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Research Article

Community composition and diversity of spider assemblages in relation to dry deciduous forest of Chandrapur district, India

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ABSTRACT

The tropical, dry deciduous forests of Chandrapur district provide a wide variety of natural ecosystems to the spider species, leading to spider diversity and abundance. Hence the spiders can be grouped into various ecological guilds, based on the foraging mode as orb weavers, space web builders, sheet web builders, ambushers, ground runners, foliage runners, stalkers etc. The present investigation, therefore, has an interdisciplinary approach that will undertake a comprehensive and holistic study of spider diversity along with the plant diversity. Well established sampling protocols for spider collections were adapted in different selected sampling plots from Chandrapur district. The present study reveals the occurrence of 21 different families, 57 genera and 90 species. Out of total spider species recorded, about 43% were found orb weaver, 17% stalker, 14% ground runner, 13% ambusher, 8% foliage runner, 3% space web builder and 2% were sheet web builder. Occurrence of high number of Araneids could be due to mixed vegetation of the forest which provides enough space to build web of different size and protection from their predators. The forest is dry deciduous and rich in shrubs as understory habitats resulting into more number of Salticides and Lycocides which are stalker in guild. Moderate numbers of Thomicides found in this region is due to availability of flowering plants with deep vegetation in forest area.

Key word: Spider diversity, Tropical dry deciduous forest, Araneidae, Lycocidae, Salticidae.

INTRODUCTION

Spiders comprise a predominant group of insect in forest and other ecosystem and play a very important role in the ecology by being extensively predatory and regulate insect population. Similarly spiders are an important food source for many vertebrate animals (Sawane, 2016). Ground dwelling spiders may be important in transferring energy directly from the bellow ground detritus food web to the above ground terrestrial food web comprising of familiar birds, reptiles, amphibians and mammals (Johnston, 2000).

In spite of several applied values mentioned above, spiders have received cursory attention. In conservation efforts, often 'Charismatic' species like birds and mammals draw most attention and ecologically significant groups like spiders are often neglected (Rajshekhar and Raghavendra, 2002). Hence the attempt has been intended to provide maiden checklist of spiders and foraging guilds in the tree, shrubs, grass-layers and ground-layer from different regions of Chandrapur district. The habitat structure and prey availability in combination may play significant roles in structuring the spider community of forest canopies (Juraj Halaj, 1998). The information on these issues with reference to Chandrapur District in particular is still lacking.

Many good accounts on spider fauna of various regions of the world are available from longtime. A general description of spiders from all over the world has been provided by Preston-Mafhan and Preston-Mafhan (1986). Thorell (1895) published a descriptive catalogue of about 200 species from Burma. The first detailed account of Indian spiders was provided by Pocock (1900) which listed 216 spider species under 17 families while, the most comprehensive description on Indian spiders is made by Tikader (1987). Two of the earliest contributions on Indian spiders were made by Stoliczka (1869) and Karsch (1873).

According to World spider catalogue version 23.0 currently 49657 spider species reported worldwide (World Spider Catlogue, 2022), while as per Caleb & Sankaran (2021) presently 1875 species under 478 genera in 61 families are known from India (Tikader 1987, Siliwal et al., 2005, Sebestian & Peter, 2009 & Keswani et al., 2012). A comparative study of the global spiders' catalogue reveals the need to study the spider diversity in India in depth.

Relevant and recent studies on spider diversity and vegetation structure have been made by Štokmane, and Spuņģis, (2016), Griotti, *et al.,* (2017), Cardoso *et al.,* (2011), Dragan and Schuldt, (2021), Dimitar and Gustavo (2021), Hu et al., (2022), Lia and Hindayana, (2022). Munevar et al., (2022).

MATERIALS AND METHOD

Chandrapur district is located in eastern edge of Maharashtra, at the boundary of Andhra Pradesh and geographically located between North Latitude 18-4 to 20-5 (19.57') to East Longitude 78-5 to 80-6 (79.18') with total area of 11443 Sq. Km. Chandrapur district having dry deciduous forest area of 3810 Sq. Km. with rich biodiversity and harbors divers flora and fauna. The description of the different locations of the study area is shown in Table-1 and forest habitat characterization of Chandrapur District is revealed in (Table 2).

