

The Study of Habit, Habitat, Web Pattern and Parental Care in *Herennia multipunctata* (Arachnida: Araneae) from Sahyadri Tiger Reserve

Suvarna More¹, Swapnil Patil²

¹Department of Zoology P. V. P. Mahavidyalaya Kavathe Mahankal, Dist-Sangli
E Mail: [suvarnam446\[at\]gmail.com](mailto:suvarnam446[at]gmail.com)

²Department of Botany P. V. P. Mahavidyalaya Kavathe Mahankal, Dist-Sangli
E Mail: [swapnilpatil2151\[at\]gmail.com](mailto:swapnilpatil2151[at]gmail.com)

Abstract: Diversity of spiders from Sahyadri Tiger Reserve is unique and is one of the important protected areas of the Maharashtra State, located in the Western Ghats. The Sahyadri Tiger Reserve is home to several species rich endemic flora and harbors different species of fauna. From the study area we studied the, habit, habitat, web pattern and parental care of coin spider, *Herennia multipunctata* (Doleschall 1859) also called as ornamental tree trunk spider. Most of the area of Sahyadri Tiger Reserve is dense semi-evergreen forest with a wide range of flora. The spiders *Herennia* from Family araneidae are the characteristic spider with a specific plant habitat. Its habit is the trunks of the trees. This spider harbors the trees like, *Dalbergia latifolia* (Shisham), *Tectona grandis* (Sag) *Terminalia arjuna*, *Acacia mangium*, *Terminalia elliptica* (crocodile bark) and some times *Mangifera indica* tree. Web pattern is unique one. The web of adult *Herennia* species is as a ladder-like in that it consists of vertically elongate parallel lines joined by multiple horizontal cross-lines with a solid silk. The hub-cap retreat incorporated into the web. So far no body has worked out or studied the habit, web pattern and parental care of *H. multipunctata* from this area and hence we have to decide to explore the diversity and unique characters of spider from this area.

Keywords: Habit, Habitat, Web,, Sahyadri Tiger Reserve and *H. multipunctata*.

1. Introduction

The Sahyadri Tiger Reserve is located in the Sahyadri Ranges of the Western Ghats of Maharashtra. Sahyadri Tiger Reserve is a reserve in the state of Maharashtra., this constitute rich evergreen, semi-evergreen and moist deciduous forests. These ranges form a common boundary between Maharashtra, Karnataka and Goa. It is the first Tiger Reserve of Western Maharashtra and 4th Tiger Reserve of Maharashtra State spreading over two Protected Areas those of the Koyana Wildlife Sanctuary and Chandoli National Park of 741.22 sq. kms. and adjoining area in the landscape 424.34 sq. kms, total of 1165.56 Sq. Kms. Chandoli National Park is located near the Chandoli Dam between longitudes 73°40' and 73°53' E and latitudes 17°03' and 17°20'N near Sangli in Western Maharashtra. It is located at the junction of four districts, Sangli, Kolhapur, Satarat and Ratnagiri District. It lies between the Koyna Wildlife Sanctuary and Radhanagri Wildlife Sanctuary and forms the southern part of the Sahyadri Tiger Reserve. [32] The spiders are known to occupy nearly every terrestrial habitat and are found all over the world. Many spider species are not yet known to science. The occurrence of major spider families and their relative abundance were studied in the central Western Ghats by Rajashekhar K. P. and Raghavendra N. [22]. The ecological development of these types is attributed to various climatic, edaphic, and topographic factors. However biotic factors play a significant role depending upon their frequency and intensity. In the Western Ghats the intensity of these factors varies from place to place.

