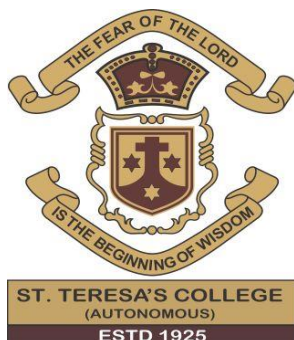


# **“A STUDY ON SPIDER DIVERSITY IN THE WETLAND TERRAIN OF PUTHUVYPPU, A COASTAL REGION IN VYPIN ISLAND”**



Project Work By  
**MARY NIMMY JOHN**  
**AB21Z00025**

Under the guidance of  
**Dr. SOJA LOUIS**  
HOD & Associate Professor, Department of Zoology,  
St. Teresa's College (Autonomous), Ernakulam, Kochi-683011

Submitted to  
St. Teresa's College (Autonomous), Ernakulam  
Affiliated to Mahatma Gandhi University, Kottayam in partial fulfilment of  
requirement for the degree of Bachelor in Science in Zoology

**2023-2024**

## **CERTIFICATE**

This is to certify that the project entitled “**A STUDY ON SPIDER DIVERSITY IN THE WETLAND TERRAIN OF PUTHUVYPPU, A COASTAL REGION IN VYPIN ISLAND**” submitted by Ms. MARY NIMMY JOHN, Reg. No. AB21Z00025 in partial fulfilment of the requirement of Bachelor of Science in Zoology to the Department of Zoology, St. Teresa’s College (Autonomous), affiliated to Mahatma Gandhi University, Kottayam is a bonafide work under my guidance and supervision and to my best knowledge, this is her best effort.

Dr. Soja Louis

Associate Professor & Head of the Department

Department of Zoology

St. Teresa’s College (Autonomous)

Ernakulam

### **EXAMINERS**

1.

2

## **CERTIFICATE**

This is to certify that the project entitled “A **STUDY ON SPIDER DIVERSITY IN THE WETLAND TERRAIN OF PUTHUVYPPU, A COASTAL REGION IN VYPIN ISLAND**” submitted in partial fulfilment of the requirement for the award of the degree of Bachelor of Science in Zoology to the Department of Zoology, St. Teresa’s College (Autonomous) affiliated to M.G. University, Kerala, done by Ms. MARY NIMMY JOHN, Reg. No: AB21Z00025 is an authentic work carried out by her at Sacred Heart College, Thevara under my guidance and supervision. The matter embodied in this dissertation has not formed the basis for the award of any Degree/ Diploma/ Associateship/Fellowship to the best of my knowledge and belief.

Dr. Mathew M.J

Assistant Professor

Department of zoology

Sacred Heart College , Thevara

## **DECLARATION**

I hereby declare that project work titled “**A STUDY ON SPIDER DIVERSITY IN THE WETLAND TERRAIN OF PUTHUVYPPU, A COASTAL REGION IN VYPIN ISLAND**” submitted to St. Teresa’s College (Autonomous), Ernakulam affiliated to Mahatma Gandhi University, Kottayam in the partial fulfilment of the requirements of Bachelor of Science in Zoology, is a record of original project work done by me under the guidance and supervision of Dr. Soja louis , Associate Professor & HOD, Department of Zoology, St. Teresa’s College (Autonomous), Ernakulam.

Ms. MARY NIMMY JOHN

Reg.No: AB21ZO0025

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## **ABSTRACT**

A study was conducted at Puthuvyppu, a coastal region on the island of Vypin to identify and document the spider diversity of the region. The region of study was situated at west side of the island facing the Arabian sea. Spiders were collected from a wetland ecosystem in this area which is inhabited by human populations. The study was conducted from 6<sup>th</sup> November 2023 to 10<sup>th</sup> February 2024 covering a duration of 3 months.

This study reports the identification and documentation of 32 spiders belonging to 24 genera and 13 families. Salticidae was the most dominant family which constituted about 22% of the total identified species. Oxyopidae and Araneidae were the second and third dominant species which constituted about 16% and 10% respectively.

