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12

## Diversity of spiders (Arachnida: Araneae) from some localities of Ahmednagar city of Maharashtra state, India

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### Abstract

Diversity of spiders depends on prey availability and ecology of habitats. The order Araneae of Class - Arachnida includes spiders, which are important links in the terrestrial food webs and also serve as bioindicators. The present study was intended to discover the species diversity of spiders from Ahmednagar city of Maharashtra, India. The study includes collection of spiders from different sites including, Ahmednagar College campus, Bhingar suburb and Chandbibi Mahal area. The research activity was spread over a period of nine months extending from August 2019 to April 2020. 30 spider individuals belonging to 10 families were collected, out of which 23 individuals were identified upto species and 07 specimens remained unidentified. Family Araneidae was the most abundant followed by Salticidae, Thomisidae, Gnaphosidae, Lycosidae, Pholcidae, Tetragnathidae, Hersiliidae, Oxyopidae and Sparassidae.

**Keywords:** biodiversity, araneae, spiders, Ahmednagar, Maharashtra

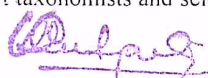
### Introduction

Spiders are ancient and successful invertebrates, residing in all types of habitats worldwide [16]. Spiders are octopod creatures which belong to phylum Arthropoda, Class Arachnida and the order Araneae [6]. Spiders occupy an important part of the overall predatory arthropod fauna in different terrestrial ecosystems [14]. Spiders are found in different habitats with high humidity [11].

### Material and methods

The present study was aimed to assess the diversity of spiders in some areas of Ahmednagar city of Maharashtra State of India. The primary objectives of the study were to record spider specimens so as to prepare a preliminary checklist of spiders from the study area and to find out dominant and rare taxa. The research activity was spread over a period of nine months extending from August 2019 to April 2020. Ahmednagar City is the Headquarters of Ahmednagar District [Latitude: 19°05'40.45" N, Longitude: 74°44'18.35" E]. The collection of spiders was done in Ahmednagar College campus and other study sites. Spiders have been sampled using many methods, each with its own limitations, such as direct searches, pitfall traps, canopy fogging, vegetation beating, litter shifting or extraction, sweep net and suction sampling [3]. As per [14], after collection, spiders were immediately preserved in 70% ethanol for later examination. In the laboratory, all spiders were sorted, counted and identified using appropriate literature. Mature spider individuals were identified to species when possible; unidentified adult specimens were recorded as morphospecies. Most immatures were identified to family only. The collection techniques used were hand picking, litter sampling and sweep netting. The collections were made during day time. Spiders were looked for and observed in a variety of places such as garden edges, official/residential buildings, road-side vegetation, on the bark of trees and underneath stones [4]. Ground search were done under leaf litter, fallen or dry wood [2]. The direct capture method (hand-picking method) was implemented to catch spiders above ground and on the plants [8]. Searching was also done by jerking the twigs of trees and bushes [10]. Freshly collected specimens were anaesthetized with Ether and then placed on a plain surface and photographed immediately using camera. The date and location of collection were noted and the other morphological features observed clearly and noted as per [11] for preliminary identification. Collected specimens were washed with xylene, sorted and preserved in a separate vial in 70 % alcohol [13]. The containers were labelled mentioning date, habitat and place of collection. Spider identification and classification is based on the morphometric parameters such as an eye arrangement, cephalothorax, labium, palps, abdomen and claws [6, 9]. Spiders were observed using stereo zoom microscopes for studying morphological features as per [17]. Identification of the spiders was done with the help of expert taxonomists and scientists from Zoological Survey of India (ZSI), Pune and identification keys [15].



