

Diversity and seasonal variation in spider abundance from MirajTahsil, Sangli, Maharashtra

Sarwade Asha Bibhishan, Kamble Nitin Ananda

Department of Zoology, Shivaji University, Kolhapur - 416 004, Maharashtra, India.

E-mail : ashasarwade@rediffmail.com ; drkntinkumar@yahoo.in

Contact No. : +91 - 7588253118

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Abstract

Arachnida is one of the largest and important order from class Insecta. Arachnids are found over terrestrial ecosystem, however some inhabit freshwater environments and marine environments also. They comprise over 100,000 of species, including spiders, scorpions, harvestmen, ticks, mites and solifuges. Spiders are the most familiar of the arachnids and the most recorded species found around 40,000. Study relates with diversity of spiders from some of the freshwater sites of the MirajTahsil in the period of January, 2011 to December, 2013. Among collected spiders, species were identified from different families. Seasonal variations showed quantitative difference among species. Numerical data recorded was maximum in summer and rainy season as compared to winter. Physicochemical alterations has greatly influenced on the biodiversity at the selected sites.

Key words : Spider diversity, physicochemical alteration, Miraj Tahsil.

INTRODUCTION

Spiders were known to have its diversity and contribute for largest portions of invertebrate fauna in ecosystem^[1]. They were distributed on every continent except Antarctica and get adapted to all known ecological environments except air and open sea^[2]. The spider belonging to order Araneae, which recorded as grasping animals group^[3]. Spiders generally give preference to humidity and temperature that, limit them to areas within the range of their physiological tolerances, which make them focused for land conservation strategies^[4].

Spiders became a winning group due to diverse ways in their potential to use silk^[5]. Currently 39,882 species were documented for spiders deiving in 3676 genera and 108 families which were described globally^[6]. The spider fauna of India, includes by 1520 species belonging to 377 genera within 60 families^[7].

Spiders are the most diverse and rich invertebrate predators^[8] foraging primarily on insects. Because of their high abundance and insectivorous, foraging spiders are considered as the major insect controlling agent communities scattered over terrestrial ecosystems^[8 - 10]. Spiders reported to be good indicator for assessment of the biodiversity considering various environmental factors and its effects related to disturbances and conservation of biodiversity^[10 - 16]. Spiders were also found to serve sensible roles as biological agents for the control of crop pests, in particular, harmful insects^[17 - 18]. Spiders were documented as the most promising potential predators of the pest mosquito, bug, etc.^[19].

Daniel documented that, spiders play important roles in the presence of a specific habitat and are sensitive to habitat loss, climatic change and environmental modifications^[20]. Spiders are also found to be potential biological control agents in agroecosystem^[21]. The variety of agro ecosystems shows species abundance or composition of spiders^[22].

Some of the spider species has been observed on surface of freshwater, spending their some part of their life on water. Some species can dive and survive below water for a short time. But the true water spider live on whole aquatic existence and some can even tolerate under salt water^[23 - 24]. Number of aquatic and

semiaquatic spiders (*Araneidae*, *Nephilidae*, *Pisauridae*, *Sparassidae*, *Theraphosidae* and *Theridiidae*) hardly ever supplements their arthropod diet with small vertebrates including frogs, toads, salamanders, lizards, snakes, mice, rats, bats and birds^[25-27]. Photographic evidence supporting the existence of fish catching by 'fishing spiders' was documented^[28-30].

Taking in to account the above literature, attempt has been made to study the diversity of spiders from the study region so as to come up with changing environmental conditions and its influence on diversity.