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Table 1. Geographical Locations of study area from Chandrapur District.

Sl. No.	Name of the Location	Taluka	Geographical Coordinates
1	Ghodazari Forest	Nagbhir	20°31'55.30"N 79°38'57.12"E
2	Gondpipari Forest	Gondpipari	19°43'45.70"N 79°41'58.41"E
3	Jiwati Forest	Jiwati Taluka	19°40'3.73"N 79°3'47.40"E
4	Jogapur Forest	Rajura	19°45'19.30"N 79°25'46.69"E
5	Junona Forest	Ballarpur	19°55'48.29"N 79°23'47.03"E
6	Khambada Forest	Warora	20°26'37.99"N 78°59'28.67"E
7	Mendhaki (Gangalwadi) Forest	Bramhapuri	20°28'23.39"N 79°51'22.41"E
8	Murpar Forest	Chimur	20°31'25.09"N 79°17'32.49"E
9	Nawkhala Forest	Nagbhir	20°35'25.90"N 79°40'26.72"E
10	Pathari Forest	Sindewahi	20°14'4.40"N 79°44'54.55"E
11	Salori Forest	Warora	20°17'18.98"N 79° 3'22.86"E
12	Satbahini Forest	Nagbhir	20°30'32.05"N 79°34'44.10"E
13	Sawalhira Forest	Korpana	19°40'45.17"N 78°57'42.00"E
14	Somnath Forest	Mul	20° 7'56.24"N 79°37'7.42"E
15	Temurda Forest	Warora	20°22'3.16"N 79°0'48.92"E

Spiders are recorded from different selected area (Table-1) of the Chandrapur district, which includes riparian habitat, grassland, dry deciduous forest, mixed forest with tall trees, shrubs, and bamboos. Survey is also carried out for ground spiders, spiders from decaying barks of tree, debris, and crevices of rocks.

Well established sampling protocols for spider collections are adapted in different selected sampling plots like pitfall trapping, sweep netting, ground hand collection, aerial hand collection, vegetation beating and litter sampling. The collections are made during early morning hours (8 to 11 hrs) and daytime (16 to 18 Hrs.).

The adult spiders were identified to family level using available literature (Tikader, 1987; Sebestian and Peter, 2009) and identification of plants up to genus level was carried out by following standard literature (Puri & Patil, 1960; Pradip 2013 and Moghe 1992).

RESULTS AND DISCUSSION

Chandrapur district forest habitat characterization reveals that it is tropical dry deciduous forest having laterite, grey black soil type with humidity between 45 to 70 % and average temperature was 24^0C to 42^0C (Table -2). This diverse and healthy environment of Chandrapur district provides habitat for 35% of the total spider families from Maharashtra which includes 90 species from 57 genera (Table-3, Figure-1) and 56 plant species which includes tree, small tree, shrub, herb and climbers (Table-4).

Table 2. Chandrapur District Forest Habitat Characterization

Soil Type	Average Temperature	Humidity	Forest
Laterite, Grey, Black	24^0C to 42^0C	45% to 70%	Tropical, Dry deciduous

Table 3. Foraging mode and Checklist of Spiders Reported during March 2011 to Feb 2014 from Chandrapur District, Maharashtra