  
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## Results

In the present investigation, spider specimens were collected from some areas of Ahmednagar city such as peripheral regions of Ahmednagar College campus, suburban zones of Bhingar and mountainous terrain of Chandbibi Mahal. Spider samples were collected from leaves, branches, barks and trunks of trees; as well as from dried fallen leaves, grasses, rocks and underneath stones. Spiders were also collected from gardens, grasslands, semi-forest patches, official and residential buildings, and roadside vegetation. Spider specimens collected and identified are enlisted in Table 1. Out of the total 30 spider specimens collected, 23 belongs to 10 families, were identified. Family Araneidae was found to be most abundant followed by Salticidae, Thomisidae, Gnaphosidae, Lycosidae, Pholcidae, Tetragnathidae, Hersilidae, Oxyopidae and Sparassidae. Family Araneidae included 08 species, Salticidae 05 species, Gnaphosidae 02 individuals, Thomisidae 02 species, whereas families Lycosidae, Pholcidae, Tetragnathidae, Hersilidae, Oxyopidae and Sparassidae, each with 01 species. Familywise dominance of spider species is shown in Figure 1. It was observed that higher diversity of spiders was found in areas of vegetation and areas where there was less human activity. Further, their diversity was more in habitats where insect's fauna is more abundant. This proves that spider diversity is related to habitat association and prey availability. Higher number of spiders was found in places of insect abundance, as we know that spiders are carnivores, predatory and chiefly insectivores. Future efforts may be able to focus on 'Integrated Pest Management' using this database. Considering the observation by [10], that apart from taxonomic study, ecological study together with the taxonomic status was not done in our country, it is suggested that future research in this regard should focus on study of taxonomy as well as ecology together. Such research should extensively survey the study area as it was not possible in the present case due to time constraint and active searching at all layers from below ground level to tree canopy layer was difficult. Future research initiatives can overcome the limitations of the present study by: increasing sample size, finding out taxa abundance, working out species, richness, abundance and evenness between habitats, notifying dominant, rare and endemic taxa; assessing seasonal variations on occurrence and diversity; and establishing the hidden threats to diversity and suggesting spider conservation strategies.

## Discussion

In studies by [2] and [9], the family Araneidae was found to be more dominant and most of the species of spiders are found belonged to family Araneidae and Salticidae. These observations are similar to the results of the present study. A study by [5] involved collection and identification 60 specimens of spiders, out of which 27 species represented 09 families and 18 genera. Family Araneidae was the most dominant with 12 species followed by Salticidae (04 species), Oxyopidae (03 species) and Lycosidae (03 species) and 01 species each from family Pholcidae, Thomisidae, Tetragnathidae, Eresidae and Hersilidae. Among the 19 families of spiders observed by [8] in the Zolambi region of Chandoli National Park, high diversity was observed in the families Araneidae (20 species) > Salticidae (17 species) > Lycosidae (13 species) > Thomisidae (7 species) and her results indicated the dominance of ground dwelling spiders like Salticids, Gnaphosids and Lycosides. Dominance of ground dwelling spiders was also observed in the present investigation. The spider diversity studies at various habitats of Savitribai Phule Pune University, Pune (M. S., India); was studied by [17] who reported family Araneidae was the most dominant species with 35 % population of species, second leading family was Lycosidae with 25 % of species, families Salticidae (19 %), Thomisidae (10 %), Tetragnathidae (6 %), whereas Pholcidae, and Uloboridae each had 3 % species. In the present study, family Araneidae was found to be most dominant family with 38 % of species. In the present work, family Araneidae was the most species abundant family. According to the survey of the spider fauna of the irrigated rice ecosystem in central Kerala, India by [12], the widely distributed families were observed to be Araneidae, Lycosidae, Tetragnathidae and Salticidae. The study on the taxonomic status of spiders in Mehsana District North Gujarat, India [10] recorded the higher count of species to be from the families of Araneidae, Salticidae and Lycosidae. Similar observations were made in the present investigation too. According to [1] the Jowai area in Jaintia Hills of Meghalaya, India, tremendous destruction of the forest habitat along with the expansion of civilization may affect the distribution pattern of different spider species. The study sites in Ahmednagar area in present research work also proves that depletion in vegetations and extension of city and suburban areas, might have led decreased spider diversity.

