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Biodiversity of Spiders in Kanyakumari District, Tamilnadu, India

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ABSTRACT: Biodiversity refers to all the population species and communities in defined area. According to the recent studies, the spider plays an important role in ecological balance and considered to be the ecological indicators. Spiders are the group of terrestrial predators and complicated by their wide biodiversity strategies. There high abundance and diversity of microhabitats allow for their effective in the environment. Arthropods are mainly representing the largest number of the biotic diversity in the world. This study to focused the spider population as they represented as a invertebrate from this ecosystem. They are the important of biological indicators, they have a habitat modification due to the short generation, temperature and moisture changes. This study is attempted to investigates the identified the status of spider population and their species. The selected area in Kanyakumari district is depend on the spider fauna diversity is more or less natural habitat without much human intervention and rich in floral communities. Spiders are observed and the photograph were taken and recorded. The study was made from August to November 2022. From the study area have 60 species belonging to 25 families and 42 genera in the class of Arachnidae. Family diversity of spider species were recorded Araneidae (11 species), Sparassidae (8 species), Salticidae (8 species), Pisauridae (4 species), Lycosidae (4 species), Scycotidae (2 species), Agelenidae (2 species), Thomisidae (2 species), Theraphosidae (2 species), Oxyopidae (2 species). The study revealed that study area is consist of spider species are highest number in Araneidae family, and remaining the families are sparassidae and salticidae. The results of the study indicated the need of the conservation of biodiversity in a selected area. Spiders are an essential part of the ecosystem. They are crucial in controlling insect populations in every ecosystem and help in the crop land from predators and acts like a biological indicator. The challenges of this study could be the impact of urbanisation and urban habitats not preferable for different biological communities compared to natural habitats. Ashuman populations changing their natural habitats, the importance of spiders in natural habitat reduced the survival of spiders.

Keywords: Biodiversity, Spiders, Ecosystem, Species, Predator.

INTRODUCTION

Spiders are among the most diverse group of animals on the population. There are over 45,000 known species of spiders in the world. Spiders are occupied by considerable portion of animal life of the diversity of group in Kanyakumari district. The spiders are most widely spread throughout the land, underground, water, plants, trees, barks, dead leaves under some stones, woods. Spiders belong to the class Arachnida, subclass Araneae and order Arachnid. A diverse group of spiders may be effective in biological control because they differ in hunting strategies, habitat preference and activity periods. Spiders exhibit both functional and numerical responses to prey densities. Spiders are the different group of species that belong to the Arachinidae family. Scientists have described over the 50,000 of species of spiders. Spiders are important and they have a carapace in their dorsal side of cephalothorax and contain chelicerae. It is used to prey and inject the venom (Suraj and Parimala 2020). In recent study to this spider biodiversity to help the gathering the information about their ecological indicators and biological diversity of many regions (Suraj and Parimala 2020). Spiders are help to keeping the insect population under control by biological control and it proved by a without these species, the insects are reached in pest proportions (Dharmaraj *et al*., 2017). In comparison into a cropland and tree or plantations the restored of area to conserve the biodiversity of ecological services (Carwardine, 1995). Spiders are also used for potentially beneficial to human given that a greater number of their peptides present some potential therapeutic applications due to their analgesic activities. Spiders are the most successful venomous animals and the most abundant terrestrial predators. Their remarkable success is due in

large part to their ingenious exploitation of silk and the evolution of pharmacologically complex venoms that ensure rapid subjugation of prey. Most spider venoms are dominated by disulfide-rich peptides that typically have high affinity and specificity for particular subtypes of ion channels and receptors. Spider venoms are conservatively predicted to contain more than 10 million bioactive peptides, making them a valuable resource for drug discovery. The structure and pharmacology of spider-venom peptides that are being used as leads for the development of therapeutics against a wide range of pathophysiological conditions including cardiovascular disorders, chronic pain, inflammation, and erectile dysfunction (Saez *et al*., 2010). Spider silk used for created bandages and added an antibiotic component and used in bullet-proof clothing, parachutes, nets and more. Spider silk, as one of the hardest natural and biocompatible substances with extraordinary strength and flexibility, have become an ideal option in various areas of science and have made their path onto the biomedical industry. Biotechnology helped production of spider silks recombinantly in different hosts and obtaining diverse morphologies out of them based on different processing and assembly procedures (Bakhshandeh *et al.,* 2021). Spider communities in areas with a temperate climate achieve equilibrium in the control of agricultural pests (Riechert, 1981).

A large number of species have become endangered due to urban development, land – use management techniques, air and groundwater pollution caused by use of pesticides and fertilisers, the introduction of invasive alien species, and in some cases are on the threshold and trafficking for the pet trade (Sebastian and Peter 2009). In spiders are eaten by a mosquito and protected us from malaria and other some mosquito borne diseases (Dharmaraj *et al*., 2017). Spiders are the group of terrestrial predators and complicated by their wide biodiversity strategies (Goldsbrough *et al*., 2004). Agricultural fields can be as high in spiders communities that in natural ecosystem and regulating the terrestrial arthropod population (Mathew *et al*., 2014). They have high abundance and high diversity of all microhabitats to advantage of easy collection allow for their effective in the environment (Pearce and Veneier 2006). In India, 1068 species belonging to the genera of 60 families are reported (Keswni *et al*., 2013). Terrestrial arthropods are mainly representing the largest number of the biotic diversity in the world and are acts as a bioindicators (Anderson 1990).

