



## Taxonomic Status of Spiders in Mehsana District North Gujarat, India

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### Abstract

The ecological study was conducted in Mehsana district, north Gujarat. The climate of a study area is tropical arid to semi-arid. It is strongly periodical and seasonal. Overall the spider faunal status, occurrence and abundance are found rich in Mehsana district. It is due to its topography, climatic condition, and agriculture practice. 90 species were identified belonging to 46 genera and 18 families. Majority of available species belong to hunting group. Of the highest count of 18 families, maximum genera are of families Salticidae and Araneidae. *Hippasa pisaurina*, *Pocock* is a pre dominant species in a district. Maximum population is found in Early Monsoon and during cold and dry season the population is very low. The impact of food availability, temperature, crop calendar and seasonal fluctuation has been observed on diversified population in different habitat of spiders. Habitat preference is very specific to different families. e.g. *Araneidae* family member are restricted to farmland.

**Keywords:** Season, habitat ecology, wetland, wasteland, genus, species, mimicry.

### Introduction

The decade from 2011 to 2020 is being celebrated as a Decade of Biodiversity throughout the world. Organisms have their own important in a nature. With this point of view we have selected the most adaptive and cosmopolite group: spiders. Arthropods are highly diversified and adaptive creatures. Spider group is one of them. Spider diversity of different ecosystem is also very vast. Taxonomic investigation has been done by many Arachnologist since 19<sup>th</sup> century. Our knowledge of the Indian forms is extremely fragmentary. Apart from taxonomic study, ecological study with taxonomic status was not done in our country. Taxonomic investigation based on ecology is a base line to study biodiversity. Habitat Ecology along with Population Ecology gives a specific direction to conserve fauna and flora.

In 19<sup>th</sup> century, Simson<sup>1</sup> (1885), Cambridge<sup>2</sup> (1879) and Karsch<sup>3</sup> (1973) reported many interesting forms of spiders from Indian. Pocock<sup>4</sup> (1900) was the pioneer to work on this group of spiders. Tikader<sup>5-18</sup> (1960 – 1969) described a number of species of various families from India. Patel<sup>19-20</sup> (1973, 1987) has done major work on taxonomic aspects of this group in Gujarat.

In North Gujarat the investigation on taxonomy with relation to ecology was not done at all though it is a best habitat for spiders. It is a preferable habitat for spiders due to its topography, semi desert condition, tropical climate and agriculture practice. Primary field visits directed to us that spiders are found in farmland, westland, wetland, houses etc. Through literature it was found that they are categorised into four groups, such as hunting spiders, web – building spiders,

ambushing spiders and miscellaneous group. It is based on their feeding guilds.

**Study Area:** Gujarat is located on the West coast of India and lies between latitudes 10.1° N and 24.7° N and longitudes 68.4° E and 74.4° E (figure-1). The main land is almost flat plain made up of alluvial soil and some sandy soil in the North. The climate of north Gujarat is tropical in nature as the Tropic of Cancer passes through it. There is a large spatial and temporal variation in rain fall. Area of Mehsana district (23° 02' to 24° 09' North latitudes and 71° 26' to 72° 51' East longitudes) of Gujarat was selected for study.

In total four different sites were selected for collection with respect to different habitat: urban area, hilly forest area, crop field area, opens westland area. The climate is also changeable throughout the year. Winter (November- January) is a cool period and summer (February- June) is a hot period in the district. Monsoon starts during mid-June and extends up to mid-October. Average percent relative humidity ranged 43.57 to 86.60 during study period (Figure-2). Average rainfall remained during Late Monsoon (321mm) and low during Post Monsoon (25mm). Moisture status remained dry during winter and Early Summer but varied during Late Summer and Post Monsoon. Winter has very short photoperiod (average 11-19 hrs) and later on it increases. Highest photoperiodism remains during Early Monsoon (average 14-12 hrs). Vegetation of a district has been classified as "Indian desert" by Clarke<sup>21</sup> (1898). Various types are crops grown. Sowing and harvesting seasons of cereals and pulses in a study area spread almost entire year, except April, May, June and September.