Guild structure analysis of the collected spiders showed the presence of six feeding guilds, namely Orb-web builders, foliage runners, ground runners, ambushers, stalkers and cob-web builders.

During the study, an unidentified species from the family Oecobiidae and genus *Oecobius* was discovered. This specimen is currently undergoing further examination for the purpose of naming and identification.

The spider fauna of this ecosystem is qualitatively rich due to varied micro habits, which supports high floral and faunal diversity. The present study shows the necessity for further exploration in the area in order to identify and document all spider species present.

## **INTRODUCTION**

As one of the most widely recognized group of arthropods, spiders make up a diverse portion of the world's invertebrates (4). They are distributed on every continent except Antarctica and have adapted to all known ecological environments except air and open sea (7). Spiders globally include about 47,099 described species in 4,073 genera and 113 families (16).

In the animal kingdom, spiders are among the most prevalent kind of predatory organisms (12). They are essential in order to prevent the overpopulation of pest and also helps to maintain a balance in nature. They primarily feed on insects, but also eat other arthropods, including other Araneae. They are suitable biological indicators of ecosystem changes and habitat modifications due to their small body size, short generation time, and high sensitivity to temperature and moisture changes (9). So, the spiders are valuable indicators of the overall species richness and health of the ecosystem (11).

Previous conservation efforts in India have focused on the larger vertebrates while invertebrates were largely ignored. There is now a growing need to conserve all species and not only the larger vertebrates (15). Documentation of spider fauna is more important because they play a significant role in the regulation of insects and other invertebrate populations in most ecosystems. A comprehensive data on diversity and distribution of spiders from Kerala region is sparse as compared to other regions of the country. India is having 1,686 species of spiders belonging to 60 families and 438 genera, which constitutes 3.6% of world's spider population (2). Very little work has been done on spider diversity of Kerala (1).

Vypin Island is located off the southwestern coast of India. It is known for its sandy beaches, serene backwaters, and lush greenery. The island is also home to several fishing villages, coconut groves, and mangrove forests. It has a variety of ecological niches that remain unexplored in terms of arachnid fauna. This study aims to fill the gap in our understanding and documentation of spider diversity on the island.



During the study , an unidentified species from the family Oecobiidae and genus *Oecobius* was discovered. This specimen is currently undergoing further examination for the purpose of naming and identification. This reflects on the importance of studies that is to be conducted in this Island

## **REVIEW OF LITRATURE**

Spiders are ecologically significant organisms found in various ecosystems worldwide. Understanding spider diversity is essential for the better understanding of the ecosystem, as spiders play vital roles in regulating insect populations and contributing to nutrient cycling. Vypin Island, located off the coast of Kerala, India, presents a unique habitat for studying spider diversity due to its coastal environment and diverse ecosystems. The area under study is a wetland ecosystem that is rich in flora and fauna and exhibits a pristine system of wetland.

The preliminary study conducted resulted in the documentation of diversity of spider fauna inhabiting in the different ecosystem of Kaveri River basin (8), 112 species of spiders belonging to 81 genera and 21 families was discovered. Araneidae was the most dominant family constituting about 21.5% of the total spider species collected. The study showed that the spider fauna of this ecosystem is rich due to its varied habitat

A pioneering study was conducted to reveal the spider diversity in Mannavan shola Forest in Kerala state, India. Mannavan shola, the largest Shola patch in Asia, exists in “Western Ghats”, one of the biodiversity hot spots of the world (15). A total of 72 species of spiders belonging to 57 genera of 20 families. This represents 5% of the total families recorded in India. Guild structure analysis of the collected spiders revealed 6 feeding guilds. The high species diversity of spiders in Mannavan shola can be attributed to the high diversity of plants and insects. This is the first report of the spider fauna from any shola forest in India.