Suraj and Parimala (2020) studied identified the status of spider population and they are occupied in a area of survey in variety of species or group of a species. The classification of spiders are mainly based on their ecosystem, maintenance of biodiversity and climatic effects. The spider communities are often argued that is the most important their parameters their web site selection (Wise, 1993). Spiders are classified like wolf spider, jumping spider, bird eating spider and web spiders primitively segmented spiders. Some species have different colors the spiders do a lot more that protect themselves. Some species are found in leaves, barks, twigs, other and all in order to fool their predators (Kuntner and Agnarson 2018).

Spiders are living both temperature and tropical climates and be found in variety of swamps, marshes. They make their homes in variety of biomes, including tundra, chaparral, desert, mountains, forests and rainforests and located relatively close to the Deku palace in the Southern Swamp (Zhang, 1990). Spider is a more important species and it play an important role in their ecosystem and to maintain a regulation of insects and other invertebrate population (Renner and Baptista, 2016). When the rate of new spider species are described was very high (Jager *et al*., 2020). While they rate of predation is may greatly influences to during the short periods of their predator way of life and the supply of food is available. During the low period availability, they have exceeding high resistance to starvation, which enable to survive and maintain the normal reproduction (Sunderland and Samu 2020).

Spiders have venom which is rich in high amount of protein contain the disulphide peptide by the subtype of ion channels and receptors. And its help for medical, pharmaceuticals and therapeutics act as a non-polluting bio pesticide (Bode *et al*., 2001). In urban areas, deforestation, amount of settlement also increases its reduces the natural; habitats of the spiders (Khan *et al*., 2019). The neurotoxic venom of funnel web spiders has been found to be specific for insects such as cockroaches, crickets, fruit flies, and the *Helicoverpaar migera* moth and are thus not harmful to non – target organisms. The compounds in venom are environmentally friendly and the development of resistance to a spider venom pesticide would be slow (Sebastian and Peter 2009). The segmented of spiders are distinguished by indentations on the top of their abdomen is the evidences of spiders, they are the common ancestry with scorpions (Culin *et al*., 2014). They are being the one of the global hotspots biodiversity, an vegetal health and biogeographic region of ancient life (Keswani *et al*., 2012). The new power plant installations to indicate any harmful changes and to provide an important of ecological webs (Wise, 1993). Spider species are studied by in different times of day or seasons or having different body sizes (Cardoso *et al.*, 2011). Spiders are studying in ecological patterns and processes in urban environments is relatively new direction of the in ecology (Grimm *et al*., 2000). In urban ecology to studied the communities and population of the spider biodiversity change in urban – rural gradient throughout of life (McIntyre, 2001). Other vertebrates and nothing about the effect of human activities heavily populated

areas upon the arthropod communities (Mclntyre *et al*., 2000). Spiders' habitat also greatly increased because of human related factors and processes (Miller and Hobbs 2002). Their habitats can support high population densities for possible seasons in the environment (Rosenzweig and Abramsky 1993). They are unique among the all organisms in their modes of silk production and the usage and reproduction (Chembakassery *et al*., 2018). Spiders have been studied in different habitats and the urbanization is the main causes biodiversity loss and they found in rural houses in higher species. They enable to consume large amount of foods in shortly periods (Jeyaparvathi *et al*., 2013).

Spiders are increasingly recognized by not only the local factors, it has the spatial surrounding of habitats patches may have a strong influence on local diversity (Wennergren, 1995). They play an important role in the classified as subtropical hot, wet monsoon periods (May – August) and cool dry winter (September – October) and average rainfall (Ghosh *et al*., 2018). Agricultural intensification is causing the global biodiversity declines within agricultural landscapes can considerably mitigate these declines, and their effects (Chetia and Kalita 2012). Landscape wide land use – use diversity, local land use diversity and local plant richness as explanatory variables. The trait composition of arthropods in woody linear landscape elements more than in herbaceous (Schirmel *et al*., 2016). In the last century, both tailed and wolf spiders were considered medically significant, only to be recanted and deaths by verified spider bites are exceedingly rare (Isbister *et al*., 2003). Current research centres on exploring the development of pesticide as well as drugs for treating cardiac patients (Sebastian and Peter 2009). The spider diversity studies are important to knowledge about development and role in the ecosystem to protect from predators (Dharmaraj *et al*., 2017). The aim of the study was to identify the spider species living on the plant communities and in the selected area of Kanyakumari district and their biodiversity.

REVIEW OF LITERATURE

Suraj and Parimala (2020), investigated the biodiversity of spider species in flora and fauna from the Western Ghats and the eastern Himalaya in Tumakuru, and Karnataka, in India. A total 172 number of spiders belonging to the 14 species of 6 families are Hersillidae, Lycosidae, Pholcidae, Oxyopidae, Salticidae and the Therilidae were identified. Dharmaraj *et al*. (2017) studied the distribution of spiders. The survey was taken by a visual and collecting the spiders from Nilgiris in Tamil Nadu. The study to reported by a microhabitat and vital conservation of these creatures of species focused on the diversity of spider representing the forest and they described by the order Araneae have total 40 species of spider belonging to 11 families and 36 genera.