Insect fauna was observed in luxurious number and variety during Monsoon. Some of them are the pest of cereals and pulses. Total 37 insectivorous bird species were seen during study period.

**Formulae used to study:**

$$\text{Percent Species Richness} = \frac{\text{number of species found in a particular sites or month}}{\text{Total number of species found}}$$

$$\text{Seasonal Index (SI)} = \frac{\text{monthly average}}{\text{Sum of monthly average}} \times 100$$

$$\text{Similarity (sim)} = \frac{2C}{A+B}$$

Where A= number of species in area “A”, B=number of species in area “B”, C= number of species Common to “A” and “B”.

**Material and Methods**

The spider fauna and its diversity (order: Araneae) of District Mehsana, Gujarat, India has been studied. Different spider species were collected from the study area viz., Mehsana, Visnagar, Kheralu, Taranga, Vadnagar, Kadi, Becharaji and their surrounding places during the period from 2003 to 2005 (Figure-1). Mainly collection was done during Monsoon and randomly in other seasons. The selected habitats were mainly the agricultural habitat, wastelands, wetlands and houses as well as dead huts. Spiders were collected mostly by hand. Searching was done by jerking the twigs of trees and bushes, keeping inverted open umbrella below to collect fallen spiders. They were kept in plastic tubes (5cm x 2cm) containing 70% ethanol and a slip indicating date and place etc. They were also collected by pit-fall trap method and sweeping method. Pit-fall trap method helps to capture non-weavers. Ditches (10 to 15 cm) were made and kept in the plastic dish (10 cm wide) filled with ethylene glycerol.

Sweeping method was operated at early morning or at evening. The sweeping net (60 cm long and 24 cm wide) was operated at crop fields, farms, or ground and tall grasses. Spiders from net were collected and preserved in the containers. Identification key was adopted. These were identified in laboratory with the help of microscope, Carl Zeiss, Jena, Germany, with magnification 80 to 100 x. The specimen was identified with the help of standard literature and with the consultation of experts.

**Results and Discussion**

During field study total 1200 specimens were collected. Out of it 552 samples were from farmland, 312 samples from wetland, 216 samples from wasteland and 120 samples from houses and huts. All these specimens are identified in different groups with respect to their habitat. Out of these specimens, 90 species were identified belonging to 46 genera and 18 families (table-1). Majority of the available species belong to hunting group. 47 species are of hunting spiders. The member of a family Thomisidae is all Ambushing spiders. 29 species builds web (table-2).

The highest count of species was obtained in families Araneidae, Salticidae and Lycosidae while the lowest count was obtained from the families Amauroboridae, Oecobidae, Pisauridae and Scytodiidae in Mehsana district. Out of 18 families, maximum genera are obtained from the families Salticidae and Aranidae (table-1). Some have found only one genus like Amauroboridae, Eresidae, Oecobidae, Pisauridae, Scytodidae, Salenopidae, Uloboridae and Urocteridae (table-1). There were 90 species in a study area among them richest group is belonging to Araneidae, Salticidae, Lycocidae. Some have only one species (table-1). Hippasa pisaurina, Pocock is a predominant species in this tropical area. 22 species are available during study period once a time. The family Amaurobiidae is cosmopolite, found all over the world, was found in a wasteland habitat. It means wasteland also act as a shelter to fauna.

**Table-1**  
**Available species belong to their families and genera**

| Name of Family | Number of Genera | Number of species |
|----------------|------------------|-------------------|
| Amaurobiidae   | 1                | 1                 |
| Araneidae      | 8                | 21                |
| Clubionidae    | 2                | 3                 |
| Gnaphosidae    | 2                | 2                 |
| Eresidae       | 1                | 2                 |
| Heteropodidae  | 2                | 3                 |
| Lycosidae      | 5                | 16                |
| Oecobiidae     | 1                | 1                 |
| Oxyopidae      | 2                | 7                 |
| Pholcidae      | 3                | 3                 |
| Pisauridae     | 1                | 1                 |
| Slticidae      | 9                | 18                |
| Scytodidae     | 1                | 1                 |
| selenopidae    | 1                | 1                 |
| Theridiidae    | 3                | 3                 |
| Thomisidae     | 2                | 4                 |
| Uloboridae     | 1                | 2                 |
| Urocteidae     | 1                | 1                 |
| <b>Total</b>   | <b>46</b>        | <b>90</b>         |