A study of spider diversity of Kerala University Campus (3), conducted for a period of four months revealed a total of 116 species of spiders belonging to 20 families. Among the families, Salticidae was found as the most common family and among the species *Hersilia savignyi* and *Hippasa agelenoides* were found as the most common species. *Plexipus petersi*, *Plexipus pykulli*, *Xysticus minutes* and *Tibellus elongates* were also noted as the commonly found spider species

A study was conducted to reveal the spider's diversity in the Nilgiris, Tamil Nadu (5). There were 59 species of spiders belonging to 25 genera of 11 families collected from Avalanche and Emerald valley. Out of 59 species recorded in different study are as follows, Grass land, Wattle plantation, and Shola forest in three study sites. Maximum number of species were recorded in shola forest area compare than grass land and Wattle plantation. Spiders, like many invertebrates receive little attention from the conservation community. This may be due to fear and dislike of their appearance behaviours or noxious nature. This study showed significant variation in the population density among the different habitats but not in the species richness and diversity

Diversity and Distribution of Spiders in Gogi, Yadgir District: A Semi-arid Landscape in Southern India (10) was undertaken as baseline study to understand the status, population, and distribution of spiders in different ecosystems viz., natural, agro, and domestic ecosystems of a semiarid region in southern India. A total of 82 spider species belonging to 19 families were found. Lycosidae was the dominant family represented by 17 species. Barren lands had the greatest spider diversity of 64 species with a density of 13 individuals m<sup>-2</sup> from 15 families (Araneae) as compared with the other habitats tested. By elucidating diversity of spiders in Gogi, this study enables further investigation of the contribution of ecosystem services by these invertebrates in semi-arid landscapes dominated by agricultural practices.

A survey on the Spider Fauna of Sugarcane Ecosystem in Southern Peninsular India (6) conducted in three states of southern peninsular India revealed the occurrence of 57 species of spiders belonging to 13 families of Araneae in the sugarcane ecosystem. Of these, only two species viz., *Hippasa greenalliae* BlackwaH (Lycosidae) and *Cyrtophora cicatrosa* Stoliczka (Araneidae) were abundant, while six species were less abundant and 49 species were rare in occurrence. The spiders were found to colonize the sugarcane crop 40-45 days after planting. The population of the wolf spider *H.greenalliae* which comprised more than 70% of the total population increased with age of the crop up to 180 days.

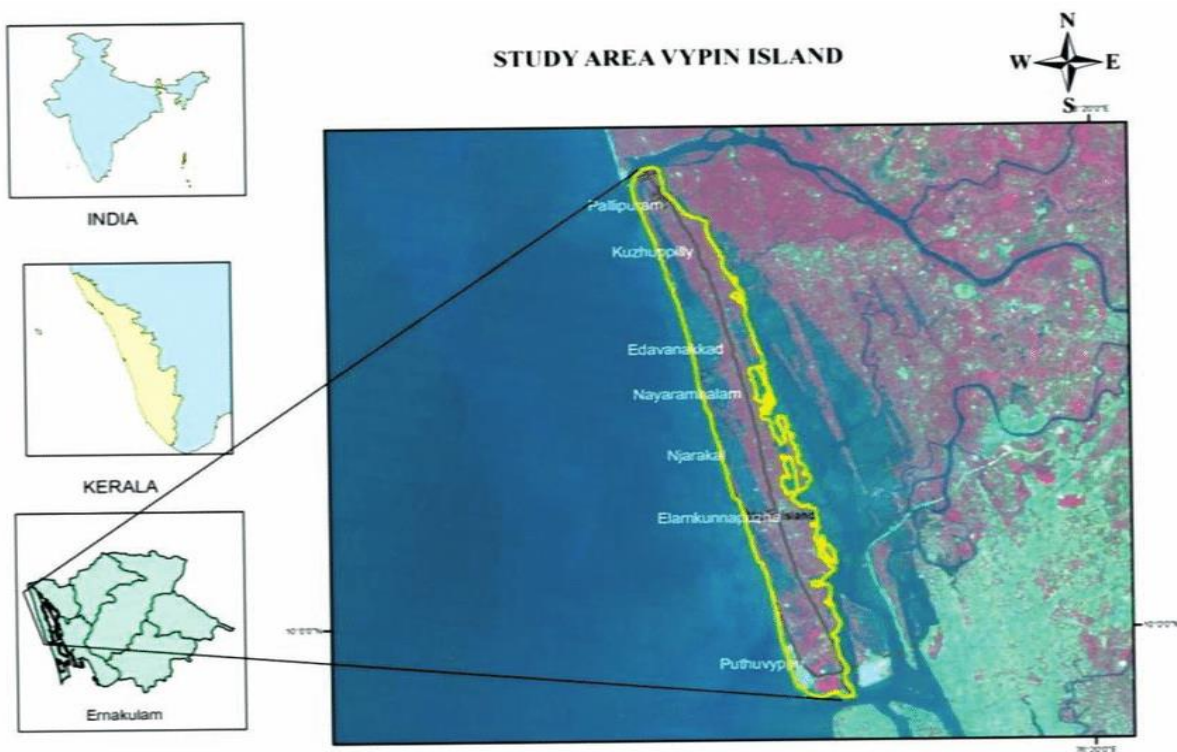
Spider diversity (Arachnida; Araneae) in different plantations of Western Ghats, Wayanad region, India (14) was conducted to explore the spider diversity in different plantations of Western Ghats Wayanad, Kerala state, India. The investigation was carried out for the period