MATERIALS AND METHODS

Collection

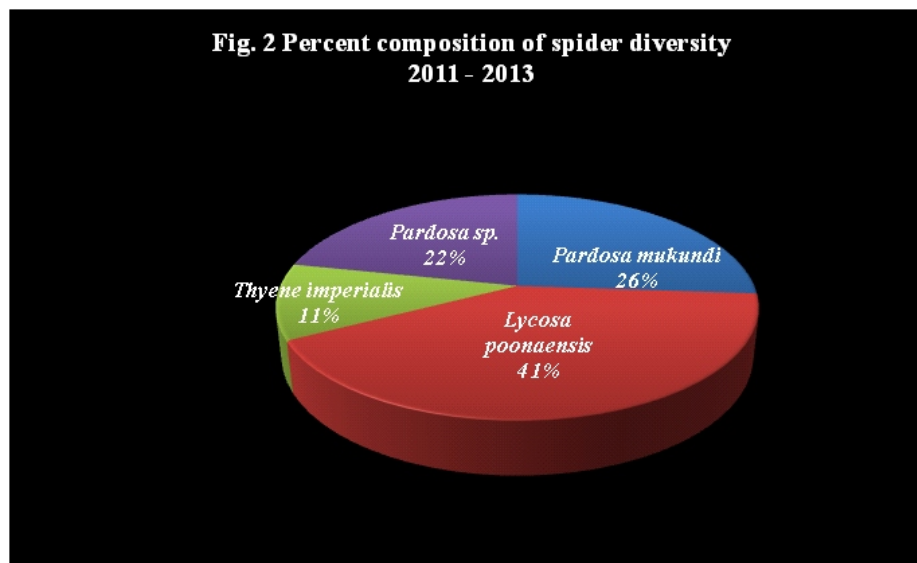
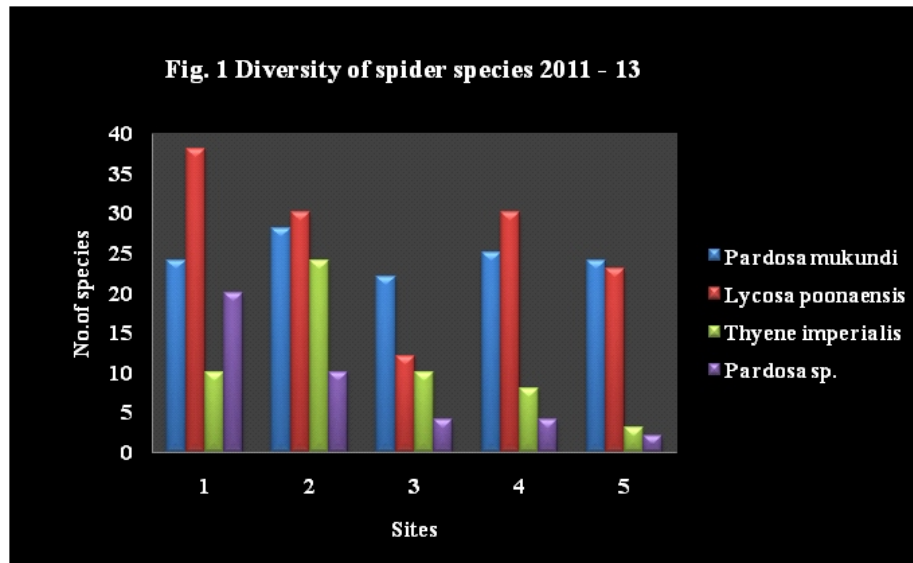
Spiders were collected by adopting standard sampling techniques such as sweep netting, beating sheets, active searching and hand picking from lentic sites i.e. Mhaishal lake, Mhaishal and Brahmanath Lake, Khanderajuri present in Miraj tahsil, district Sangli, Maharashtra. (Plate No. 1 and 2). The work was carried out in the morning hours between 7:00 am to 11:00 am. Collected specimens were preserved in 70% ethanol. After preservation specimen were sorted photographed, identified and labelled.

Identification

Identification of all specimens were noted by using the taxonomic keys published by Zoological Survey of India, (ZSI) Pune Ref. No.6-1/Tech/2015-16/.

RESULTS

Spiders are strongly influenced by habitat structure and microclimatic factors^[31]. Habitat requirements are different for every spider species, thus spider species composition may be an indicator of changes in habitat quality^[32 - 33]. Body of the spiders has benefit to the mankind as a valuable source of protein and flexible silk they produce for variety of uses^[34]. Worldwide number of toxic spiders was recorded with their typical behavior as skin punctures development of extreme pain develops. It can also affect nervous system. In severe cases patient may die^[34].



Work enlightens to the specificity and diversity of spiders with their potential role as bio indicators with in the region. Species noted during the study period were *Pardosa mukundi* (22%), *Lycosa poonaensis* (41%), *Thyeneimperialis* (11%) and *Pardosa species* (22%) (Fig. No 1 and 2). Present work showed that, quantitatively more number of spiders was recorded in rainy and summer season as compared to winter season. Supporting to this Anderson^[35] reported that, adult spiders could better withstand the dry season as that of small spiders. Janzen and Schoener^[36] documented that, both small and very large spiders seemed to less in number from mansoon to premonsoon. The seasonal activity of spiders was found affected by two important processes as reproduction and dispersal. Considering courtship behaviour of species time is the main factor affecting the activity, where particularly males found most active in their movements^[2].