Foraging mode	Family	Genus	Species
		13	34
		Arachnura	angura ♀.
		Araneus	ellipticus ♀.
			mitifica ♀.
		Argiope	aemula ♀.
			anasuja ♀.
		Chorizopes	kastoni ♀.
			khanjanes ♀.
		Cyclosa	bifida ♀., ♂.
			confraga ♀.
			hexatuberculata ♀.
			insulana ♂.
			moonduensis ♀.
			mulmeinensis ♀.
			neilensis ♀.
			spirifera ♀.
		Cyrtarachne	bengalensis ♀.
	1. Araneidae		bidenta ♀.
		Cyrtophora	cicatrosa ♀.
			citricola ♀.
			moluccensis ♀.
Orb weavers		Eriovixia	excels ♀.
		Gea	spinipes ♀.
		Larinia	chloris ♀.
			emertoni ♀.
		Neoscona	bengalensis ♀.
			molemensis ♂.
			mukerjei ♀. , ♂.
			nautica ♀., ♂.
			pavida ♀.
			rumpfi ♀.
			sinhagadensis ♀.
			theis ♀.
		Poltys	nagpurensis ♀.
		Zygiella	indica ♀., ♂.
		1	1
	2. Nephilidae	Nephila	pilips ♀, ♂
		2	1
	3. Uloboridae	Uloborus	danolius ♀, ♂.
		Zosis sp. ♀.	
		2	2
	4.Tetragnathidae	Leucauge	decorata ♀.
		Tetragnatha	mandibulata ♀, ♂.
		2	2
	5. Pholcidae	Artema	atlenta ♀.
Space Web Builder		Pholcus	phalangioides ♀.
		1	1
	6. Theridiidae	Theridion	manjithar ♀.
		1	1
	7. Eresidae	Stegodyphus	sarasinorum ♀, ♂.
Sheet Web Builder		1	1
	8. Oecobiidae	Oecobius	marathaus ♀.

Table 3. continued in next page

	9. Philodromidae	3 Philodromus Thanatus Tibellus	3 decoratus ♀. dhakuricus ♀. elongates ♀.
	10. Pisauridae	2 Pisaura Thalassius	2 gitae ♀. marginellus ♀.
Ambusher	11. Sparassidae	2 Heteropoda Olios	2 venatoria ♀ ♂. milleti ♀.
	12. Thomisidae	4 Oxylate Thomisus Tmarus Xysticus	4 elongate ♀. viveki ♀. jabalpurensis ♀. bharatae ♀.
Ambusher & Stalker	13. Sicariidae	1 Loxosceles	1 rufescens ♀.
	14. Gnaphosidae	3 Calliepis Gnaphosa Zelotes	3 rukhminiae ♀. poonaensis ♀, ♂. poonaensis ♀.
Ground Runner	15. Lycosidae	5 Arctosa Evippa Hippasa Lycosa Pardosa	8 indica ♀. Shivaji ♀, ♂. madhuae ♀. pisaurina ♀. bistriata ♀. poonaensis ♀, ♂ mukundi ♀. sumatrana ♀.
	16. Scytodidae	1 Scytodes	2 alfredi ♀. thoracica ♀.
Foliage Runner	17. Clubionidae	1 Clubiona	5 acanthochemis ♀. analis ♀., ♂. drassodes ♀. filicate ♀. tikaderi ♀.
	18. Hersiliidae	1 Hersilia	1 savignyi ♀, ♂
	19. Miturgidae	1 Cheiracanthium	1 poonaensis ♀.
	20. Oxyopidae	2 Oxyopes Peucetia	6 bharatae ♀. burmenicus ♀. pawani ♀ shwetae ♀. jabalpurensis ♀. viridana ♀.
Stalker	21. Salticidae	8 Hasarius Hyllus Marpissa Myrmarachne Phintella Plexippus Rhene Telamonia	9 adansoni ♀. semicupreus ♀. decorata ♀. singhi ♀. orientales ♀,♂. vittata ♀. paykullii ♀. indica ♀. dimidiata ♀.
Total	21	57	90

♂: Male spider species, ♀: Female spider species

Figure-1: Graph showing species diversity of spiders reported during March 2011 to Feb 2014 from Chandrapur District.