**Biodiversity with respect to climate:** It was experienced that very low species population was available during cold and dry period (Winter and Early Summer) (Table 3). Population of spiders starts to increase after Early Summer and reach at peak in Early Monsoon (figure- 2). Food source in Monsoon might be the prime factor (table-3). Barghusen Et al.<sup>23</sup> (1997) has observed that temperature effect on web-building behaviour of the common house spiders in a temperate region. In winter in some species hibernation chambers were observed by Patel and Kareemullah<sup>24</sup> (1989). Here it is a tropical area, though r = +0.85 value shows that there is a positive effects of temperature on spider population (table-3). Rainfall is irregular in Mehsana district. Rainfall directly does not effect on population but due to large count of insect fauna it gets credit. Subrammyam<sup>25</sup>

reported that the members of family Argiopidae, Sparasidae, Clubionidae, Psecridae, Lycocidae and Oxyopidae become active on the onset of Monsoon. Season wise Species Richness (SR) shows that % SR is 64 in Early Monsoon where as it goes down at 20 % SR in winter (table-3). Photoperiodism moderately effects ( $r = +0.70$ ) (table-3). Brady<sup>26</sup> gave a reason why very little research has been conducted on the feeding ecology of spiders. It might be due to the difficulty in observing predation by these vagrant spiders in the field.

**Table-2**  
 Different categories of spiders in different taxa observed in a study area

| Group                 | Family        | Genus     | Species   | Total |
|-----------------------|---------------|-----------|-----------|-------|
| Hunting Spiders       | Clubionidae   | 02        | 03        | 47    |
|                       | Lycosidae     | 05        | 16        |       |
|                       | Oxyopidae     | 02        | 07        |       |
|                       | Pholcidae     | 03        | 03        |       |
| Web-building Spiders  | Salticidae    | 09        | 18        | 29    |
|                       | Araneidae     | 08        | 21        |       |
|                       | Eresidae      | 01        | 02        |       |
|                       | Oeicobidae    | 01        | 01        |       |
| Ambushing Spiders     | Theridiidae   | 03        | 03        | 04    |
|                       | Uloboridae    | 01        | 02        |       |
|                       | Thomisidae    | 02        | 04        |       |
| Miscellaneous Spiders | Amauroboridae | 01        | 01        | 10    |
|                       | Gnaphosidae   | 02        | 02        |       |
|                       | Heteropoidae  | 02        | 03        |       |
|                       | Pisauridae    | 01        | 01        |       |
|                       | Scytodiidae   | 01        | 01        |       |
|                       | Selenopidae   | 01        | 01        |       |
| Total                 | Uroctedae     | 01        | 01        | 90    |
|                       | <b>18</b>     | <b>46</b> | <b>90</b> |       |

**Table-3**  
 Season wise Species Richness (SR) in spider's population of a study area

| Season        | Species Richness (%) |
|---------------|----------------------|
| Winter        | 20                   |
| Early summer  | 26                   |
| Late summer   | 54                   |
| Early monsoon | 64                   |
| Late monsoon  | 51                   |
| Post monsoon  | 68                   |

**Correlation of SR with climatic factors**

**Factors r-Value Remark**

Sps. Richness → Average temp. + 0.85 Fairly Correlated  
 Sps. Richness → % Humidity + 0.48 Low Correlated  
 Sps. Richness → Rainfall + 0.52 Moderate Correlated  
 Sps. Richness → Photo. Perio. + 0.69 Moderate Correlated  
**Habitat preference:** Evolutionary aspect shows that these creatures are well adapted to a drought condition and spread even all over the world. Preference of habitat was observed very