Bapista *et al*. (2016), investigated diversity of spiders using the analytical tool for measuring the diversity. The spiders are collected and survey from the Atlantic Forest areas at Pedra Branca state parle in Brazil and reported 14,626 spider specimens are recorded in this part and represented by 49 families and 373 species are found out. They observed by a number of higher species that estimates a minimum of 368 and a maximum of 468 species.

Smitha and Sudhikumar (2020) investigated a diversity of spiders in the cashew ecosystem in Kerala, India and reported by a total of 63 species of under 52 genera and belonging to the 14 families. The report was revealed about most of species are Salticidae and Araneidae represented 33% and 27% of spider fauna.

Borges and Wunderlich (2006), studied by spider biodiversity patterns and their conservation in the Azorean archipelago from the island. The total number of 122 species and eight new records for the Azorean islands and reported by a new species are namely, Oecobiidae, Linyphiid, Clubionidae, Salticidae.

Jose *et al*. (2018), studied the spider biodiversity in Kavvayi River Basin, in Kerala reported 112 species of spider belonging to 81 genera and 21 families. They revealed Araneidae was the most dominant family of 21.5% of total spider population and Salticidae constitutes about 19.5% of the spider population.

Koneri and Nangoy (2016) investigated the biodiversity of spiders at Mount Tumpa Forest parle in Indonesia. A total of 2218 spiders belong to the 17 families of 62 genera reported and a new species of spiders are namely Tetragnathidae, Scytodidae and Araneidae and Salticidae.

Ysnel and Canard (2000) investigated by Biodiversity of spider in connection with vegetation structure and the orientation of hedges from the campus Beaulieu in France and concluded that the foliage orientation of hedges may induce the substitution of spider species.

Asima (2020) investigated spider biodiversity from a university campus in Kerala. Totally 116 species of spiders are belonging to the 26 families were identified in rice ecosystem in Kumarakom. Shabnam *et al*. (2020) investigated the spider biodiversity in different plantation of Western Ghats Wayaned in Kerala, India and reported the 100 species belonging to 74 genera under 20 families were recorded. They concluded the structure of the vegetation is expected to influence the diversity of different plantations. Variale and Wagh 2021 studied spiders in microhabitats of a trophical reserve forest of Amravati in Maharastra in India and reported the 120 species of spiders are belonging to the 14 families and 37 genera also identified the new species belong to Araneidae, Clubionidae, Eresidae, Gnaphosidae etc.

Fernandes and Ganesh (2020) studied on the diversity of spiders of order Araneae of Larbagh Botaniael garden in Bangalore south, in Karnataka and reported a total of 21 species belonging to 16 genera and 10 families.

MATERIALS AND METHODS

Study area. Spiders were searched in few places of Kanyakumari District. The searching was carried for four months from August to November, 2022. The sampling methods includes – visual searching for the spiders as far distinct vision is possible. Ground search were done under leaf litter, dry wood. The process of identification was conducted by comparison to published papers, type material, whenever possible, and online catalogues (World Spider Catalogue 2015).

Methodology. The Spider collection was carried out the period from the August to November 2022. Spiders are collected due to summer, winter time and also the rainy season. A survey was conducted in the early hours from 5 am to 9 am or at night for nocturnal spiders. The various methods used to capture the spiders were sweep net, bush beating, pitfall trap and visual searching. Spider collection and preservation methodology was followed according to Tikader (1987). The search methods were used for collecting the spiders. The spiders are collected by walking throughout the area and visually searching the spiders, and their webs. Spiders are collected using the mobile camera and some monographic books are to help to identified and classified the spiders.

Collection of Spiders. Visual Searching. Spiders are visually searched by a terrestrial land environment, plants, trees, leaves and under stones and some housing areas.

Photography and Identification. Freshly collected or visually searched species was taken a photo immediately. The data and location are noted. After collected spider species are observed, identified. Spider are classified based on the ecological characteristic of known family by relating their ecological characteristics relating to foraging manner, nature of web, microhabitat, prey species (Young and Edwards 1990).

RESULTS

Diversity of spider species in the study area. A total of sixty species of spiders were collected belonging to twenty-five families and forty-two genera from the different habitats of the studied area. Spider species were recorded from Oxyopidae, Ctenidae, Cheiracanthidae, Salticidae, Sparassidae, Lycosidae, Pisauridae, Sicariidae, Pholcidae, Oecobiidae, Lycosoidae, Araneidae, Anobiidae, Anyphaenidae, Scycotidae, Sclerosomatidae, Agelenidae, Filistatidae, Linyphiidae and Thomisidae in twenty-five different families.

Kingdom: Animalia
Phylum: Arthropoda
Class: Arachnidae
Order: Araneae

Table 1: Diversity of terrestrial spiders observed in the selected area of the Kanyakumari district during the study period.