from February 2019 to February 2020. A total of 100 species belonging to 74 genera under 20 families were recorded from the selected habitats. This represents 51% families recorded from the Western Ghats, Kerala. During the period of study, five different web patterns were recorded- orb web, tent web, cob web, sheet web and funnel web. It is concluded that the structure of the vegetation is expected to influence the diversity of spiders in different plantations.

# **METHOD AND MATERIALS**

## **STUDY AREA**

The study was conducted at Puthuvypvu, a coastal region on the island of Vypin to identify and document its spider diversity. The region of study was situated at west side of the island facing the Arabian sea. Vypin is the densest populated island in Kerala and 58<sup>th</sup> most dense island in the world. It is situated along the coastlines of Ernakulam district forming a barrier between the Arabian sea in west and the Cochin backwaters formed by the distributaries of Periyar River, in the east. This island is about 27 kilometers long. (Figure 1)



**Figure 1: Study location**

The vegetation consists of tropical flora, including coconut palms, mangroves, and various types of shrubs and grasses. The island's fertile soil and abundant rainfall support lush vegetation throughout the year. The island typically has warm to hot temperatures throughout the year, with average highs ranging from 30°C to 35°C (86°F to 95°F).

The study was conducted in a selected habitat of wetland ecosystem. It had a palustrine system of wetland which is dominated by shrubs and grass with scattered presence of trees and a small stream active only during the monsoon season. It has a unique and diverse collection of flora and fauna which coexists in all its natural manner. The region is inhabited by human populations and infrastructures surrounding it.

Puthuvypvu has become one of the fastest growing city suburbs due to the the SPM project run by Kochi Refineries, an offshore pumping station of Kochi port, the Puthuvypvu LNG Terminal, IOC Blotting plant etc. . This area is under constant changes . the geography of this region has changed drastically during the last 10 years due to urbanization and the industrialization brought by the Indian petroleum industries in the area. Due to easy transportation access to the main city of Ernakulam, construction of roads has also led to the loss of vegetation from this region.

## **METHODOLOGY**

The collection was done over a span of 3 months i.e., from 6<sup>th</sup> November 2023 to 10<sup>th</sup> February 2024 . A thorough idea of habitats and characters of spiders were studied before the collection process . This helped in searching of these spiders under all possible habitats.

Spiders were collected using the following methods:

### **i) Visual search method:**

visual search method also known as hand collection method is used collect spiders by searching them in all possible habitats. spiders were spotted on leaves, tree barks, ground, bushes, from human build infrastructures etc. Once spotted they were photographed and captured using a bottle.

## **ii) Sweep nets:**

A net attached to a circular metallic frame was used to carry out this method. These nets are moved quickly through the foliage's and other vegetation to capture the spiders resting on it. The spiders are separated from the collected insects and are kept inside separate bottles.

## **iii) Beating:**

An inverted umbrella was kept under the bushes while beating it with a stick. when the branches are struck with a stick in a downward motion, it dislodges the spiders and other insects present on the foliage of plants. Only spiders are collected from it using a net or a stick and is transferred into a bottle.