specific in a study area. Member of family Lycosidae and Theridiidae select wetland habitat. Hippassa pisaurina, Pocock is very common. Araneidae family members are restricted to farmland (table-4) and remained active as per crop calendar. Other families like Oxyopidae and Thomisidae also prefer crop land area (table-4). Out of a total population 46 percent population were found in farmland. Nescona theis, Tikader, Oxyopidae ratnae, Tikader and Tibellus pateli are observed in large scale. Wasteland groups belonging to Heteropoidae and Eresidae, families. Olios punctipus, Simon and Stegodyphus socialis, Pocock are see in high rang among wasteland species. Human habitation i.e. houses and huts are selected by the members of Pholcidae. Atema atlanta, Walckenaer species is common in it (table-4). They are only 10 percent. The species which prefer vegetation and mimic are found in farmland, even though they struggle with insecticides. Wetland group prefers to stay near grass patch and hanging twigs over water. Wasteland population try to hide their selves under dry leaves. Mostly they prefer to live within xerophytes vegetation for web preparation. Pholcidae group selects the unused high site corners sites of houses. The selection of members of farmland and wetland has a high degree (0.25) Similarity Index. Because mostly wetland are covered with croplands. There is no relation between farmland and wasteland (0.08) (table-5). It is due to diversified vegetation.

**Table-4**  
 Family wise habitat selection within the study area

| Family                    | (Number of samples) |            |            |            |
|---------------------------|---------------------|------------|------------|------------|
|                           | Farmland            | Wetland    | Wasteland  | Houses     |
| Amaurobiidae              | 00                  | 00         | 026        | 00         |
| Araneidae                 | 144                 | 00         | 00         | 00         |
| Clubionidae               | 041                 | 00         | 00         | 00         |
| Eresidae                  | 00                  | 00         | 059        | 00         |
| Gnaphosidae               | 031                 | 00         | 00         | 00         |
| Heteropoidae              | 00                  | 00         | 071        | 00         |
| Lycosidae                 | 031                 | 222        | 00         | 001        |
| Oeicobidae                | 00                  | 00         | 00         | 020        |
| Oxyopidae                 | 084                 | 00         | 00         | 00         |
| Pholcidae                 | 00                  | 00         | 00         | 058        |
| Pisauridae                | 00                  | 00         | 009        | 001        |
| Salticidae                | 028                 | 00         | 006        | 014        |
| Scytodiidae               | 00                  | 010        | 00         | 00         |
| Selenopidae               | 00                  | 00         | 00         | 005        |
| Theridiidae               | 00                  | 063        | 00         | 00         |
| Thomisidae                | 082                 | 00         | 00         | 00         |
| Uloboridae                | 037                 | 00         | 00         | 00         |
| Uroctidae                 | 00                  | 010        | 027        | 00         |
| Dried samples*            | 070                 | 007        | 018        | 021        |
| Very small sized sample * | 004                 | 00         | 00         | 00         |
| <b>Total</b>              | <b>552</b>          | <b>312</b> | <b>216</b> | <b>120</b> |