(Figure No.) Name	Classification	Description
1. *Oxyopes shweta* -White lynx spider (Fig.1)	Family: Oxyopidae Genus: *Oxyopes* Species: *shweta*	High carapaces, distinctive eyes, numerous spines on their legs, and bright colour in some species.
2. *Phoneutria nigriventer* - Wandering spider	Family: Ctenidae Genus: *Phoneutria* Species: *nigriventer*	Large hairy spindly-looking spiders who have eight eyes, two of which are large.
3. *Cheiracanthium inclusum* - Black footed yellow sac spider	Family: Cheiracanthiidae Genus: *Cheiracanthium* Species: *inclusum*	It is a pale-yellow beige colour with dark brown markings on its palps.
4. *Menemerus bivittatus* - Grey wall spider	Family: Salticidae Genus: *Menemerus* Species: *bivittatus*	Dark brown, lighter hairs forming a median longitudinal streak.
5. *Palystes castaneus* -Huntsman spider	Family: Sparassidae Genus: *Palystes* Species: *castaneus*	Large, long-legged spiders, grey to brown.
6. *Lycosa hispanica* -Spanish wolf spider	Family: Lycosidae Genus: *Lycosa* Species: *hispanica*	Body is large, robust, rounded and brownish in colour.
7. *Pisaurina mira* -American nursery web spider	Family: Pisauridae Genus: *Pisaurina* Species: *mira*	Yellowish brown in colour and sometimes have a light to dark brown band down the middle of the back.
8. *Chinchippus peruvianus* - Sun spider	Family: Ammotrechidae Genus: *Chinchippus* Species: *peruvianus*	Hairiness and rounded opisthosoma are spiderlike, while the front appendages somewhat resemble those of a scorpion.
9. *Sicarius thomisoides* -Six eyed-sand spider	Family: Sicariidae Genus: *Sicarius* Species: *thomisoides*	Most species are reddish-brown to yellow in colour without any distinct patterns.
10. *Pholcus phalangioides* -Daddy long-legs spider	Family: Pholcidae Genus: *Pholcus* Species: *phalangioides*	Spherical or ovoid in shape. The legs are typically several times as long as the body.

11. *Heteropoda venatoria* -Huntsman spider	Family: Sparassidae Genus: *Heteropoda* Species: *venatoria*	Large, long-legged spiders. Mostly grey to brown, sometimes with banded legs.
12. *Platycryptus undatus* - Tan jumping spider	Family: Salticidae Genus: *Platycryptus* Species: *undatus*	An undulating pattern on the abdomen is grey, tan, and brown coloration camouflages it against tree bark.
13. *Oecobius navus* -Wall spider	Family: Oecobiidae Genus: *Oecobius* Species: *navus*	Tiny pale brown mottled, semi-translucent species. They live in a small tangled web.
14. Wolf spider - *Hogna carolinensis*	Family: Lycosoidea Genus: *Hogna* Species: *carolinensis*	Two large eyes gleam from the top of the head, most wolf spider spend their time on the ground.
15. *Argiope catenulata* - Orb-weaver spider	Family: Araneidae Genus: *Argiope* Species: *catenulate*	Brightly colored, have hairy or spiny legs and a relatively large abdomen that overlaps the back edge of the cephalothorax.
16. *Ploxippus paykulli* - Jumping spider	Family: Salticidae Genus: *Ploxippus* Species: *paykulli*	The body is often brightly coloured or strikingly patterned. At night they hide in closely woven nests under bark, stones, leaves.
17. *Gibbium psylloides* -Beetles spider	Family: Anobiidae Genus: *Gibbium* Species: *psylloides*	Dark reddish-brown to black, shiny, globular abdomen.
18. *Pellenes seriatus* -Orchard spider	Family: Tetragnathidae Genus: *Pellenes* Species: *seriatus*	The orchard orb weaver is a colourful, delicate spider that are usually positioned horizontally or at an angle to the ground.
19. *Phidippus otiosus* - Canopy jumping spider	Family: Salticidae Genus: *Phidippus* Species: *otiosus*	Their colour could range from brown or white to grey and orange. They have black tufts of hair on their body.
20. *Anyphaena accentuata* -Anyphaenid sac spider	Family: Anyphaenidae Genus: *Anyphaena* Species: *accentuate*	Prosoma with black, serrated lateral bands. Legs yellow-brown to black.
21. *Rabidosa rabida* - Rabid wolf spider	Family: Lycosidae Genus: *Rabidosa* Species: *rabida*	The body colour is generally light brown. The dorsal side of the abdomen has a light spot toward the back.
22. *Scytodes globula* - Chilean tiger spider	Family: Scytodidae Genus: *Scytodes* Species: *globula*	Its body is small. It has slow movements and it hunts only at night.
23. *Macrocheira kaempferi* - Bug crab legs spider	Family: Inachidae Genus: Macrocheira Species: kaempferi	Short, wide, flat bodies.
24. *Argiope keyserlingi* -Orb- web spider	Family: Araneidae Genus: Argiope Species: keyserlingi	A cephalothorax abdomen, 8 legs and fang-like mouthparts called chelicera.
25. *Leiobunum aldrichi* - White Harvestman spider	Family: Sclerosomatidae Genus: *Leiobunum* Species: *aldrichi*	Does not have fangs, are not venomous, and not venomous, and do not bite.
26. *Argiope anasuja* - Signature spider	Family: Araneidae Genus: *Argiope* Species: *anasuja*	The writing spider and the garden spider. The spider is found all over the world.
27. *Phidippus regius* - Jumping spider	Family: Salticidae Genus: *Phidippus* Species: regius	It is primarily a tree-living species. Its iridescent chelicerae can range in colour from purple to green.
28. *Heteropoda maxima* - Giant huntsman spider	Family: Sparassidae Genus: Heteropoda Species: *maxima*	Long legged, large spider. Mostly grey to brown colour.
29. *Scytodes thoracica* -Spitting spider	Family: Scytodidae Genus: *Scytodes* Species: *thoracica*	Most species have six pearly- white eyes rather than the usual eight.
30. *Oxyopes salticus* - striped lynx spider	Family: Oxyopidae Genus: *Oxyopes* Species: *salticus*	Brown or black stripes are present on the back as well.
31. *Micrommata virescens* - green huntsman spider	Family: Sparassidae Genus: *Micrommata* Species: *virescens*	The cephalothorax and the long legs of the females are bright green, with a lighter green abdomen.
32. *Araneidae aurantia* - yellow garden spider	Family: Araneidae Genus: *Argiope* Species: *aurantia*	Large,orb-weaving arachnids, meaning they spin a circular web.
33. *Eratidena agrestis* - Hobo spider	Family: Agelenidae Genus: *Eratidena* Species: *agrestis*	Herringbone pattern on the top side of their abdomens.
34. *Sicarius terrosus* - Six eyed sand spider	Family: Sparassidae Genus: *Sicarius* Species: *terrosus*	Body length up to 0.6 inches and the width across the legs is about 2 inches.
35. *Olios lamarcki* - Olios spider	Family: Sparassidae Genus: *Olios* Species: *lamarcki*	Primarily coloured black, brown tan and orange.
36. *Neoscona crucifera* - Spotted orb weaver	Family: Araneidae Genus: *Neoscona*	Brightly colored, have hairy or spiny legs and relatively large abdomen that overlaps the back edge of the cephalothorax.