The collected spiders were kept in separate bottles and labelled. Pictures were taken either from its natural habitat or after capturing using the mobile phone camera of Nokia 7.2. After the collection these spiders only, large spiders were proved by dry privation technique of taxidermy and the smaller specimens were preserved in 70 % ethyl alcohol. These preserved specimens were kept as wet mount slides and were observed under a stereo microscope. They were identified with the help of a guide in the Arachnology department of Sacred Heart College, Thevara.

Only one specimen of each species was collected in order to minimize the impact on local spider population

The spiders were classified on the basis on their family, genera and species. they were also classified into six functional guilds based on their foraging mode. It was done using the Guild structure analysis.

## RESULT

A total of 32 spiders belonging to 24 genera and 13 families were recorded and identified from the selected habitat. Salticidae was the dominant family constituting 7 species under 7 genera, followed by Oxyopidae (5 species), Areneidae (3 species), Tetragnathidae (3 species), Therididae (3 species), Sparassidae (2 species), Thomcidae (2 species), Uloboridae (2 species), Cheiracanthiidae (1 species), Hesiliidae (1 species), Lycosidae (1 species), Pholcidae (1 species) and Oecobiidae (1 species) (Table 1, Figure 1 & 2)

The spiders were grouped into six functional guilds based on their foraging mode. The stalkers were the dominant feeding guild with 39%, followed by orb-web builders 26%, ambusher 16%, cob-web builder 13%, foliage runner 6% and ground runner 3%. (Figure 1 & 2)

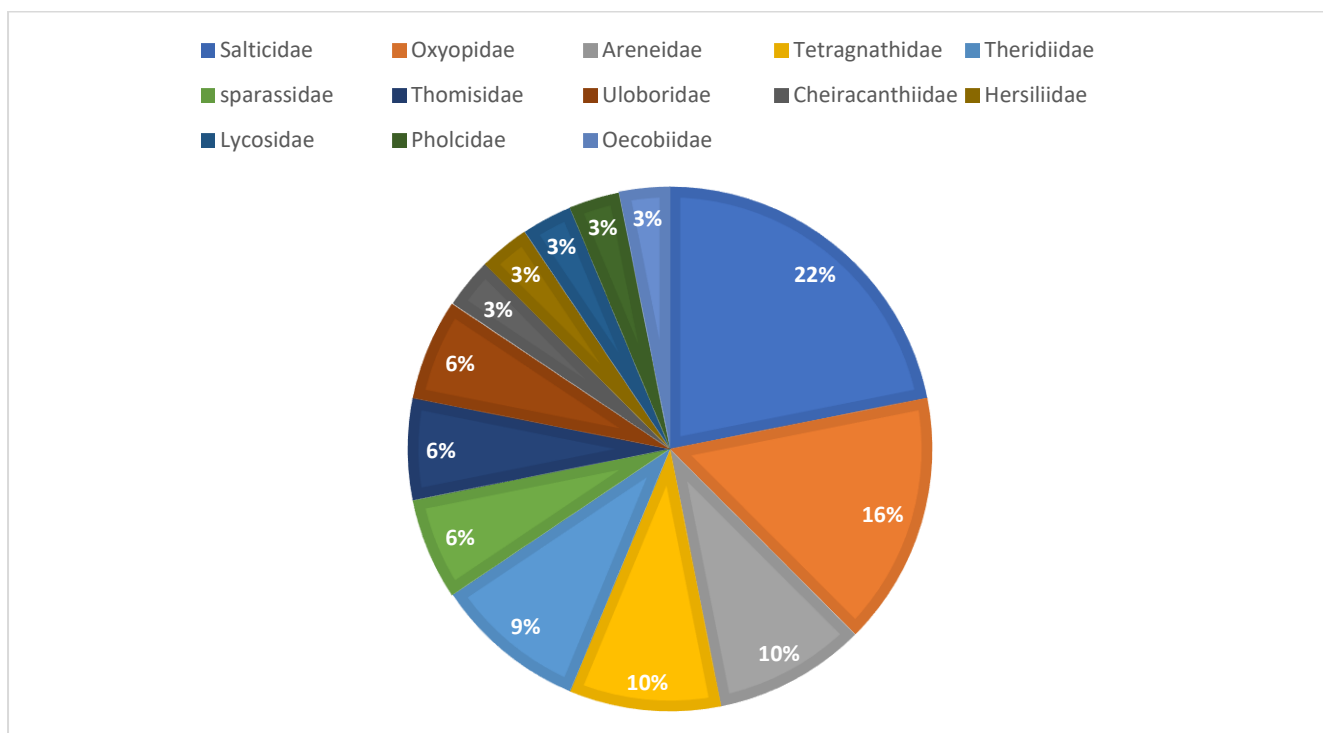
**Table 1:** List of spiders identified along with the respective scientific names