## Conclusion

In the present investigation, diversity of invertebrate fauna of spiders belonging to Phylum Arthropoda, Class Arachnida and Order Araneae; was studied from varied habitats in few areas of Ahmednagar city. Total 30 spider individuals belong to 10 families. The family Araneidae was found to be most abundant followed by Salticidae, Thomisidae, Gnaphosidae, Lycosidae, Pholcidae, Tetragnathidae, Hersilidae, Oxyopidae and Sparassidae. Familywise diversity of spiders was observed as: Araneidae (08 species) > Salticidae (05 species) > Thomisidae & Gnaphosidae (02 species) > Lycosidae (01 species), Pholcidae (01 species), Tetragnathidae (01 species), Hersilidae (01 species), Oxyopidae (01 species), and Sparassidae (01 species). Diversity of spiders was more in the regions of rich vegetation showing abundance of insects, which may be due to their habitat preference and insectivorous habit. During the past few decades, some parts of the densely vegetated areas of the city were converted into domestic and commercial constructions and open spaces have been encroached upon for various purposes. Such change of land use pattern probably has a negative impact on faunal diversity, especially that of spiders. Growth in population has resulted in crowding of the central parts and extension of the peripheral



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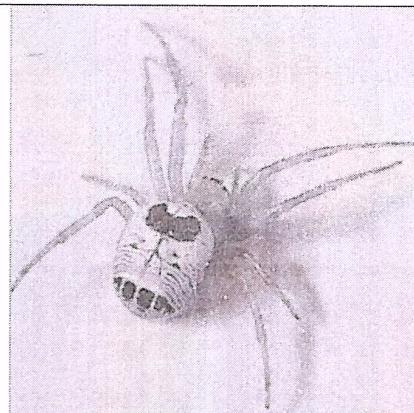
areas of the city. Regions of human dwellings also witness spraying of insecticides by local residents as well as municipal sanitation workers. The city area also includes gardens and farmlands in some zones where pesticides are used, thus reducing insect pest population. Spider diversity and abundance depends on food i.e., prey population, which is decreasing and therefore we observed less diversity of spiders in the present study.

**Table 1:** Spider Specimens from some areas of Ahmednagar City

Sr. No.	Order	Family	Zoological Name
	Araneae	Araneidae	<i>Neoscona sp.</i>
	Araneae	Araneidae	<i>Araneus mitificus</i>
	Araneae	Araneidae	<i>Cyrtophora citricola</i>
	Araneae	Araneidae	<i>Cyclosa sp.</i>
	Araneae	Araneidae	<i>Argiope anasuja</i>
	Araneae	Araneidae	<i>Cyrtophora cicatrosa</i>
	Araneae	Araneidae	<i>Neoscona mokerjei</i>
	Araneae	Araneidae	<i>Araneus sp.</i>
	Araneae	Salticidae	<i>Plexippus paykulli</i>
	Araneae	Salticidae	<i>Rhene sp.</i>
	Araneae	Salticidae	<i>Telamonia dimidiata</i>
	Araneae	Salticidae	<i>Hyllus semicupreus</i>
	Araneae	Salticidae	<i>Thyene imperialis</i>
	Araneae	Thomisidae	<i>Thomisus sp.</i>
	Araneae	Thomisidae	<i>Oxytate sp.</i>
	Araneae	Pholcidae	<i>Pholcus sp.</i>
	Araneae	Lycosidae	<i>Lycosa sp.</i>
	Araneae	Tetragnathidae	<i>Leucauge decorata</i>
	Araneae	Hersiliidae	<i>Hersilia savignyi</i>
	Araneae	Oxyopidae	<i>Oxyopes sp.</i>
	Araneae	Sparassidae	<i>Heteropoda sp.</i>
	Araneae	Gnaphosidae	2 individuals