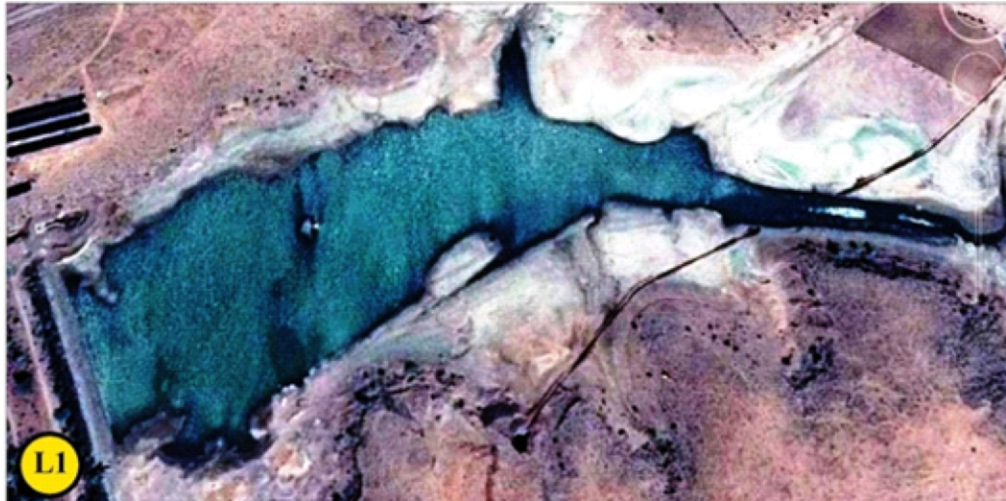
DISCUSSION

The important limiting factor during seasonal variations in year may be the availability of food. The dry season decrease corresponds to a period of low spider populations. The absence of spiders during the late wet season may be related to food supply as suggested by Lubin,^[37]. Even though flood, pathology decreases

the number of terrestrial species, riparian zones enlarge regional and global species diversity as a source of unusual habitats and species^[38]. The behavior of the spider species such as active hunting and air, ground, and water surface dispersal capacity enable spiders to settle in a newly emerged territory^[39-43].

The pioneering contribution on the taxonomy of Indian spiders found reported by European arachnologist^[44]. Reviews of available literature revealed that, the earliest contribution by^[45-47] were the pioneer workers of Indian spiders. They described many species from India. Tikader^[48] also published the first comprehensive list of Indian spiders, which included 1067 species belonging to 249 genera in 43 families. Gajbe,^[49] described 147 new spider species from different habitats of India. More,^[50] studied, diversity of spider fauna from Bannoli region of Koyna Wildlife Sanctuary. Keswani et al.,^[51] of Amravati University Arachnology laboratory documented 1686 species from 438 genera and 60 families from India. Patel,^[52] described 91 species belonging to 53 genera from Parabikulam Wildlife Sanctuary, Kerala. Silwal et al.,^[53] recorded 116 species from 66 genera and 25 families of spiders from Puma wildlife Sanctuary. Dunlop,^[54] studied Geological history and phylogeny of

Plate No. 1



L1 - Satellite view of Brahmanath lake



L1.a Brahmanath lake, Khanderajuri, Sangli, Maharashtra located at 16.89315N longitude and 74.79305E



L1.b: Brahmanath lake showing rocky shore



L1.c: Collection site of Brahmanath lake

Chelicerata; Bhat *et al.*,^[55] worked on seasonal diversity and status of Spiders (Arachnida: Araneae) in cashew ecosystem; Perveen and Jamal,^[56] presented Checklist of spider fauna of FR Peshawar, FATA, Pakistan; Wankhade *et al.*,^[57] studied diversity and abundance of spider fauna at different habitats of University of

Pune; Galle and Schweger,^[58] focused on Habitat and landscape attributes influencing spider assemblages at lowland forest river valley (Hungary);^[59] Fish Predation by Semi-Aquatic Spiders: A Global Pattern; Obuid-Allah *et al.*,^[60] presented a key for Identification of spiders at Qena Governorate, Upper Egypt.

Plate No. 2



L2: Satellite view of Mhaishal lake



L2.a Mhaishal lake located at 16°44'30.94"N longitude and 74°43'10.74" E latitude



L2.b Collection Site with algal blooms and surface water pollution.



L2.c Site showing source of domestic pollution.

Presence of suitable vegetation at the lentic sites may be the reason for abundance of the spiders. Their abundance and species composition are affected by the structural complexity of vegetation, giving their site preferences for building their webs^[61-65].

The annual and seasonal changes of the water level in a river

can influence abundance, species composition and dominance structure of spider^[66]. (Table no.1).

An increase in the spider population depends on prey availability and, if the density of prey becomes higher, spiders are expected to increase proportionally to some extent^[55]. It might be probable that climatic changes through seasons would control the

