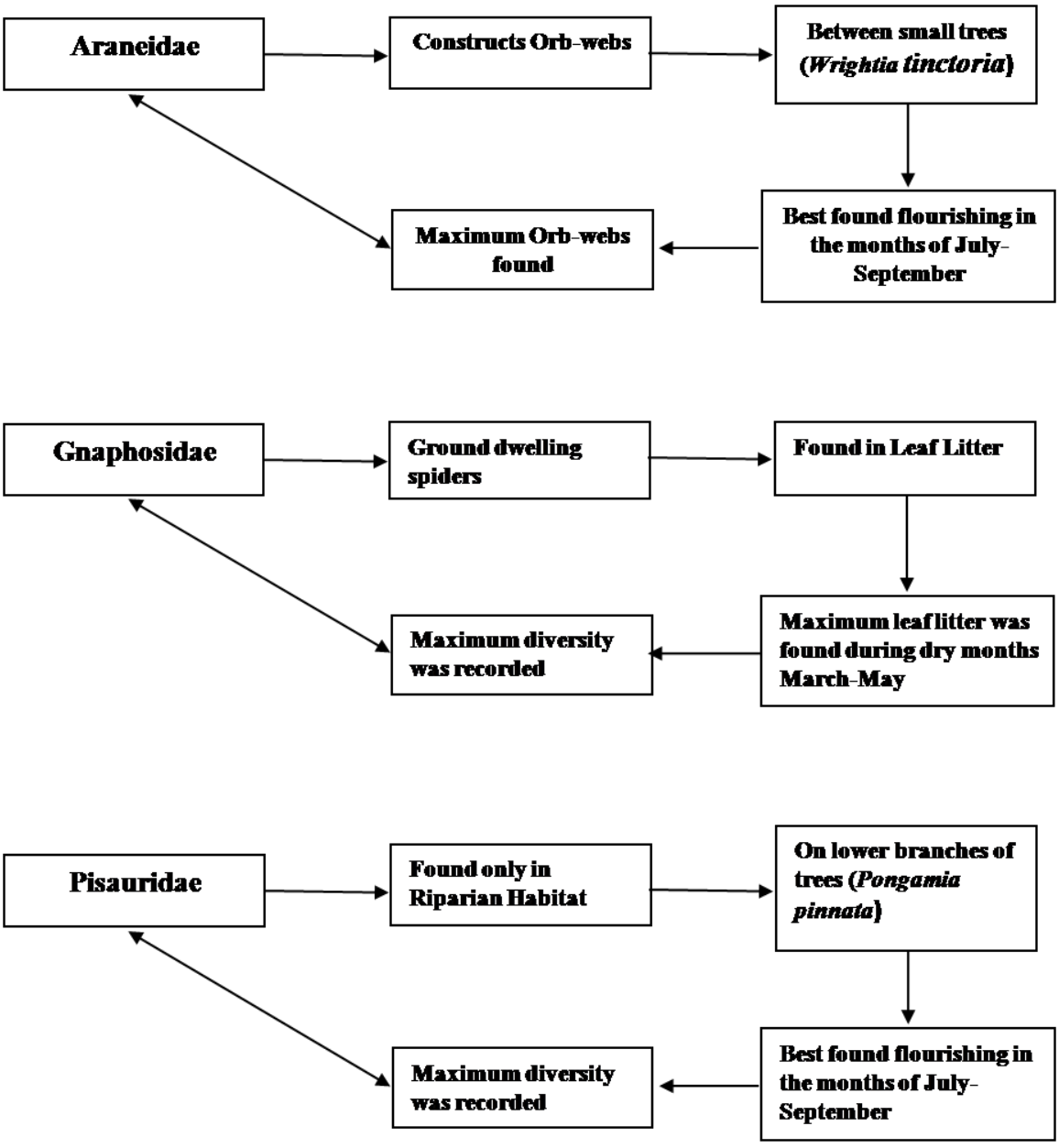
CHAPTER-V

5. DISCUSSION AND CONCLUSION

Spiders are one of the vital components of terrestrial ecosystems throughout the world and certainly have a direct impact in maintaining the ecological balance. As insects constitute the major source of food, spiders regulate the insect populations in both natural and agricultural ecosystem. If the information on their natural role is increased by their diversity and ecological studies like feeding and breeding behaviour it would be helpful in conservation of flora and fauna which ultimately helps in conserving an entire ecosystem.