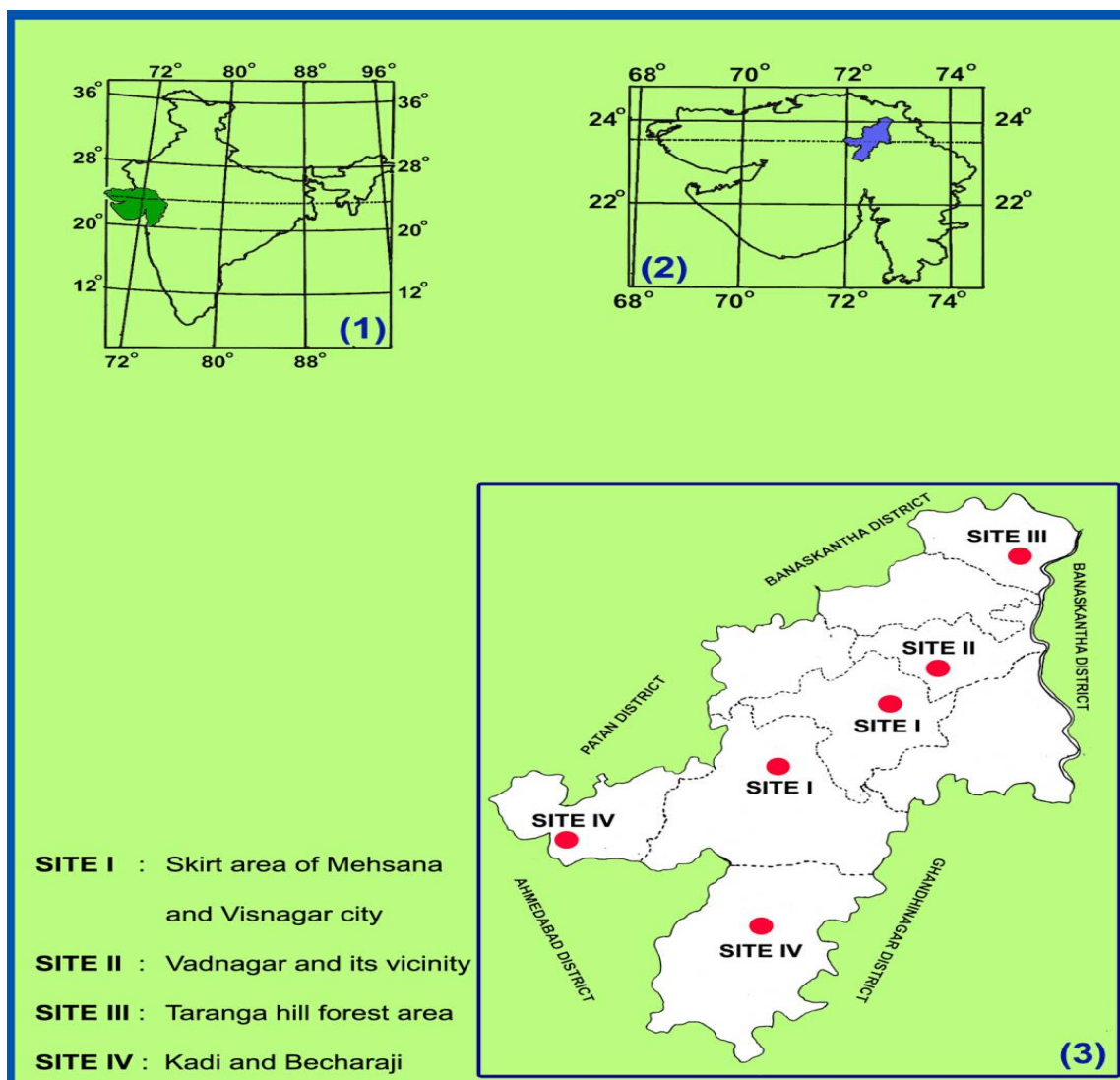
**Table-5**  
**Degree of similarity of habitat preferred by spiders in a study area**

| Sites           | Similarity Index | Degree of Similarity |
|-----------------|------------------|----------------------|
| Site I and II   | 0.25             | High                 |
| Site III and IV | 0.21             | High                 |
| Site I and IV   | 0.13             | Moderate             |
| Site II and III | 0.12             | Moderate             |
| Site II and IV  | 0.11             | Moderate             |
| Site I and III  | 0.08             | Low                  |

**Conclusion**

Climate of Mehsana district is tropical arid to semi-arid. It is strongly periodical and seasonal. The higher count of species

obtained was from the families of Araneidae, Salticidae and Lycocidae while the lowest count was obtained from the families Amauroboridae, Oeicobidae, PISAUROIDAE, Scytodidae, Selenopidae and urocteridae in this District. Hunting spiders are dominant in this area (47 sps.). Ambushing type spiders were very less (4 sps.). Lycocidae and Theridiidae families prefer wetland. Areneidae families restricted to farmland only. Heteropidae and Eresidae group prefer wasteland habitat. Members of Pholicidae family were found in huts and houses. Early monsoon and thereafter are more favourable seasons to spiders but not cold season. Over all the spiders faunal status, occurrence and abundance is found rich in a district. Mimicry is a specific behaviour for survival to spiders. Feeding ecology will give more lighting for unsolved problems on spider population.