	Species: *crucifera*	
37. *Argiope amoena* - Zipper spider	Family: Araneidae Genus: *Argiope* Species: *amoena*	Quite large,females growing up to 30mm in length and it black and bright colour.
38. *Thomisus spectabilis* -White crab spider	Family: Thomisidae Genus: *Thomisus* Species: *spectabilis*	Small spider. Body length of the female is up to 10mm, white and yellow colour.
39. *Agelenopsis actuosa* - Grass spider	Family: Agelenidae Genus: *Agelenopsis* Species: *actuosa*	Greatly elongated hind spinnerets and the dorsal markings on the carapace and abdomen.
40. *Hentzia poenitens* - Hentz jumper spider	Family: Salticidae Genus: *Hentzia* Species: *poenitens*	Large, round eyes in the front of the face are nestled in an orange band of hairs and they are surrounded by smaller pairs of eyes.
41. *Argiope trifasciata* -Banded Garden spider	Family: Araneidae Genus: Argiope Species: trifasciata	The males are 4to5mm in length and their abdomens are mostly white.
42. *Heteropoda ferina* - Cane spider	Family: Sparassidae Genus: Heteropoda Species: ferina	Large, flat-bodied arachnids with two rows of eyes and long, hairy legs.
43. *Kukulcania hibernalis* - Southern house spider	Family: Filistatidae Genus: *Kukulcania* Species: *hibernalis*	The females are dark brown or black and more compact.
44. *Araneus ventricosus* - Orb weaving spider	Family: Araneidae Genus: *Araneus* Species: *ventricosus*	Reddish-brown or grey spiders. Which also have two noticeable humps towards the front.
45. *Argiope bruennichi* -Wasp spider	Family: Araneidae Genus: *Argiope* Species: *bruennichi*	Yellow, black and white stripes, legs are also stripy.
46. *Dolomedes actaeon* - Fishing spider	Family: Pisauridae Genus: *Dolomedes* Species: *actaeon*	Typically, brown and may display black and light-brown markings.
47. *Frontinella pyramitela*- Bowl and doily spider	Family: Linyphiidae Genus: *Frontinella* Species: *pyramitela*	It is small spider, an inverted dome shaped web or bowl suspended above a horizontal sheet web.
48. *Argiope argentata* - Silver argiope spider	Family: Araneidae Genus: *Argiope* Species: *argentata*	Extremely long legs half silver and half black and white bands.
49. *Misumena vatia* - Dwarf red crab spider	Family: Thomisidae Genus: *Misumena* Species: *vatia*	The first two pairs of legs are larger than the hind legs and held open.
50. *Dolomedes tenebrosus* - Dark fishing spider	Family: Pisauridae Genus: *Dolomedes* Species: *tenebrosus*	It is mottled black and brown, with few white markings. The abdomen has dark W-shaped patterns on the upper surface.
51. *Dolomodus scriptus*- Striped fishing spider	Family: Pisauridae Genus: *Dolomodus* Species: *scriptus*	It is semiaquatic usually found on or very near water.
52. *Hadronyche modesta* - Funnel web spider	Family: Atracidae Genus: *Hadronyche* Species: *modesta*	They are medium to large spiders, varying from 1 cm – 5cm body length.
53. *Neoholothele incei* -Trinidad Olive tarantula	Family: Theraphosidae Genus: *Neoholothele* Species: *incei*	Growth fast. Temperament skittish and nervous.
54. *Missulena dipsaca* - Mouse spider	Family: Actinopodidae Genus: *Missulena* Species: *dipsaca*	High, bulbous heads and jaws. The carapace is smooth and shiny.
55. *Araneus gemmoides* - Cat faced spider	Family: Araneidae Genus: *Araneus* Species: *gemmoides*	Two bumps and dimple-like features on their round abdomens.
56. *Salticus scenicus*- Zebra spider	Family: Salticidae Genus: *Salticus* Species: *scenicus*	It's a small, ranging from 4-7mm in size.
57. *Heteroscodra masculata* - Togo starburst spider	Family: Theraphosidae Genus: *Heteroscodra* Species: *masculata*	Size 11to 13 cm. Fast growth Aggressive and defensive.
58. *Lycosa singoriensis* -Chinese wolf spider	Family: Lycosoidae Genus: *Lycosa* Species: *singoriensis*	They have eight eyes arranged in three rows.
59. *Euophrys frontalis* - Black jumping spider	Family: Salticidae Genus: *Euophrys* Species: *fronatalis*	Black and brown or grey.
60. *Palystes superciliosus* -Rain spider	Family: Sparassidae Genus: *Palystes* Species: *superciliosus*	It has a body length of 15-36 mm and a leg span of up to 110mm.