1. *Neoscona sp.*



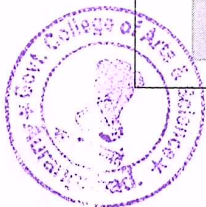
2. *Araneus mitificus*



3. *Cyrtophora citricola*



4. *Cyclosa sp.*



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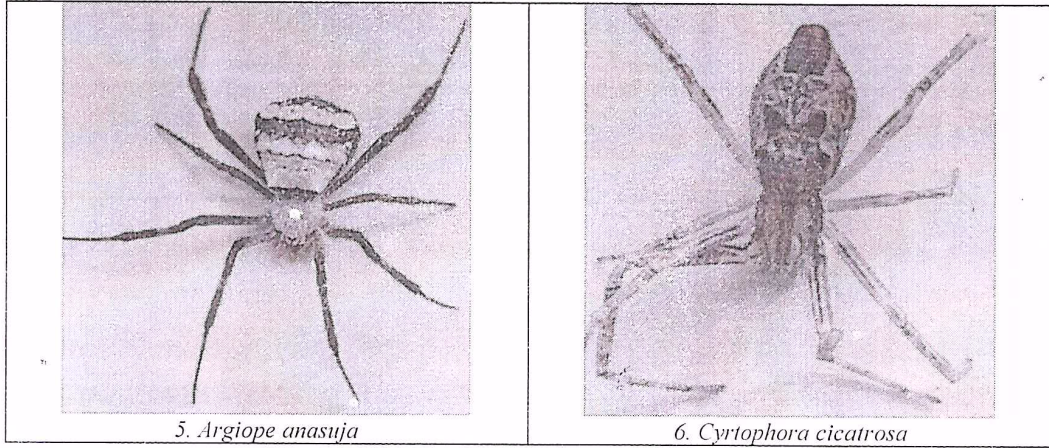
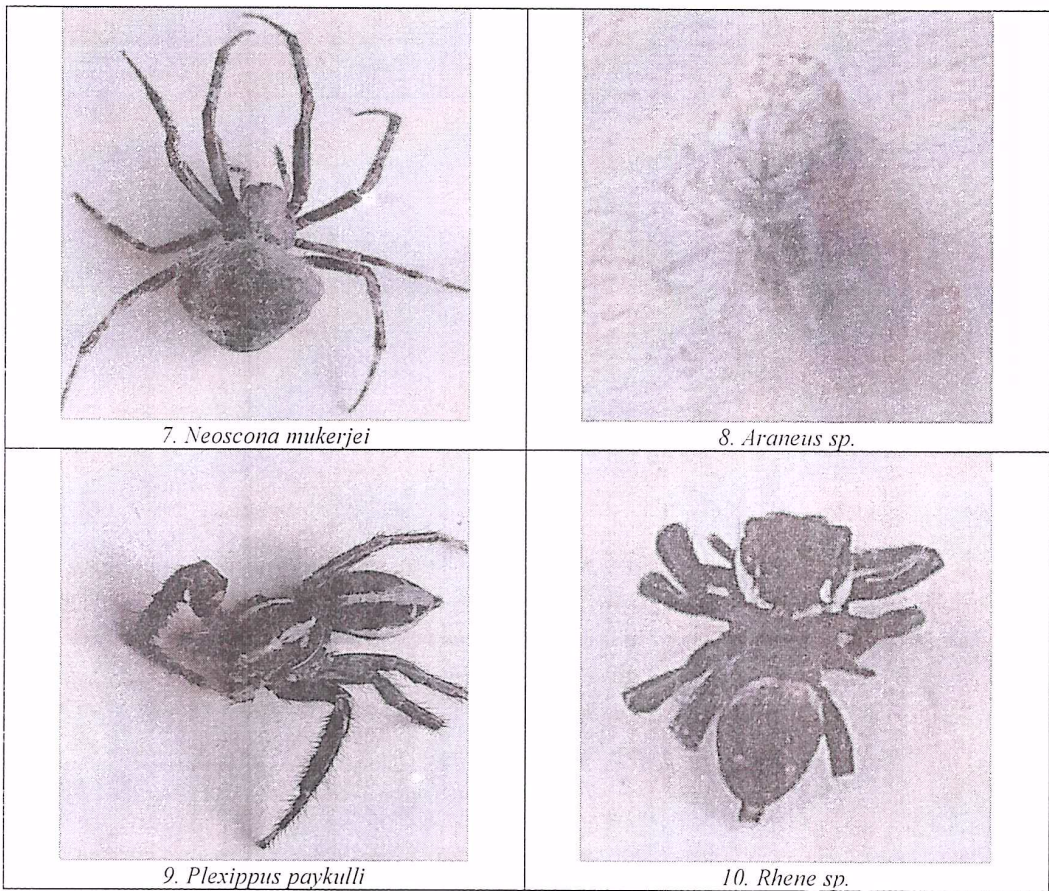


