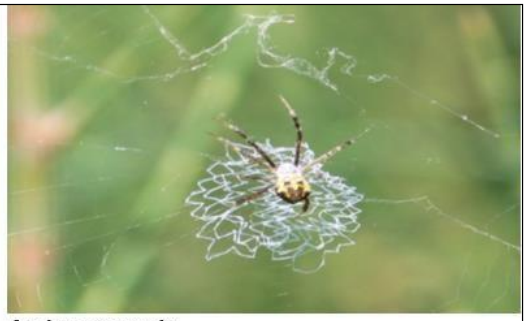
Result

Argiope keyserlingi
Phylum: Arthropoda
Class: Arachnida
Order: Araneae
Family: Araneidae
Genus: Argiope
Species*: A. keyserlingi*



Heteropoda maxima
Phylum: Arthropoda
Class: Arachnida
Order: Araneae
Family: Sparassidae
Genus: Heteropoda
Species: *H. maxima*

Cosmophasis micans
Phylum: Arthropoda
Class: Arachnida
Order: Araneae
Family: Salticidae
Genus: Cosmophasis
Species: *C. micans*



Argiope anasuja
Phylum: Arthropoda
Class: Arachnida
Order: Araneae
Family: Araneidae
Genus: Argiope
Species: *A. anasuja*

Fig 1

Gasteracantha fornicata
Phylum: Arthropoda
Class: Arachnida
Order: Araneae
Family: Araneidae
Genus: Gasteracantha
Spicies: G. fornicata

Peucetia viridans
Phylum: Arthropoda
Class: Arachnida
Order: Araneae
Family: Oxyopidae
Genus: Oxyopes
Spicies: *P.viridans*

Plexippus paykulli
Phylum: Arthropoda
Class: Arachnida
Order: Araneae
Family: Salticidae
Genus: Plexippus
Species: *P. paykulli*

Xysticus (crab spider)
Phylum: Arthropoda
Class: Arachnida
Order: Araneae
Family: Thomicidae
Genus: Xysticus
Species: *Xysticus .sp*

Fig 2

Table 1: Field data sheet L.no:1, 2, 3 zones, Location: Butterfly park, Latitude: 78.637202°lat, Longitude: 0.877862°lon. Elevation (mts):100mts

S.No	Common Name	Scientific Name	Host Plant	Breeding Sites	Web Structure& Position	Tem	Stage A/Y	Count.	Reason For Web		Prey	Predator
									F	M		
1	Signature Spiders	A. keyserlingi & A. anasuja	Platycladus orientalis (Cupress plant)	Web with egg sac	Round & Center	28°C	A&Y	10			Small insects	Birds
2	Hunts man spider	Heteropoda maxima	(Spider lilly)	Without web with egg sac	_	27°C	A&Y	15	_	_	Variety of arthropods	Garden lizards
3	Striped lynx spider	Oxyopes shewta	Causuarina equisetifolia (whistling pine)	Web with egg sac	Sheet web, center	27°C	A&Y	20			Worms	Scorpions
4	Jumping spider	Carrhotus viduus & C.micans	Jatropha integerrima (peregrina)	No web but Nocturnal shelters	-	27°C	A&Y	8			Other spider sps	Spider Wasp
5	Green lynx spider	Peucetia viridana	Causuarina equisetifolia (whistling pine)	Web with egg sac	Sheet web, center	29°C	A&Y	20			Honeybees and other nectorning insect	Monkey
6	Spiny Orb Weaver	Gasteracantha geminate & G. fornicata	Commonly present in trees and shrubs	Web	Round & Center	29°C	A&Y	30			Flies,moths small bettel	Centipedes
7	Crab spider	Thomisus Kitamurai & Xysticus .sp	Tridax procumbens(tridax daisy)	–	-	29°C	A&Y	2			Pollinators	Scorpions
8	Tunnel web Spider	Hippasa holmerae	Commonly present in Ground	Web with egg sac	Tunnel shape ,Center	29°C	A&Y	More then 30			Termites and worms	Human
9	Jumping spider	Menemerus bivittatus & Plexippus paykulli	Ixora coccinea (Ixora)	No web but Nocturnal shelters	-	29°C	A&Y	10			Flies	Birds
10	Green spider	Oxytate virens	Causuarina equisetifolia(whistling pine)	Web with egg sac	Sheet web, center	29°C	A&Y	5			Flies	Birds