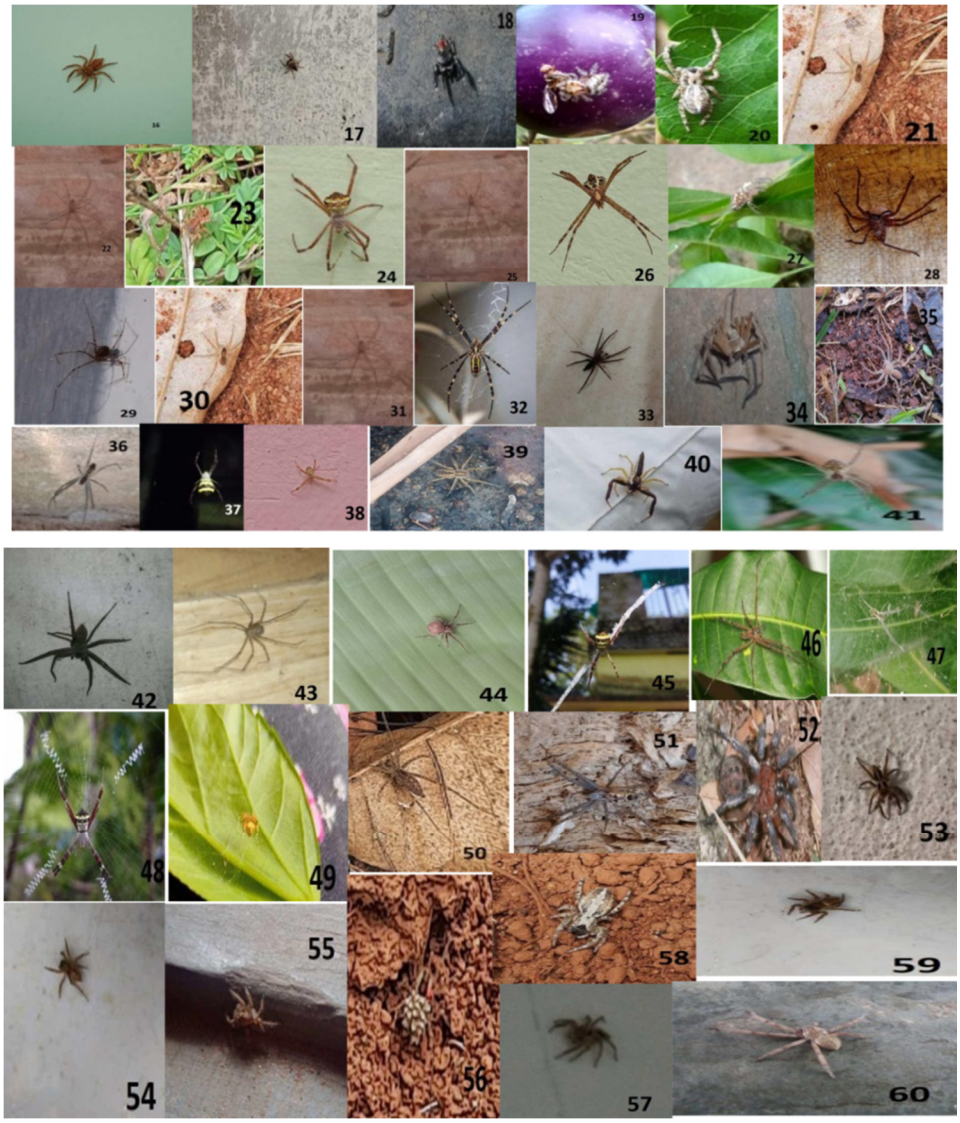

Table 2: Family wise arrangement of Spider species.