Plate. No. 3

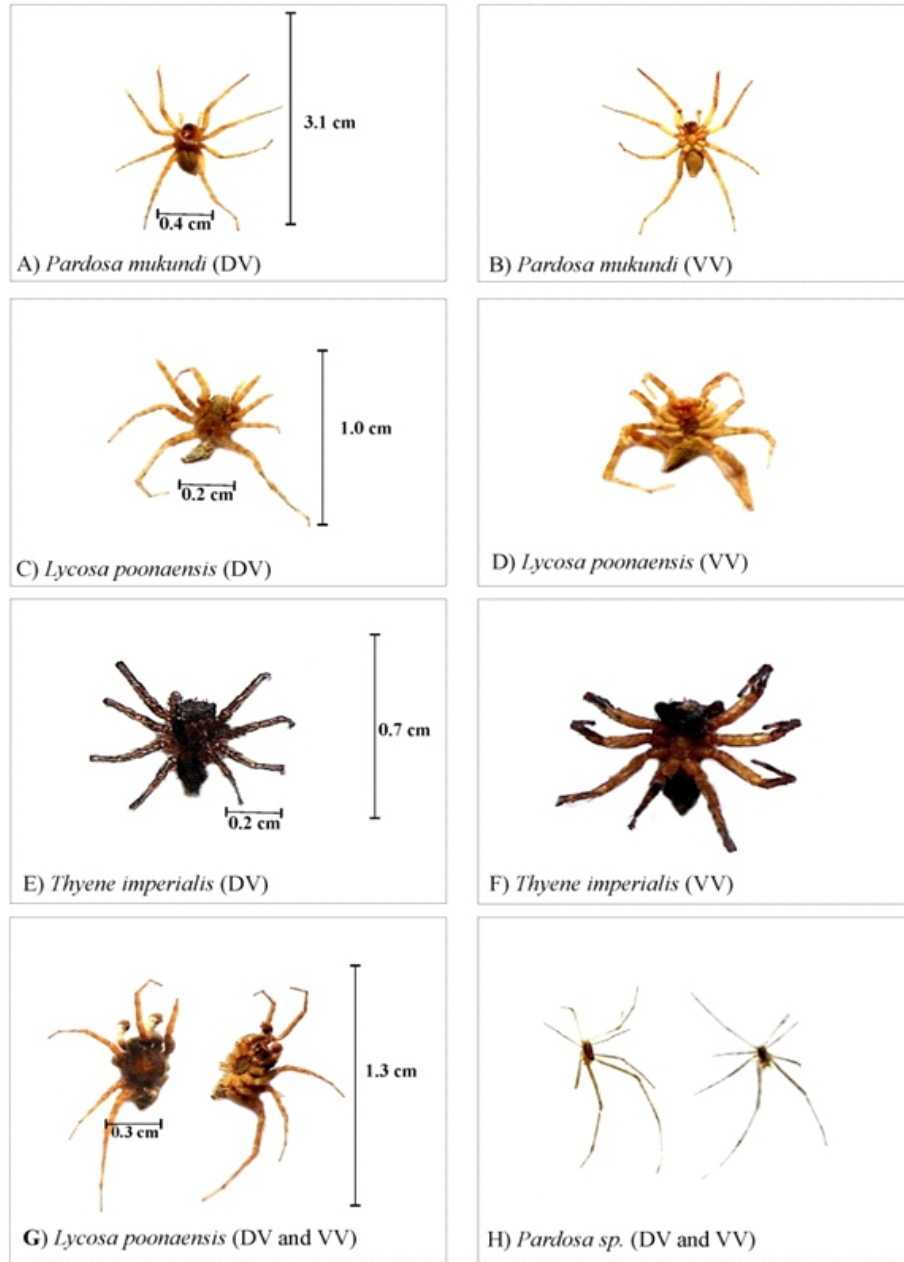


Table 1: List of Spider species with taxonomical classification

Sr.No.	Phylum	Class	Order	Family	Species
1.	Arthropoda (Chelicerata)	Arachanida	Araneac	Lycosidac	<i>Pardosa Mukundi</i> (Tikader and Malhotra, 1980)
2.	Arthropoda (Chelicerata)	Arachanida	Araneae	Lycosidae	<i>Lycosa poonaensis</i> (Tikader and Malhotra, 1980)
3.	Arthropoda (Chelicerata)	Arachanida	Araneac	Salticidac	<i>Thyene imperialis</i> (Rossi, 1846)
4.	Arthropoda (Chelicerata)	Arachanida	Araneac	Lycosidac	<i>Pardosa species</i> (C.L.Koch, 1847)

abundance of spiders^[67]. Most spiders are limited to a certain extent by environmental conditions. In general, different species have varying humidity and temperature preferences and are limited to those seasons which offer a climate within the range of their physiological tolerances^[68]. A recent study examining the effects of anthropogenic change on spider populations which found significantly greater concentrations of certain heavy metals in spider tissue, when compared to other Arthropods^[15]. (Plate no. 3: DV Dorsal view, VV Ventral View).

CONCLUSION

In the present work spider abundance was found to be more at lentic sites as compared to lotic sites. Also the diversity and abundance of spider were influenced by seasonal changes as rainy and summer season was found to be favorable for increase in population of spiders as compared to summer season. Hence the spider diversity is affected by habitat as well as seasonal changes.

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