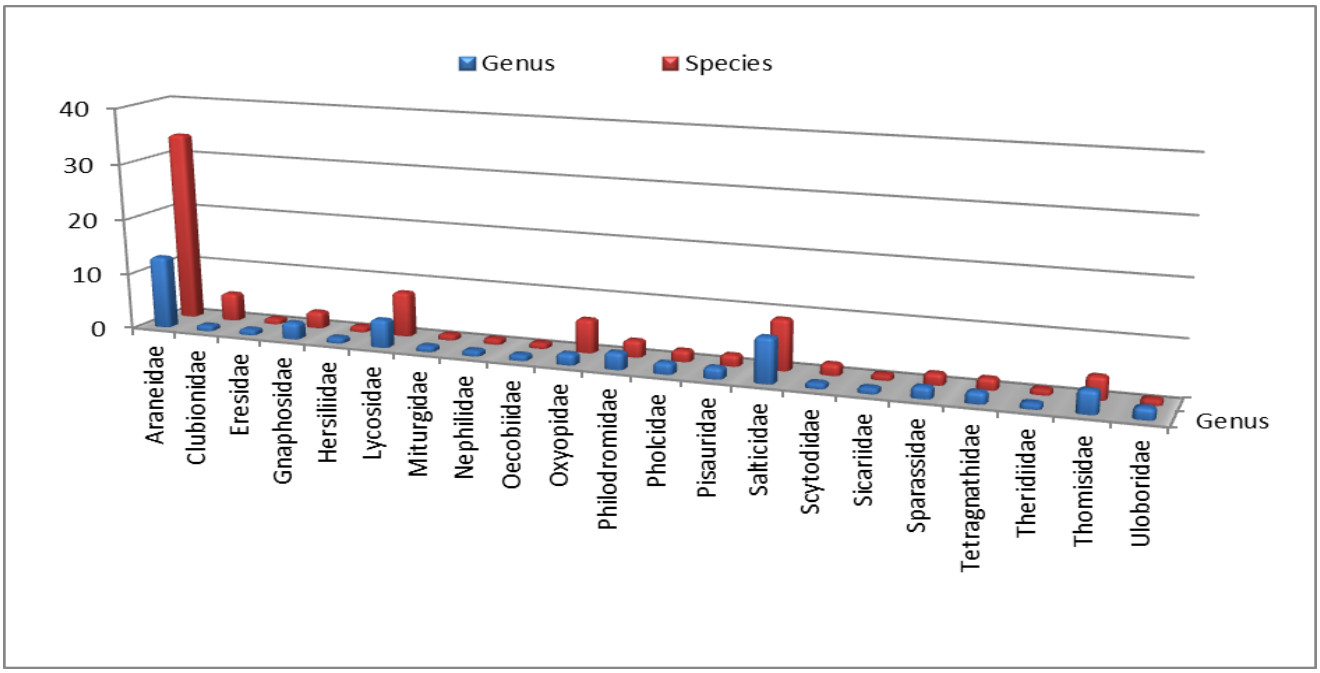

Figure 1. Family-wise distribution of spiders reported from Chandrapur District, Maharashtra, India

Table 4. Checklist of Plants from study area from Chandrapur District

	Plant Name	Type
1	Acaccia chundra	Tree
2	Acaia nilotica	Tree
3	Aegle marmelos	Tree
4	Albezia lebbak	Tree
5	Andrographis paniculata	Herb
6	Anogeissus latifolia	Tree
7	Azadiracta	Tree
8	Bauhinia vareigata	Tree
9	Baunia tomentosa	Tree
10	Biophytum sensitivum	Herb
11	Bombax ceiba	Tree
12	Boswelia serrata	Tree
13	Buchnania cochinchinesis	Tree
14	Buchnania lanzan	Tree
15	Butea monosperma	Tree
16	Butea superba	Climber
17	Calicopteris floribunda	Climber
18	Canthium	Tree
19	Carea arborea	Tree
20	Cassia fistula	Tree
21	Cassia pussila	Herb
22	Chlorophytum laxum	Herb
23	Chloroxylon sweitenia	Herb
24	Clestanthus collinus	Tree
25	Curcilago orchiodes	Herb
26	Desmodium gangeticum	Shrub
27	Dyospirus melanoxylon	Tree
28	Evolvulus alsinoides	Herb
29	Gardenia latifolia	Tree