As we know spiders are important components of ecosystem and the presence and absence of spider populations indicates a particular environment. In the present study maximum population of spider families namely, Araneidae and Salticidae were found, followed by Theridiidae, Gnaphosidae and Thomisidae. In a dry deciduous forest more populations of such families directly indicates the type of soil, temperature, humidity and to certain extent the flora which the soil sustain for e.g. Araneid spiders were mostly dependent on small tree species like *Wrightia tinctoria* and *Helicteres isora* which has more spaces in-between the branches and hence, provide larger space to construct large orb-webs for better prey capture efficiency. In addition to this, these plants (*Wrightia tinctoria* and *Helicteres isora*) normally needs more moisture and humid conditions to grow which is apt for the sustainance of spiders like *Neoscona mukerjei* and other orb-weaver spiders. Studies on Araneid spider polulations also showed that the presence of more variety of plants provides more niches to sustain web-building spiders (Uniyal & Hore, 2006). Hence, there is a direct link between the plants which flourishes well in the months of June-September and it was a coincidence that these spider populations were collected maximally during these months.

Who says that spider diversity is not ecologically connected there are evidences proving that spiders and their sustenance depends not only on availability of predators but also on vegetation type, litter layers, humidity and other climatic conditions for example:



The forest plantations were reported to have lowest species diversity as compaire to other habitats due to uniformity in vegetation and continuous alteration of habitat either by natural forest fires or by human interference. There are also reports where distruction of natural habitat for removal of unwanted plants from a given area reduces the populations of spiders (Hore & Uniyal, 2008a), proving that ecology and diversity is interconnected. Therefore there is a need to conserve the ecosystem whichever they may be for the best survival of faunal populations specially spiders. Studies on spiders in India may be immense but in Gujarat they are scares and more so the importance of ecology and diversity of spiders is least observed by the researches.

The Jambughoda Wildlife Sanctuary as stated in chapter-I has got rich flora and fauna. To sustain such rich biodiversity the habitat has to be ecologically balanced and this southern tropical dry deciduous forest is one of them as it has capability to sustain such diverse number of flora and fauna including spiders. And therefore it was possible to get interesting first records of genus and species which includes two first records from India namely, *Cephalobares globiceps* belonging to family Theridiidae and *Pandava laminata* from family Titanoecidae. Both these species were collected from Natural forest. Almost 50% of the vegetation in natural forest was of *Tectona grandis* trees and we found *Cephalobares globiceps* from under side of leaves of *T. grandis* whereas *Pandava laminate* inhabits under the barks of these trees.

5.1 Different Habitats within JWLS (Sub-Sites)

As shown in chapter-II within Jambughoda Wildlife Sanctuary various habitats were selected depending upon vegetation types namely, Natural forest, Riparian habitat, Agricultural fields and Forest plantations. All the four habitats were having remarkably different type of characteristic features. Natural forest had abundance of *Tectona grandis* followed by *Madhuca longifolia*, *Terminalia crenulata*, *Dalbergia latifolia* etc. whereas Riparian habitat had more amount of moisture with vegetation like *Pongamia pinnata*, *Syzygium cumini*, *Alangium salvifolium* along the sides of streams. An interestingly family Pisauridae could not be found in any other habitat except in riparian which as stated earlier have lots of moisture with vegetation at the periphery of entire stream. Such

habitats can sustain species of spiders whose populations fluctuate with the amount of moisture in the surroundings.