Table 2: Host Plant

S.No	Common Name	Scientific Name	Type	Leaf			
				Shape	Colour	Length	Width
1	Whistling Pine	Causuarina Equisetifolia	Tree	Needle	Green	10-20cm	0.2mm
2	Peregrina	Jatropha Integerrima	Shrub	Fiddle With 3 Sharp Pointed Lobes	Green	7cm	2.5cm
3	Ixora	Ixora Coccinea	Shrub	Oblong	Green	10 Cm	3cm
4	Tridax Daisy	Tridax Procumbens	Herb	Toothed And Arrow Head	Green	4 Cm	2.5cm

Discussion

Spider diversity, distribution and their insect feeding habits exhibits a vital role in Nature balancing. They are potential biological indicators of natural habitats and are used for Natural pest control, determining how communities react to environmental changes or disturbances. The status of spider diversity is an important constraint to evaluate the community level of biological organization. Higher species diversity is an indicator of a healthier and complex community because a greater variety of species allows more interactions, hence greater system stability which in turn indicates good environmental conditions. In the current study, a total of 15 species belonging to 10 genera under 5 families were recorded from the selected habitats of Butterfly Park, Trichy. This habitat showed rich floral (trees and shrubs) and faunal (butterflies, moths, beetles, dragon flies and ants) diversity which is a key factor to build microhabitats for a wide variety of spider species. Spiny orb weaver spider is present in elevated number at Nakshatravanam as its filled taller trees. Host plant and Nector patch was excess with tunnel web spiders. These varied habitats provide a greater array of microhabitats, microclimatic features, alternative food sources, retreat sites and web attachment sites for spiders. This may be due to increased vegetation in these areas which lead to the increase in biodiversity and ultimately leads to the greater cover and food resources for these fantastic creatures. Spiders of the families like Tetragnathidae, Oxyopidae, Theridiidae, Araneidae were found mainly on trees, shrubs and herbs in our study. Studies have demonstrated that the spider habitat selection is affected by a variety of biotic and abiotic factors together with the architectural attributes of the habitat. Architectural attributes include size; shape and spatial arrangement of substrate used by spiders suggest that structurally more complex habitat types can support a more diverse spider community. In general, spiders have preferences for humidity and temperature and these factors limit them to areas within the range of their physiological tolerances (Pandit and Pai, 2017) [11].

Conclusion

The results of the present study and several other observations led to the conclusion that habitat structure and environmental factors may be crucial in determining the composition of spider community of the area. Therefore, documenting spider diversity patterns can provide important information to justify the conservation significance of the ecosystem.

Conflicts interest

All authors have no conflicts of interest to declare.

Acknowledgements

This research was made possible by the Tamil Nadu Forest Department Tiruchirappalli Division in Tamil Nadu, India, which was funded (No:44500/L/2019) by a grant from the Directorate of Collegiate Education, Chennai, Tamil Nadu, India, which is warmly thanked.

Reference

1. Walker D. Spider diversity and stability in ecological concepts, the contribution of ecology to an understanding of the Natural world, 1992, 115-45.
2. Ayyar EM. Non-Chordates. Viswanathan Publishers, 11, McNichol Road, Chetput, Madras
3. Basavarajappa, S. 2018, Density, Abundance and Per Cent Occurrence of Spider Species (Arachnida: Araneae) In and Around Mysore City, Karnataka, India J. of Pha. and Bio. Sci. 2278-3008, 2319-7676,2018:13:3
4. Tikader BK. Handbook of Indian Spiders. Calcutta, Zoological Survey of India, 1987, 251.
5. Sebastian PA, Peter KV. Spiders of India. Publ. by Universities Press (India) Private Limited, Hyderabad, India, 2009, 614.
6. Oyeniyi Abiola Oyewole. Diversity and Distribution of Spiders in Southwestern Nigeria. Natural Resources, 2014, 1-9
7. Bennett RG. 2001. Spiders (Araneae) and araneology in British Columbia. J. Entomol. Soc. B. C,2001:98:83-90.
8. Pearce JL, Venier LA. The use of ground beetles (Coleoptera: Carabidae) and spiders (Araneae) as bioindicators of sustainable forest management: a review. Ecological indicators,2006:6(4):780-793. https://doi.org/10.1016/j.ecolind.2005.03.005
9. Murphy FJ Murphy. An Introduction to the Spiders of South East Asia. MNS, Malaysia, 2000, 624.
10. Dipp Enaar, Scho Eman AS. The spider guide of Southern Africa. ARC-Plant Protection Research Institute. South Africa, 2002.
11. Pandit R, Pai IK. Spiders of Taleigao Plateau, Goa, India, 2017.
12. Islam AT, Islam MS, Yasmin M, Yamanaka A. Effect of temperature on the life cycle and pupal color of lime swallotail butterfly, Papilio demoleus (Lepidoptera: Papilionidae). International Journal of Entomology Research. 2019;4(5):42-7.