30	Gardenia resinifera	Shrub
31	Grewia asiatica	Tree
32	Habenaria sp.	Herb
33	Helicteres isora	Shrub
34	Hemidesmus indicus	Climber
35	Hollarheana pubescence	Tree
36	Ixora sp.	Tree
37	Lagerstroemia parviflora	Tree
38	Lannae coromandelica	Tree
39	Lantana camara	Shrub
40	Madhuca longifolia	Tree
41	Mitragyna parviflara	Tree
42	Mytenus emerginata	Small Tree
43	Phoenix sylvestris	Tree
44	Pterocarpus marsupium	Tree
45	Scilla hycinthiana	Herb
46	Semecarpus anacardium	Tree
47	Soymida febrifuga	Tree
48	Soymida febrifuga	Tree
49	Tectona grandis	Tree
50	Terminalia allata	Tree
51	Terminalia belerica	Tree
52	Terminalia tomentosa	Tree
53	Tridax procumbenes	Herb
54	Vanda tsesellata	Herb
55	Wrightia tinctoria	Tree
56	Zizypus oenophilia	Shrub

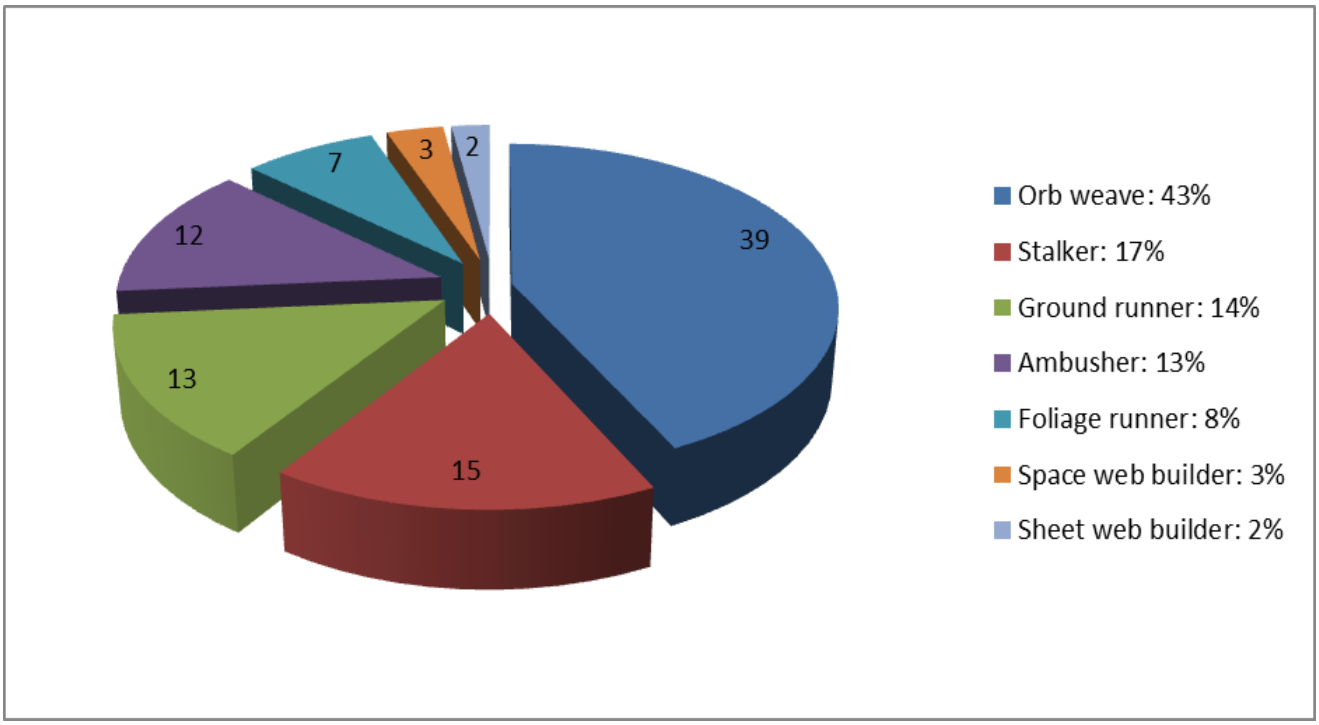

Figure 2. Comparative density of spiders on the basis of foraging from Chandrapur district during the year 2011-14.