Photo plate 1



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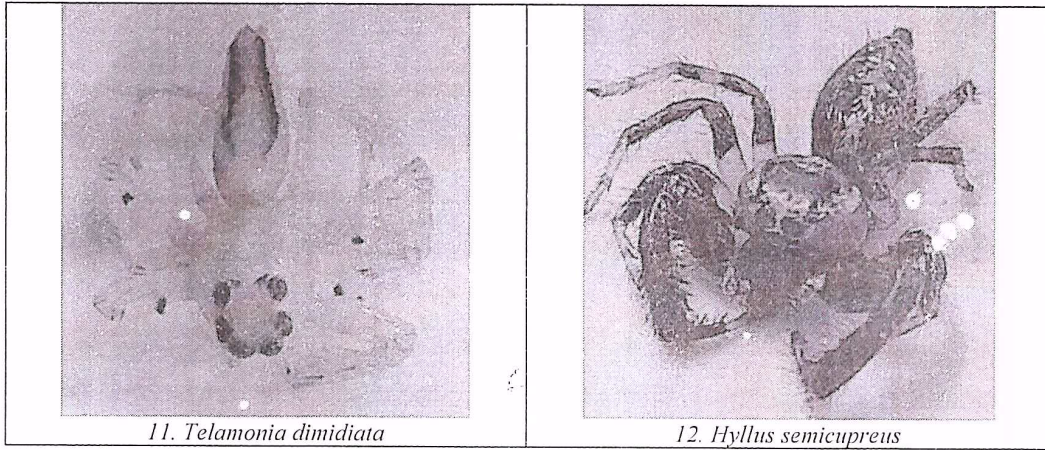
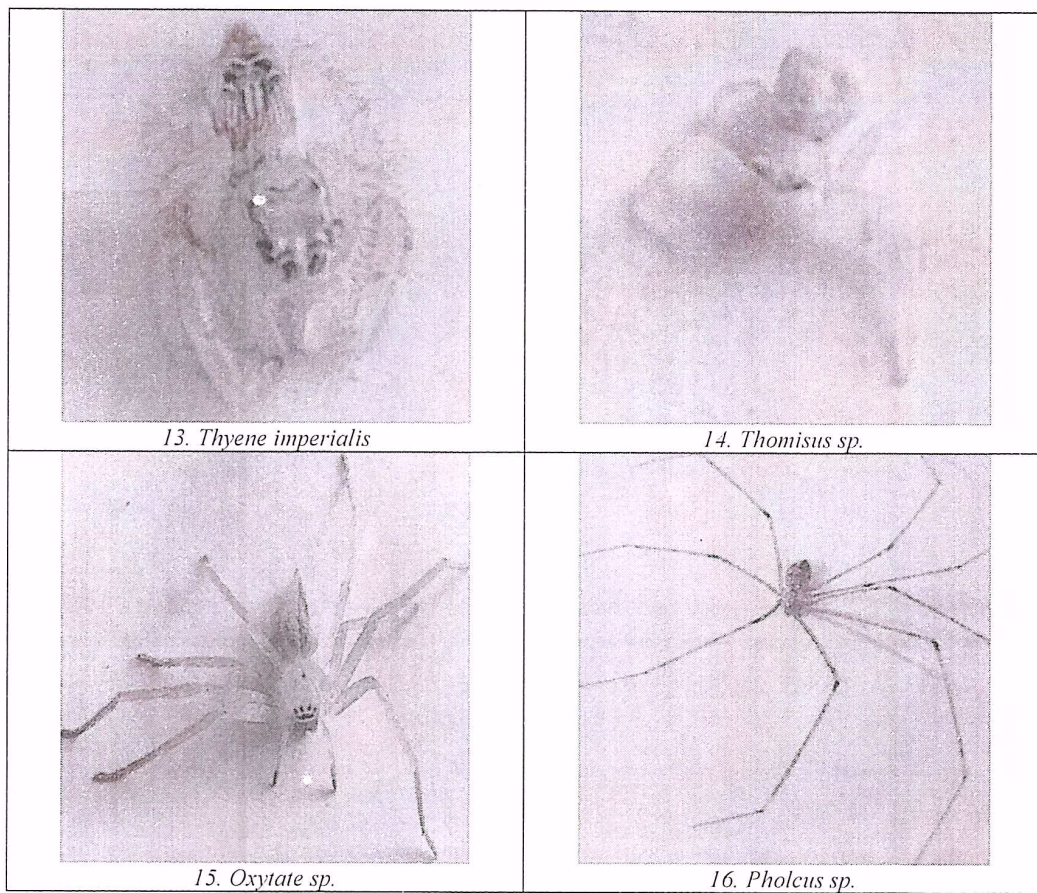