Spiders comprise one of the largest orders of animals. The spider fauna of India has never been studied in its entirety despite of contributions by many arachnologists [27]. Review of available literature reveals that the earliest contribution and the pioneer workers of Indian spiders [2, 11, 29]. They described many species from India. Tikader (1987) also published the first comprehensive list of Indian spiders, which included 1067 species belonging to 249 genera in 43 families from the last three decades [31]. Gajbe described 147 new spider species from different habitats of India. [6, 7]. Bristowe (1941) fondly recalled that *Herennia* spider were common in Southern Siam [3]. The *H. multipunctata* is an interesting study model. It is an obligate arboricole because it is obliged to live on tree trunks as a result of evolutionary specialization although it can also utilize alternative habitats that often analogous structural opportunities. (Timothy C. Hawes 2015) [28]. Ladder web of *Herennia* is made up of the vertical dimension exceeds the horizontal dimension to the extent that their shape resembles a ladder. The first description of this web type has been traditionally attributed to Robinson & Robinson (1972) [24]. So far nobody has worked out or studied the spider fauna of Sahyadri Tiger Reserve and hence we have decided to explore the spider diversity from this area. Recently Western Ghats is declared as world heritage site. The main geological formation of the area is the Deccan trap. The area prevails humid and moderate climate and heavy rainfall. *Herennia* show different, yet homologous ladder webs (Robinson & Lubin, 1979; Kuntner, 2005, [23, 13]. The ladder web have been identified in number of unrelated families and genera by Eberhard, 1975, Stowe 1978, Robinson and Lubin 1979, Forster and Rorster 1985, Kuntner et. al, 2008, a, b 2010, Harmer and Frambnau 2008, Harmer 2009. [4, 26, 23, 5, 17,

18, 19, 25, 8, 9]. They are a particular interest because of their unusual architecture (Eberhard 1975, Robinson and Lubin 1979, Forster and Rorster 1985) [4, 23, 5] and interaction with substrate (Kuntner et. al 2010) [19] and prey specialization (Eberhard 1975, Stowe 1978) [4, 26] and as a model for the plasticity of the web templet (Harmer and Framenau 2008, Harmer 2009, Harmer and Herberstein 2009). [8, 9, 10]. Simon 1894 described *Herennia* webs in Sri Lanka as stretched, orbicular webs also he emphasize the ornateness of *Herennia* webs [25]. The first description of ladder webs as we know today came from Oates (Thorell 1895) [29]. Kuntner et al., 2008b; Kuntner & Agnarsson, 2009 studied the web shape [18, 15] and the presence of a hub-cup and a retreat; Kuntner, 2005, Kuntner et al., 2008a, b [13, 17, 18].

2. Materials and Methods

The techniques used for spider study was visual search. The study was carried out during early morning hours (6 hours to 9 hours) and day time (16 hours to 18 hours), from different parts of the tree trunks with sharp eye vision. This spider harbors the trees like, *Dalbergia latifolia* (Shisham), *Tectona grandis* (Sag) *Terminalia arjuna*, *Acacia mangium*, *Terminalia elliptica* (crocodile bark) and some times *Mangifera indica* tree. These trees were identified and spider systematic nomenclature follows by Platnick 2013 [21] and the World Spider Catalog (2021). They were photographed as in their natural conditions. And studied and identified mainly on the basis of morphological characteristics, epigyne and or palp structure after carrying out the necessary literature [12, 1, 30, 31, 20]. The details of body parts of specimens were examined under a good quality stereo zoom microscope. The identification of species was carried out by the comparison of morphological features with the help of published literature, standard books and field guides.

3. Results and Discussion

Herennia is a genus of spiders in the family Araneidae, found from Western ghats. Spiders in this genus are sometimes called coin spiders. It is found in dry environment in tree trunks or barks. It was formerly placed in a separate family, Nephilidae. Easily identified with the presence of hard abdomen with innumerable invaginations dorsally. Dorsally the carapace is flat, broad posterior. Carapace is bordered with mottled white markings. Legs are long with sharp spines, tarsus bears claws for attachment. The third pair of legs is short than the other three pairs. Abdomen is tapered proximally, broad in the middle and pointed distally with minute sharp outgrowth. Abdomen possess large black spots. Eight eyes present, anterior median eyes larger than posterior medians, lateral eyes present on prominent tubercles. Cephalothorax elongated and covered with hairs. A distinct U shaped white patch present on the cephalic region. Thoracic region with dark brown patch. Chelicerae Light brown in color and are stout. Abdomen flattened and paired projections arise from lateral sides. Five pairs of sigilla present. Legs are long with sharp spines, tarsus bears claws for attachment. third pair of legs is short than the other three pairs (Fig.1) It exhibits sexual dimorphism Male is very much smaller than the female, its

body is almost uniformly red brown in color, and it has black legs and chelicerae (Fig.2). The spider rests on the web downwardly with flexed legs.



Figure 1



Figure 2

Camouflage and mimicry are adaptations that helps spiders catch their prey. This spiders are active during day. Their body pattern and color make them difficult for their predators to spot. And their color match to bark where they live on.