The spiders reported from Chandrapur district can grouped in various ecological guilds, based on the foraging mode as orb weavers, space web builders, sheet web builders, ambushers, ground runners, foliage runners, stalkers etc. Out of total spider species recorded, about 43% were found orb weaver, 17% stalker, 14% ground runner, 13% ambusher, 8% foliage runner, 3% space web builder and 2% were sheet web builder (Figure-2).

Among these 21 families the most dominant family was Araneidae with 34 genera. Family salticidae is represented by 8 genera and 9 species, followed by lycocidae with 5 genera and 8 species and family Thomicidae by 4 species and 4 genera. Three genera and three species were recorded from family Gnaphocidae and family Philodromidae. Six families were recorded 2 genera and 2 species, among which Family Oxypidae shows 6 species. There are 9 families with single genera and single species only family clubionidae with 5 species. Checklist of the plant species from different study area from Chandrapur district is prepared, 56 plant species which includes trees, shrubs, herbs and climbers were reported (Table2).

CONCLUSION

In natural systems, insect diversity and abundance are often positively correlated with plant diversity) (Wenninger, and Inouye 2008. Occurrence of high number of Araneids could be due to mixed vegetation of the forest (Table-3) which provide enough space to build web of different size and protection from their predators, these finding are in corroboration with Bhatkar, 2011. Large numbers of Thomicidae and Araneids found in this region is due to availability of flowering plants with deep vegetation in forest area. The forest is dry deciduous and rich in shrubs as understory habitats resulting into more number of Salticides and Lycocides which are stalker in guild.

The diversity of web building spiders (Araneides, Oxypides) was higher in vegetation that supports a heterogeneous population of tree and shrubs and climbers these finding are in corroboration with the studies carried out by Bhatkar (2011) in Wan Sanctuary, Melghat Tiger Reserve and Lia and Hindayana (2022) in Bogor, West Java, Indonesia.

In grassland vegetation signature spider (Argiope sp.) and oxypides is predominant species similar observations reported by Gajbe (2004), while, and in three tire forested areas *giant wood spider* (Nephila sp.) were more dominant, healthy and more numbers of Nephila speices were found in forested area of Shrilanka by Tharaka et al (2019). The diversity of ground dwellers (Salticides & Lycosides) was higher in grassland, leaf litter and leaf foliage, similar conclusions were observed by Labanon et al (2020) in experimental Forest Area, Upper La Paz, Zamboanga City, Philippines .

The ant spiders (Family Miturgidae) was typically predominant on small trees and shrubs and plant litters that have fallen on the ground. Barton *et al*., (2017) highlighted the importance of the spatial proximity of microhabitat structures in driving assemblage turnover and Miturgidae richness at trees.

The crab spiders (Family Thomicidae, Family Philodromidae) were common in inflorescence and flowers of herbaceous plants eg. Habenaria, Chlorophytum, Helectoris and Wrightia. Members of these families are well known as flower crab spiders, conclusion drawn by Singh & Singh (2021) is in corroboration with present work. The genus Oxyope, Pucetia and Oxytate were more common in shrub lands and thick, gregarious grass lands.Spiders from Family Oxyopidae actively jump over the prey for feeding which is commonly called as stalker, hence more common in shrub land and grass land (Sebestian et al., 2017).

The present study has proved invaluable as it has helped in creating a specimen bank of good numbers of spider specimen from Chandrapur district for the first time. Several species of spiders are photographed and the digital database is created for the first time for Chandrapur district.

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REFERENCES

Batron S. Philip, Evans I. Maldwyn, Foster N. Claire, Cunningham A. Saul and Manning D. Adrian (2017). Environmental and spatial drivers of spider diversity at contrasting microhabitats. Austral Ecology (2017), A Journal of Ecology in the Southern Hemisphere, 42, 700–710.