Hence with affermity we can say that habitat has a major role to play in the spider populations and diversity. Dry deciduous forests do have pockets of different habitats which harbours different families of spiders (Table 31). Agricultural fields harbour 16 different families of spiders where the dominating families were Araneidae, Salticidae, Lycosidae and Oxyopidae. Also out of the five agricultural fields namely, castor, corn, cotton, paddy and pigeonpea, the diversity of spider was observed to be dominant in corn fileds. The higher diversity of spiders in corn fields is due to habitat diversification; also corn provides provisioning of alternative food (pollen) and enhanced habitat resources (Peterson et al., 2010).

5.2 Different Types of Webs

There was a wide range of webs types constructed by different species of spiders observed in study site namely, orb-webs and tent webs were constructed by spiders of family Araneidae, funnel webs and sheet webs were constructed by Lycosid spiders, tangle webs and cob-webs were constructed by spiders belonging to family Theridiidae. Each of these webs needs different complexity in vegetation type and is build in different type of surroundings like sheet-webs constructed by Lycosids needs lower vegetation like grasses and humid atmospheric conditions (Koh & Ming, 2013). For construction of cob-webs Theridiids need vegetation comprising of bushes with less spaces in-between the branches whereas Araneid spiders needs shrubs with more spaces in-between the branches for the construction of orb-webs. This shows that not only the climatic conditions which affects the spider populations but also the type of vegetation in a particular habitat which affects the abundance of different spider populations.

5.3 Guilt Structure

Out of the eight guilt structure described by (Uetz et al., 1999), we found seven from Jambughoda Wildlife Sanctuary namely, Stalkers, Ambushers, Foliage runners, Ground runners, Sheet web-builders, Orb weavers and Space web-builders. From all these seven

functional groups the dominant guilt was of ground runners followed by foliage runners then ambushers and orb-weavers. The dominance of ground runners was due to the fact that these forests being dry deciduous have more amount of leaf litter which provides hiding places for such ground dwelling spider species (Stevenson & Dindal, 1982).

In the moths of January-May the populations of web-building spiders were sparsely distributed in all the habitats whereas the populations of ground dwelling spiders were observed to be more. One of the reasons for such drastic fluctuation in change of functional groups is due the climatic conditions as these are months of dry season when the layers of leaf litter increases in the forest areas resulting into increase in the diversity of ground spiders like Lycosids, Gnaphosids etc. as stated earlier.

The reproductive rates were also dependent on climatic conditions and food source availability i.e. insects. The maximum diversity of spiders were found in the months of June to October as this is post-monsoon season and the flora flourishes well in this season also the climatic conditions like humidity, temperature etc. are apt for the breeding of spiders. Also the insect populations in this particular season are observed to be maximum which provides ample food source for their spiderlings. The insect orders maximally preferred by spiders during this period were Coleoptera, Diptera, Ephemeroptera, Hemiptera, Hymenoptera, Isoptera, Lepidoptera, Neuroptera, Odonata and Orthoptera. For successful sustenance of their newly emerged spiderlings parental care behaviour was also prominent in many spider species which includes guarding of egg-sac by female (Lycosidae, Oxyopidae, Salticidae, Sparassidae, Theridiidae); spiderlings carried by female on its back (Lycosidae); spiderlings being feed by mother (Scytodidae). Similar observation on parental care and predatory behaviour of Scytodes sp. was documented from Philippines (Li et al., 1999).

Apart from seasonal variation in spider diversity, feeding behaviour and reproductive ecology, spiders also provide various ecological services. As they are generalist predator they help in keeping check on insect population in natural forests, plantations and also in agricultural fields. They are also source of food for ants, mites, wasps, lizards and birds. Birds were also observed to feed their hatchlings with spiders whereas few species of birds like Paradise fly-catcher uses spider webs in gluing its web while constructing.

They also act as biological indicators for monitoring biodiversity and their presence and absence indicates the changes in environmental conditions of a particular ecosystem (Scott et al., 2006; Hore & Uniyal, 2008b). Hence, all the above observations definitely bring us to the conclusion that natural preadtors like spiders are must in an ecosystem as they play an important role in balancing the food chain along with other ecological roles. As spiders are also biological indicators therefore ecolgy along with diversity informations of such species helps in improving the conservation stratergies for a particular ecosystem.