Sr. No.	Family	Genus	Species
1.	Oxyopidae	*Oxyopes*	*shweta*
		Oxyopes	*solstices*
2.	Ctenidae	*Phoneutria*	*nigriventer*
3.	Cheiracanthidae	*Cheiracanthium*	*inclusum*
4.	Salticidae	*Menemerus*	*bivittatus*
		Platycryptus	*undatus*
		Ploxippus	*paykulli*
		Phidippus	*otiosus*
		Phidippus	*regius*
		Hentzia	*poenitens*
		Salticus	*scenicus*
		Euophrys	*frontalis*
5.	Sparassidae	*Palystes*	*castaneus*
		Heteropoda	*venatoria*
		Heteropoda	*maxima*
		Micrommata	*virescens*
		Sicarius	*terrosus*
		Olios	*lamarcki*
		Heteropoda	*farina*
		Palystes	*superciliosus*
6.	Lycosidae	*Lycosa* *Lycosa* *Hogna*	*hispanica* *singoriensis* *carolinensis*

7.	Pisauridae	*Rabidosa*	*rabida*
		Pisaurina	*mira*
		Dolomedes	*actaeon*
		Dolomedes	*tenebrosus*
		Dolomedes	*scriptus*
8.	Ammotrechidae	*Chinchippus*	*peruvianus*
9.	Sicariidae	*Sicarius*	*thomisoides*
10.	Pholcidae	*Pholcus*	*phalangioides*
11.	Oecobiidae	*Oecobius*	*navus*
12.	Araneidae	*Argiope*	*catenulate*
		Ardiope	*aeyserlingi*
		Argiope	*anasuja*
		Argiope	*aurantia*
		Argiope	*argentata*
		Araneus	*gemmoides*
		Argiope	*Amoena*
		Neoscona	*crucifera*
		Argiope	*trifasciata*
		Araneus	*ventrius*
		Argiope	*bruennichi*
13.	Anobiidae	*Gibbium*	*psylloides*
14.	Anyphaenidae	*Anyphaena*	*accentuata*
15.	Scytodidae	*Scytodes*	*globula*
		Scytodes	*thoracica*
16.	Sclerosomatidae	*Leiobunum*	*aldrichi*
17.	Agelenidae	*Eratidena*	*agrestis*
		Agelenopsis	*actuosa*
18.	Filistatidae	*Kukulcania*	*hibernalis*
19.	Linyphiidae	*Frontinella*	*pyramitela*
20.	Thomisidae	*Misumena*	*vatia*
		Thomisus	*spectabilis*
21.	Atracidae	*Hadronyche*	*modesta*
22.	Theraphosidae	*Neoholothele*	*incei*
		Heteroscodra	*masculata*
23.	Actinopodidae	*Missulena*	*dipsaca*
24.	Tetragnathidae	*Pellenes*	*seriatus*
25.	Inachidae	*Macrocheira*	*Kaempferi*

Analysis of the diversity of Spiders. Species richness was observed in floral diversity area and less than the human intervention area, which is a residential area with much human intervention. In most species are belong to the Arachinidae class and Araneae order. 60 species belonging to the family in 25 and 42 genera in to the order of Araneae and the class of Arachnidae from the field area of Kanyakumari district from the different habitats of the studied area. Spider species were recorded from Oxyopidae, Ctenidae, Cheiracanthidae, Salticidae, Sparassidae, Lycosidae, Pisauridae, Ammotrechidae, Sicariidae, Pholcidae, Oecobiidae, Lycosoidae, Araneidae, Anobiidae, Tetragnathidae, Anyphaenidae, Scycotidae, Inachidae, Sclerosomatidae, Agelenidae, Thomisidae, Filistatidae, Linyphiidae, Atracidae, Theraphosidae, and Actinopodidae in 25 different families (Table 1).

Abundance of the spider species are arranged family wise with order Lynx spiders (Oxyopidae), Wandering spiders (Ctenidae), Black footed yellow sac spiders (Cheiracanthidae), Jumping spiders (Salticidae), Huntsman spider (Sparassidae), Spanish wolf spiders (Lycosidae), Nursery web spider, Sun spider (Ammotrechidae), Sand spider (Sicariidae), Wall spiders (Oecobiidae), Beetles spiders (Anobiidae), Orchard spiders (Tetragnathidae), Sac spiders (Anyphaenidae),Crab leg spider (Inachidae),Harvestman spiders (Sclerosomatidae), Crab spiders (Thomisidae), House spiders (Filistatidae), Bowl and doily spiders (Linyphiidae), Funnel web spider (Atracidae), Olive tarantula spiders (Theraphosidae), Mouse spiders (Actinopodidae), Orb weaver spiders (Araneidae),Wolf spider (Lycosidae), Fishing spider (Pisauridae), Long legs spider (Pholcidae), Grass spider (Agelenidae) and spitting spider (Scycotidae). Family diversity of spider species were recorded Araneidae (11 species), Sparassidae (8 species), Salticidae (8 species), Pisauridae (4 species), Lycosidae (4 species), Scycotidae (2 species), Agelenidae (2 species), Thomisidae (2 species), Theraphosidae (2 species) and Oxyopidae (2 species) (Table 2).

DISCUSSION

Spider biodiversity, distribution and their insect feeding habits play an important role in balance of nature (Yong and Edward, 1990). They are the potential biological indicators of natural habitats and they are used for determining how communities react to environmental changes or disturbances (Marc and Canard 1997).