Bhatkar, N.V. (2011) Spider diversity in the Wan Sanctuary of Melghat Tiger Reserve. Electronic Journal of Environmental Science Vol.4: 31-38

Caleb, J.T.D. & Sankaran, P.M. (2021). Araneae of India. Version 2021, online at http://www.indianspiders.in.

Cardoso P, Pekár S, Jocqué R, Coddington JA (2011) Global Patterns of Guild Composition and Functional Diversity of Spiders. PLoS ONE 6(6): e21710. https://doi.org/10.1371/journal.pone.0021710

Dimitar Dimitrov and Gustavo Hormiga 2021. Spider Diversification Through Space and Time. Annual Review of Entomology. Vol. 66:225-241 (Volume publication date January 2021) https://doi.org/10.1146/annurev-ento-061520-083414https://doi.org/10.1146/annurev-ento-061520-083414

Dragan Matevski, Schuldt Andreas, 2021. Tree species richness, tree identity and non-native tree proportion affect arboreal spider diversity, abundance and biomass. Forest Ecology and Management, Volume 483, 2021, ISSN 0378-1127.

Gajbe P.U. (2004) Spiders of Jabalpur Madhya Pradesh (Arachnida:Araneae), Rec. Zool. Surv. India. Occ. Paper No 227.

Griotti, Mariana & Muñoz-Escobar, Christian & Ferretti, Nelson. (2017). Linking Vegetation Structure and Spider Diversity in Riparian and Adjacent Habitats in Two Rivers of Central Argentina: An Analysis at Two Conceptual Levels. Environmental entomology. 46. 10.1093/ee/nvx094.

Hu, W., Mei, Z., Liu, Y., Yu, Z., Zhang, F., & Duan, M. (2022). Recovered grassland area rather than plantation forest could contribute more to protect epigeic spider diversity in northern China. Agriculture, Ecosystems & Environment, 326, 107726. doi.org/10.1016/j.agee.2021.107726

Johnston J. M. (2000). The contribution of microarthropods to above ground food webs: A review and model of belowground transfer in coniferous forest. American Midland Naturalist 143 pp 226-238.

Juraj Halaj, Darrell W. Ross and Andrew R. Moldenke (1998) Habitat Structure and Prey Availability as Predictors of the Abundance and Community Organization of Spiders in Western Oregon Forest Canopies. Journal of Arachnology, Vol. 26, No. 2 (1998), pp. 203-220 http://www.jstor.org/pss/3706159.

Karsch E. (1873) Verzeichniss westfalischer spinnen (Araneiden) Verh.Naturh, Ver. Preuss.Rhem. Westfal 10 pp 113-160.

Keswani, S.P., Hadole, P. and Rajoria, A. (2012). Indian Journal of Arachnology,1 (1), ISSN 2278-1587 (online) pp001-129.

Labanon O. Kirstin Kaye and Nuñeza M. Olga (2020). Species Diversity of Salticid Spiders (Araneae: Salticidae) according to Elevation and Vegetation Type in Western Mindanao State University – Experimental Forest Area, Upper La Paz,Zamboanga City, Philippines. Bulletin of Environment, Pharmacology and Life Sciences Bull. Env. Pharmacol. Life Sci., Vol 9[5] April 2020 :53 -64 ©2020 Academy for Environment and Life Sciences, India Online ISSN 2277-1808 Journal's URL:http://www.bepls.com

Lia, M., Rauf, A., & Hindayana, D. (2022). Comparisons of the composition of spider assemblages in three vegetation habitats in Bogor, West Java, Indonesia. Biodiversitas Journal of Biological Diversity, 23(1).

Moghe R.P. (1992) Flora of Chandrapur and Gadchiroli District. Ph.D. Thesis, Nagpur University Nagpur. Maharashtra State, India.

Munévar, A., Cardoso, P., & Zurita, G. A. (2022). From forest to forestry: Reassembly of spider communities after native forest replacement by pine monocultures. Ecological Entomology. DOI:10.6084/m9.figshare.14758773.

Pocock R. I. (1900). The fauna of British India including Ceylon and Burma, Secretary of state for India in Council, London, pp 279.