Web of adult *H. multipunctata* (Fig.3, 4, 5)

The silk is produced in silk glands from their spinneret glands located at the tip of their abdomen. The spiders with the help of spinnerets produce silk threads to build their webs. When spider begins a web it release silk threads. The thread anchors to branch of tree, shrub or herb, corner of room or wherever it builds its web. Generally the webs are meant for to catch its prey or for wrapping it. Webs allow a spider to catch prey without having to expend energy by running it down. Thus it is an efficient method of gathering food. *Herennia multipunctata* forms ladder-shaped webs are spun only on tree trunks. They have parallel (rather than converging) side frames attached to the trunk, relatively horizontal, parallel "spirals," and hubs that attach to the substrate (Kuntner 2005, 2006) [13, 14]. The web of adult *Herennia* species is as a ladder-like in that it consists of vertically elongate parallel lines joined by multiple horizontal cross-lines with a solid silk. The hub-cap retreat incorporated into the web. So the whole structure pressed tightly against a tree trunk. The male rest attached to the tree surface while the female rest in the web. The spider is a fast runner. When disturbed, the spider vibrates the web in up-down postures with high speed. More than one male may be present around the web of the female. *Herennia* builds its

elongate webs close to tree boles, generally less than 2 cm away from the bark. The spider rests in a cuplike silken depression at the top of the web which is close to the bark. (Figure 3, 4, 5).



Figure 3



Figure 4



Figure 5

Parental Care

Good parental care observed in *H. multipunctata* spiders. The female prepare the silken retreat prepared by silk (Fig.6). The females also guard the egg cases until the young hatch from the eggs. (Fig.7). Parental care that increases egg

survival, and also low juvenile death rate. It is interesting to note that the dorsal surface of this spider is beautifully camouflaged and that it is very difficult to pick out against a back-ground of bark.



Figure 6



Figure 7

4. Discussion

This spider found in different tree species with with rough, medium or smooth bark surface. We observed web characteristics, web pattern and construction, hub height from ground and characteristic spider with a specific plant habitat. From the architectural perspective, *Herennia* web may be considered the exemplar of the ladder form par excellence as a result of a number of unique web elements that complement elongation, web curvature and the hub cup are of particular note. However, these unique traits of *H. multipunctata*'s ladder web template that its webs are architecturally best suited to trees in which the topography of the tree trunk is sufficiently streamlined to facilitate their expression (Timothy C Hawes 2015) [28]. Spiders are undoubtedly fascinating. They are of great value to the environment. The present study of spider fauna will be a great significance from the point of view of biodiversity. Spiders have a general blanket effect promoting evolution helping and keeping insect population under control and supplying food for many other animals and therefore keeping the flow of life moving.

5. Acknowledgements

Author thanks to UGC for their financial assistance.