SI. No.	GENUS	SPECIES
<b>Family Araneidae [Orb-web builders]</b>		
1.	<i>Anepsion</i> Strand, 1929	<i>Anepsion maritatum</i> (O.Pickard-Cambridge 1877)
2.	<i>Argiope</i> Audouin, 1826	<i>Argiope anasuja</i> Thorell, 1887
3.	<i>Neoscona</i> Simon, 1864	<i>Neoscona mokerjei</i> Tikader, 1965
<b>Family Cheiracanthiidae [Foliage runner]</b>		
4.	<i>Cheiracanthium</i> C.L.Koch, 1839	<i>Cheiracanthium melanostomum</i> (Thorell, 1895)
<b>Family Hersiliidae [foliage runners]</b>		
5.	<i>Hersilia</i> Audouin, 1826	<i>Hersilia savignyi</i> Lucas, 1836
<b>Family Lycosidae [Ground runner]</b>		

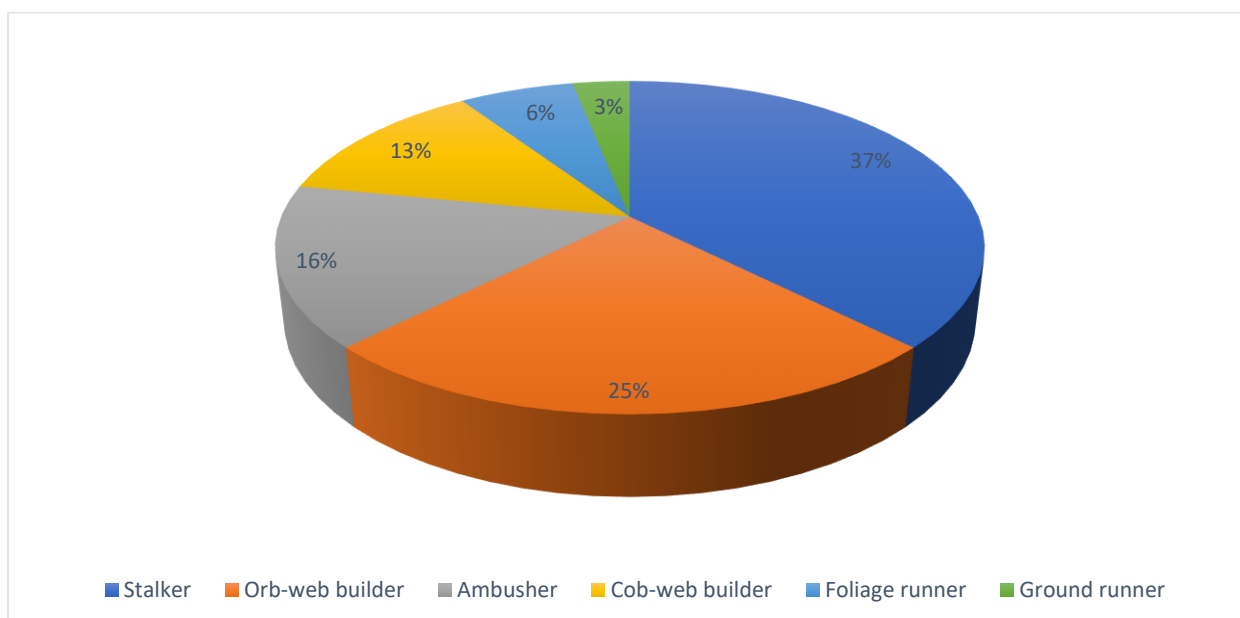


6.	<i>Arctosa</i> C.L,Koch,1847	<i>Arctosa</i> sp.
<b>Family Oecobidae [Ambushers]</b>		
7.	<i>Oecobius</i> Lucas,1846	<i>Oecobius</i> sp.
<b>Family Oxyopidae [Stalkers]</b>		
8.	<i>Oxiopes</i> Latreille, 1804	<i>Oxiopes hasta</i> Lo,Cheng & Lin, 2021
9.	<i>Oxiopes</i> Latreille, 1804	<i>Oxiopes Shweta</i> Tikader, 1970
10.	<i>Oxiopes</i> Latreille, 1804	<i>Oxiopes sushilae</i> Tikader 1965
11.	<i>Oxiopes</i> Latreille, 1804	<i>Oxiopes</i> sp.1
12.	<i>Oxiopes</i> Latreille, 1804	<i>Oxiopes</i> sp.2
<b>Family Pholcidae[cob web builder]</b>		
13.	<i>Crossopriza</i>	<i>Crossopriza lyoni</i> (Blackwall, 1867)
<b>Family Salticidae [Stalkers]</b>		
14.	<i>Hyllus</i> C.L.Koch , 1846	<i>Hyllus semicupreous</i> (Simon,1885)
15.	<i>Indopadilla</i> Caleb & Sankaran, 2019	<i>Indopadilla insularis</i> (Malamel, Sankaran & Sebastian, 2015)