Pradip Krishen (2013), A field guide for tree spotters Jungle trees of central India, Penguin Book India, Pvt. Ltd. 7th floor, Infinity Tower, Cyber City Gurgaon 122002, India

Preston-Mafham R. and Preston-Mafham K. (1984). Spiders of the world. Blandford Press Ltd. Dorset, UK. Pp 191.

Puri G.S. and Patil R.M. (1960), Study of evergreen vegetation of Maharashtra. Bull. Bot. Survey. India Vol.2 Calcutta.

Rajshekhar K.P. and Raghavendra N. (2002). An overview of spider diversity in India. http://wiienvis.nic.in/rain-forest/chapter7

Sawane A. P. (2016), Diversity and distribution of spiders (Arachnids: Aranae) from Chandrapur District, Maharashtra, India. Online International Interdisciplinary Research Journal, {Bi-Monthly}, ISSN 2249-9598, Volume-VI, Issue-I, Jan-Feb 2016 Issue

Sebastian P.A. and Peter K.V. (2009) Spiders of India, First Edison, University Press, Hyderabad.

Sebastian P.A., Sudhikumar A. V., Mathew M. J. and Sunish E. (2017) Diversity of spiders (Araneae) in the Western Ghats – an overview. In book: Invertebrate diversity and conservation in the Western Ghats (pp.235-247) Chapter: Diversity of spiders (Araneae) in the Western Ghats – an overview Publisher: ATREE, Bangalore Editors: Priyadarsanan Dharma Rajan, Soubadra Devy, Aravind Madhyastha, Subramanian, K. A., and Seena Narayanan

Siliwal Manju , Sanjay Molur and B.K. Biswas (2005). Indian spiders (Arachnida: Araneae): Updated checklist 2005. ZOOS' PRINT JOURNAL 2 0 (10): 1999-2049 ISSN 0973-2535 (Print edition); 0973-2551 (Online edition)

Singh Rajendra & Singh Garima (2021) Diversity and distribution of crab spider (Thomisidae:Araneomorphae:Araneae:Arachnida) in India. International Journal of Zoology and Applied Biosciences ISSN: 2455-9571, Volume 6, Issue 3, pp: 132-161, 2021 http://www.ijzab.com https://doi.org/10.5281/zenodo

Štokmane, M. & Spuņģis, V., 2016. The influence of vegetation structure on spider species richness, diversity and community organization in the Apšuciems calcareous fen, Latvia Animal Biodiversity and Conservation 39.2 (2016) © 2016 Museu de Ciències Naturals de http://wsc.nmbe.ch, accessed on {13.04.2022}. doi: 10.24436/2

Barcelona ISSN: 1578–665 X eISSN: 2014–928 X

Stoliczka F. (1869). Contribution towards the knowledge of Indian Arachnoidea. J. Asiat. Soc. Beng. 38(2) pp 201-251.

Tharaka Wijerathna, Dilini Tharanga, Inoka C. Perera, Mayuri R. Wijesinghe (2019). Effect of Habitat Change on the Web Characteristics and Fitness of the Giant Wood Spider (Nephila pilipes) in Sri Lanka. International Journal of Zoology, Vol 2019 Article ID 6395015, 6 pages 2019. Htt://doi.org/10.1155/2019/6395015

Thorell T. (1895). Descriptive catalogue of the spiders of Burma. London 1-406.

Tikader B. K. (1987). Handbook of Indian spiders, Zoological survey of India, pp 251.

Tikader B. K. (1987). Handbook of Indian spiders, Zoological survey of India, pp 251.

Wenninger E.J. and Inouye R.S. (2008) Insect community response to plant diversity and productivity in a sagebrush–steppe ecosystem. Journal of Arid Environments, Volume 72, Issue 1, January 2008, Pages 24-33.

World Spider Catlogue (2021). World spider catlog, Natural History Musium Bern, Online at http://wsc.nmbe.ch, Version 22.5, 2021

World Spider Catalog (2022). World Spider Catalog. Version 23.0. Natural History Museum Bern, online at http://wsc.nmbe.ch, accessed on {13.04.2022}. doi: 10.24436/2