**Figure-1**  
**Map of study area**

1.The Gujarat State within India, 2. The Mehsana region within Gujarat, 3.The Mehsana District indicate Sites

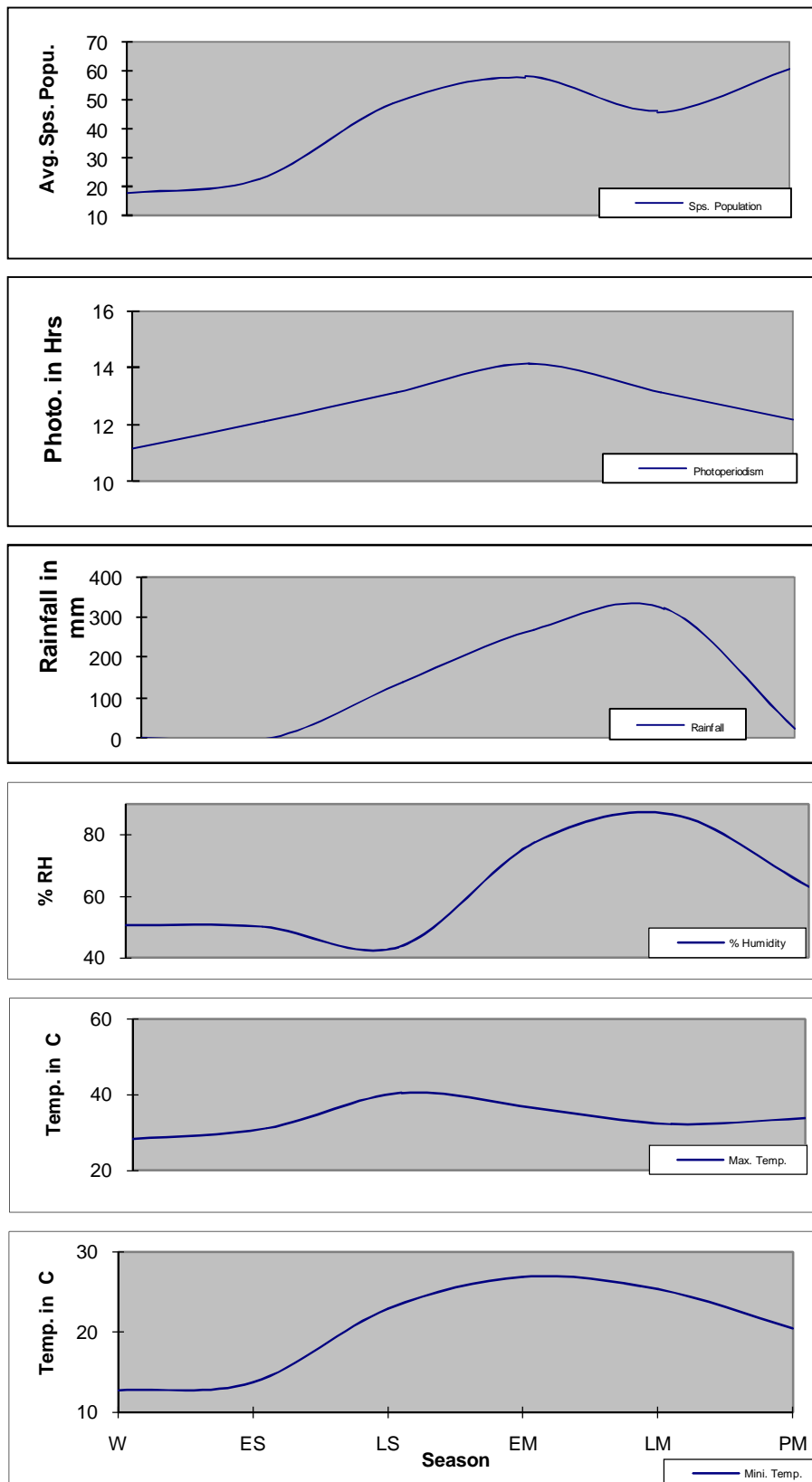


Figure-2  
Average climatic factors and species population in a study area

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