16.	<i>Menemerus</i> Simon, 1868	<i>Menemerus bivittatus</i> (Dufour, 1831)
17.	<i>Phintella</i> Strand, 1906	<i>Phintella vittata</i> (C.L.Koch)
18.	<i>Plexippus</i> C.L.Koch, 1846	<i>Plexippus petersi</i> (Karsch,1878)
19.	<i>Telamonia</i> Thorell, 1887	<i>Telamonia dimidiata</i> (Simon 1899)
20	<i>Thiania</i> C.L.Koch, 1846	<i>Thiania bhamoensis</i> Thorell, 1877
<b>Family Sparassidae [Ambushers]</b>		
21.	<i>Heteropoda</i> Latreille,1804	<i>Heteropoda</i> sp.
22.	<i>Heteropoda</i> Latreille,1804	<i>Heteropoda venatoria</i> (Linnaeus,1767)
<b>Family Tetragnathidae[orb-web builder]</b>		

23.	<i>Tetragnatha</i> Latreille, 1804	<i>Tetragnatha javana</i> (Thorell, 1890)
24.	<i>Tetragnatha</i> Latreille, 1804	<i>Tetragnatha viridorufa</i> Gravely, 1921
25.	<i>Tylorida</i> Simon, 1894	<i>Tylorida ventralis</i> (Thorell, 1877)
<b>Family Theridiidae [cob web builder]</b>		
26.	<i>Chikunia</i> Yoshida, 2009	<i>Chikunia nigra</i> (O.Pickard- Cambridge, 1880)
27.	<i>Meotipa</i> Simon, 1895	<i>Meotipa picturata</i> Simon, 1895
28.	<i>Theridion</i> Walckenaer, 1805	<i>Theridion zonulatum</i> Thorell, 1890
<b>Family Thomisidae [Ambushers]</b>		
29.	<i>Thomisidae</i> Walckenaer, 1841	<i>Thomisidae lobosus</i> Tikader, 1965
30.	<i>Oxytate</i> L.Koch, 1878	<i>Oxytate virens</i> (Thorell, 1891)
<b>Family Uloboridae [orb- web builder]</b>		
31.	<i>Zosis</i> Walckenaer, 1841	<i>Zosis sp.1</i>
32.	<i>Zosis</i> Walckenaer, 1841	<i>Zosis sp.2</i>