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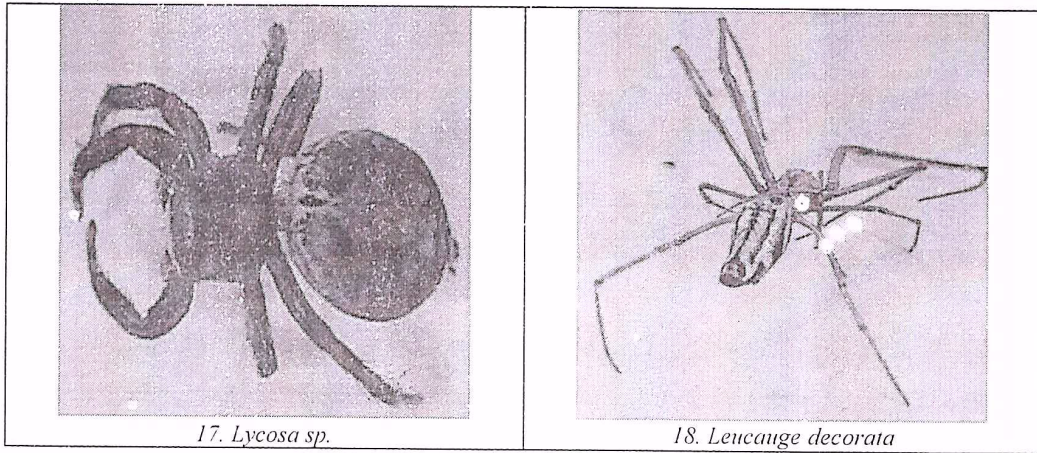