Higher species diversity is an indicator of a healthier and complex community because a greater variety of species allows more interactions, hence they greater system stability which in turn indicates the good environment (Hill, 1973).The status of spider diversity to evaluate the community level of spiders of biological organizations. Highest species rich in flora and fauna diversity which is a key factor to build microhabitats for a wide variety of spider species. The selected area also holds a wide range of plants and animals. These variety habitats provide a greater array of microhabitats, microclimatic features, good food sources and web attachment sites for spiders. This may be due to increased vegetation in these areas which leads to increase biodiversity, greater cover and good resources for fantastic features.

Oxypidae, Pholcidae, Salticidae, Lycosidae, Theraphosidae, Philodromidae, Araneidae were the families found mainly on trees, shrubs and herbs. Studies have demonstrated that the spider habitat selection is affected by a variety of abiotic and biotic factors. Spiders have preferences for humidity and temperature and these factors limit them to areas within the range of their physiological tolerances. We can find out the documenting the fauna of spiders present the simple list of spiders and considered the analyse the dynamics the spiders (Alvarez-Padilla and Hormiga 2011). It was expected that areas under these conditions would only present the number of higher species of broad distribution, which may allow the human influences and land with higher variation environmental factors. Coloration in spiders varies extensively among the species due to different environmental effects which also is due to different behavioural patterns observed on them (Pocock, 1900).

The human tendency is to favour some organisms over others of equal importance because the latter lack a universal appeal. The major obstacle for spider conservation is an absence of public support, arguably due to fear and ignorance. Conservation of spiders will thus necessitate a greater understanding by the general public, scientists, land managers and conservationists about the importance of conserving these fascinating creatures (Sebastian and Peter 2009). The increase in the spider's density suggested that spider's density was influenced by the increase in prey density. In a particular area, the interaction of prey and predator showed a constant numerical interaction about these relationships which was fundamental to biological control. Spiders are considered as the favourable biological control agents in the forest ecosystem (Rajeevan *et al*., 2019).

Wetland spiders are in large number than after shrubland and below grassland spider species. Due to grazing habitat the grassland spider species are comparatively lower than wetland and shrubland. The spider species in debris are very much low and in wetland spider species are more in numbers. Buckup *et al*. (2010) documented the fauna of spiders presenting a simple list. During this study we had reported 60 species of spiders belonging to 25 families and 42 genera from the different habitats of the studied area. Spiders species were recorded from Oxyopidae, Ctenidae, Cheiracanthidae, Salticidae, Sparassidae, Lycosidae, Pisauridae, Ammotrechidae, Sicariidae, Pholcidae, Oecobiidae, Lycosoidae, Araneidae, Anobiidae, Tetragnathidae, Anyphaenidae, Scycotidae, Inachidae, Sclerosomatidae, Agelenidae, Thomisidae, Filistatidae, Linyphiidae, Atracidae, Theraphosidae, and Actinopodidae in 25 different families.

SUMMARY

Spiders can be effective predators of herbivorous insect pests, and can exert considerable top-down control, often catching more insects than they actually consume. Despite the potential for competition and intraguild predation, a diverse assemblage of spiders may have the greatest potential for keeping pest densities at low levels. Spiders are potential biocontrol agents because they are relatively long lived and are resistant to starvation and desiccation. Additionally, spiders become active as soon as conditions are favourable and are among the first predators able to limit pests. The risks associated with using spiders to control pests are minimal. Since diverse species of spiders are naturally present in an agricultural system and predaceous at all stages of their development, they fill many niches, attacking many pest species at one time (Agnew and Smith 1989; Marc *et al*., 1999). Fagan *et al*. (1998) indicated that treatments which combine the augmentation of natural enemies with insecticide applications may be counterproductive. However, spiders still play an important role in reducing the numbers of insect pests in agricultural fields, even when insecticides are used. In fact, spiders may be responsible for a significant proportion of insect deaths which were thought to be from insecticide applications. The study was carried out in the floral rich places, dead leaves, terrestrial land of Kanyakumari district. Nearly 60 species were found to be study area. They were found to be different family under Arachnida class. The collected spiders are biologically, economically, environmentally and medically beneficial. The study area of Kanyakumari District is richer in floral communities are rich in spider fauna diversity. The study was made from August to November. From the study area contain 60 species belonging to the 25 families, 42 genera, order of Araneae of same Arachidae class.

CONCLUSIONS

Spider are playing a very important role in the ecosystem. Spiders are high abundance and diversity of microhabitats allow their effect in the environment.

They serve as important connection between trophic level and several are important indicators of changing the environment. Spiders are occupied by a considerable portion of animal life of the diversity of group. Arthropods are mainly representing the largest number of the biotic diversity in the world. This investigation on terrestrial spider diversity in selected area of Kanyakumari district, one with rich vegetation and another with less vegetation area proved that faunal diversity is depends to the flora diversity.

FUTURE SCOPE

The study on biodiversity of spiders clearly depicted that human intervention, destruction of natural habitat, loss of floral community reduces the spider fauna diversity. This preliminary study gives base line information of spider's diversity and distribution in the Kanyakumari District, indicating the species richness of spiders in this unexplored area. It is quite likely that further detailed and intensive studies may bring out more information and documentation of more spider species from Kanyakumari District.

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