**Figure 1 :** species distribution of different families found in the study area.



**Figure 2 :** Guild structure analysis of spiders recorded from the study area

**FAMILY OXYOPIDAE**



*Oxyopes shweta*



*Oxyopes sp.1*



*Oxyopes hasta*



*Oxyopes sushilae*



*Oxyopes sp.2*

**FAMILY THOMICIDAE**



*Oxytate lobosus*



*Oxytate virens*

**FAMILY TETRAGNATHIDAE**



*Tetragnatha viridorufa*

**FAMILY HERSILIIDAE**



*Hersilia savignyi*

**FAMILY SALTICIDAE**



*Hyllus semicupreus*



*Telamonia dimidiata*



*Indopadilla insularis*



*Thiania bhamoensis*



*Plexippus petersi*

#### **FAMILY CHERACANTHIDAE**



*Cheiracanthium melanostomum*

#### **FAMILY THERIDIDAE**



*Chikunia nigra*



**FAMILY ARENEIDAE**



*Anepsion maritatum*



*Neoscona mukerjei*

**FAMILY SPARASSIDAE**



*Heteropoda venatoria*

**FAMILY ULOBORIDAE**



*Zosis sp.*

## **DISCUSSION**

The study on spider diversity in Vypin Island shows the island's unique geographic and ecological features support a distinct and diverse spider fauna compared to the mainland. It is believed that the island ecosystems promote higher endemism and species diversity among spiders when compared to the mainland fauna. This can be tested by comparing the species richness, distribution pattern and ecological roles of spiders on Vypin Island with available data from similar habitats on the mainland. This study also helps in identification and protection of endemic and endangered species present here.

The discovery of an unidentified species belonging to family Oecobiidae and genus *Oecobius* shows the need for further studies to be carried out in this region. The new specimen is currently undergoing further examination for the purpose of naming and identification.

Compared to the size of the island only a small piece of land was studied during a span of three months. A study on spider diversity in different terrains of Vypin Island will open the door towards the current situation and health of the island. As Spiders are ecologically significant organisms for the better understanding of the ecosystem, as spiders play vital roles in regulating insect populations and contributing to nutrient cycling. They also act as a natural pesticide.

Spiders are an important building block of our ecosystem. These tiny creatures are present in varying number according to the location, climate and topography of the place .The observation made from these studies can be used as a measure to check the qualitative health of these places.

This study aims to fill the gap in our understanding and documentation of spider diversity on the island. It helps in the identification of species present in the coastal island, which is prone to industrialisation and urbanisation. Such a baseline data is vital for assessing the health of local habitats and can serve as a benchmark for the future conservation efforts that is to be done in this region.



The study provides baseline information of spiders inhabiting in this ecosystem. The habitat destruction is at its peak, this type of valuable scientific information would help to create proper conservation and management strategies of this landscape

By identifying the various spider species present and assessing their distribution across different habitats, this research will provide essential insights into their ecological roles and contribute to the broader knowledge of the island's biodiversity. This foundational information is critical for developing targeted conservation strategies and managing natural resources effectively on Vypin Island.

## **CONCLUSION**

This was the first attempt to document spider diversity in wetland terrain of Vypin Island. Although the study was conducted in small area it resulted in the documentation of 32 spiders belonging to 24 genera and 13 families were recorded and identified from the selected habitat. Salticidae was the dominant family constituting 7 species under 7 genera, followed by Oxyopidae (5 species), Areneidae (3 species), Tetragnathidae (3 species), Therididae (3 species), Sparassidae (2 species), Thomcidae (2 species), Uloboridae (2 species), Cheiracanthiidae (1 species), Hesiliidae (1 species), Lycosidae (1 species), Pholcidae (1 species) and Oecobiidae (1 species).

During the study, an unidentified species from the family Oecobiidae and genus *Oecobius* was discovered. This specimen is currently undergoing further examination for the purpose of naming and identification.

The diversity both at ecosystem and microhabitat level supports large number spiders in this area. Since the study area is a human dominated landscape, they are facing threats like habitat loss, pollution and changes in land use pattern. Appropriate conservation strategies should be developed and implemented to conserve the faunal and floral diversity in the wetland ecosystems of the region.

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