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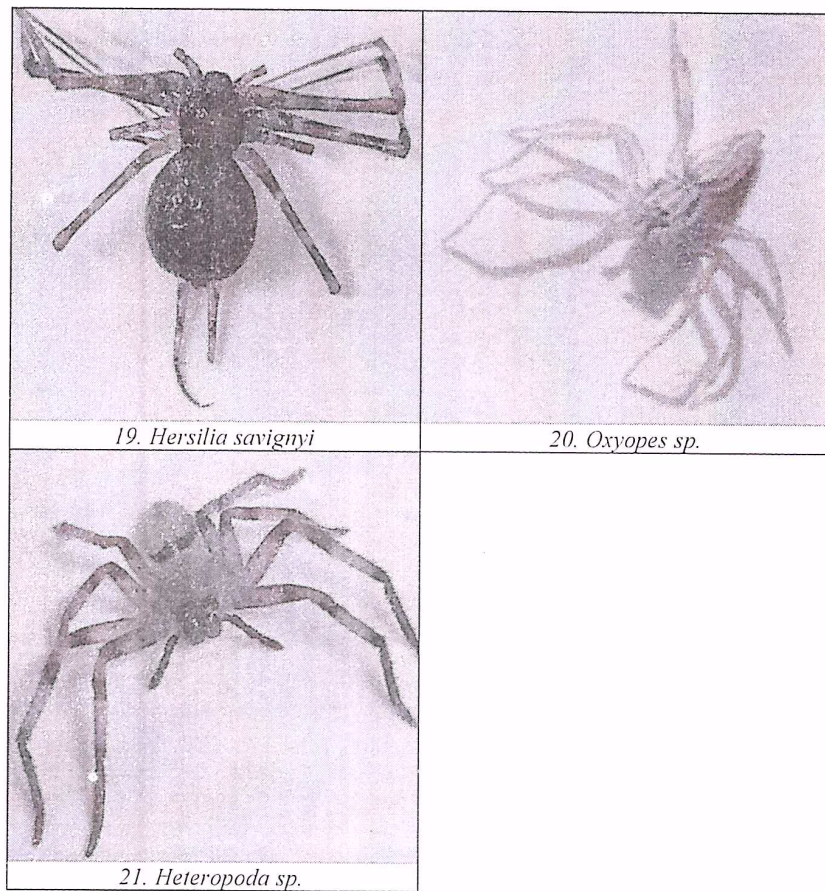


Photo plate 4



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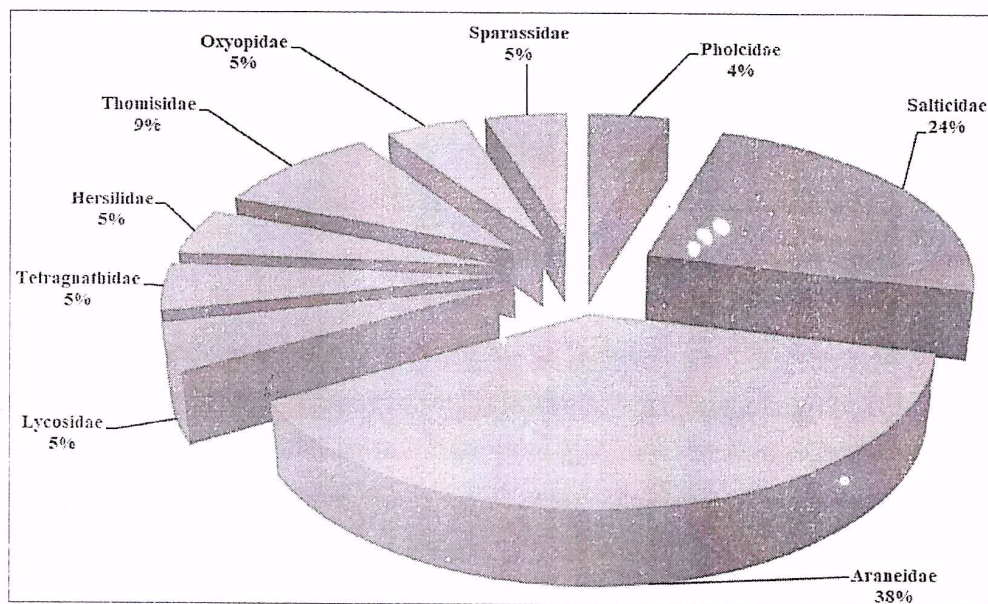


Fig 1: Familywise Dominance of Spider Species

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