References

- [1] Barrion, A. T and Litsinger, J. A. (1995): Riceland spiders of south and Southeast Asia, CAB International, Cambridge, UK: 1-700.
- [2] Blackwell, J. (1867): Description of seven new species of East Indian spiders received from the Rev. O P. Cambridge. Annals and Magazine of Natural History. (3) 14: 36-45.
- [3] Bristowe W. S. 1941. The Comity of Spiders. Vol. II. The Ray Society. London. 560 pp.
- [4] Eberhard, W. G. 1975: The inverted ladder orb web of *Scoloderus* sp. And the intermediate orb of *Eustala* sp., Araneae: Araneidae, J. Nat. Hist. 9: 93-106.
- [5] Forster L. M. and R. R. Rorster 1985 A derivative of the orb web and its evolutionary significance. New Zealand. J. Zool. 12: 455-465.
- [6] Gajbe, P. (2003): Checklists of Spiders (Arachnid; Araneae) of Madhya Pradesh and Chhattisgarh. Zoos. Print Journal 18 (10): 1223-1226.
- [7] Gajbe, U. A. (1995): Spiders Fauna of Conservation Areas: Fauna of Kanha Tiger Reserve, Madhya Pradesh. Zoological Survey of India, Publication: 27-30.
- [8] Harmer A. M. T. and V. W. Frambnau 2008: *Telaprocera* (Araneae: Araneidae), a new genus of Australian orb web spiders with highly elongated webs. Zootaxa 1956: 59-80.
- [9] Harmer A. M. T. 2009. Elongated orb web of Australian ladder web spiders (Araneidae: *Telaprocera*) and significance of orb web elongation. J. Ethol. 27: 45-460.
- [10] Harmer A. M. T and M. E. Herberstein 2009: Taking it to extreme: what drives extreme web elongation in Australian ladder web spiders (Araneidae: *Telaprocera maudae*) Anim. Behav. 78: 499-504.
- [11] Karsch, E. (1873): Verzeichniss Westfälischer Spinnen (Araneiden) Verh. naturh. Ver. Preuss. Rhein. Westfal. 10: 113-160.
- [12] Kaston, B. J. (1978): How to know spiders? The pictured key Nature series. Wm. C. Brown. Co. Publishers. Dubuque, Iowa, USA: 1-272.
- [13] Kuntner M. 2005. A revision of *Herennia* (Araneae: Nephilidae: Nephilinae), the Australasian 'coin spiders. Invertebrate Systematics 19: 391-436.
- [14] Kuntner M. 2006. Phylogenetic systematics of the Gondwanan nephilid spider lineage Clitaetrinae (Araneae, Nephilidae). Zoologica Scripta 35: 19-62.
- [15] Kuntner M, Agnarsson I. 2009. Phylogeny accurately predicts behaviour in Indian Ocean Clitaetra spiders (Araneae: Nephilidae). Invertebrate Systematics 23: 193-204.
- [16] Kuntner M, Coddington JA. 2009. Discovery of the largest orbweaving spider species: the evolution of gigantism in *Nephila*. PLoS ONE 4: e7516.
- [17] Kuntner M, Coddington JA, Hormiga G. 2008a. Phylogeny of extant nephilid orb-weaving spiders (Araneae, Nephilidae): testing morphological and ethological homologies. Cladistics 24: 147-217.
- [18] Kuntner M, Haddad CR, Aljancic G, Blejec A. 2008b. Ecology and web allometry of *Clitaetra irenae*, an arboreal African orb-weaving spider (Araneae, Araneoidea, Nephilidae). Journal of Arachnology 36: 583-594.
- [19] Kuntner M. C., Kralj Fisher and M. Gregoric. 2010. Ladder web in orb web spiders: ontogenetic and evolutionary pattern in Nephilidae, Biol. J. Linn. Soc. 99: 849-866.
- [20] Majumder, S. C. (2007): Pictorial handbook on spiders of Sunderbans: West Bengal. Zoological Survey of India: 138pp.
- [21] Platnick, N. I. (2013): The world spider catalog, version 13.5. American Museum of Natural History, online at <http://research.amnh.org/iz/spiders/catalog>.
- [22] Rajshekar K. P. and Raghavendra N. (2001): An Overview of Spider Diversity In India
- [23] Robinson M. H. and Y. D. Lubin 1979. Specialists and generalists: the ecology and behavior of some web-building spiders from Papua New Guinea. 1. *Herennia ornaticissima*, *Argiope ocyaloides* and *Arachnura melanura* (Araneae: Araneidae). Pac. Insects 21: 97-132.
- [24] Robinson M. H. and B. Robinson (1972) The structure, possible function and origin of the remarkable ladder web built by a New Guinea Orb Web Spider (Araneae: Araneidae) J. Nat. Hist. 6: 687-694.
- [25] Simon E 1894. *Histoire Naturelle des Araignees*. Vol. I pp. 489-760.
- [26] Stowe M. K. 1978, Observations of two nocturnal orb weavers that build specialized webs: *Scoloderus cordatus* and *Wixia ectypa* (Araneae: Araneidae). J. Arachnol 6: 141-146.
- [27] Stoliczka, F. (1869): Contribution towards the Knowledge of Indian Arachnoidae. Journal of Asiatic Society of Bengal. 38: 201-251.
- [28] Timothy C. Hawes (2015): Tree Trunk Topography Modifies the Webs of the Arboricole Spider *Herennia multipunctata* (Dolleschall, 1859) (Araneae: Nephilidae) Nat. Hist. Bull. Siam Soc. 61 (1): 29-39, 2015.
- [29] Thorell, T. (1895): Descriptive Catalogue of the spiders of Burma. Brit. Mus. Lond. UK: 1-406.
- [30] Thorell, 1877 "*Gen. Herennia*" - World Spider Catalog, Natural History Museum Bern, retrieved 2017-05-12.
- [31] Tikader, B. K. (1987): Hand book of Indian Spiders. Zoological Survey of India.
- [32] "Western Ghats (sub cluster nomination), Western Ghats—Sahyadri Sub-Cluster (with Four Site Elements)". UNESCO World Heritage Center. Retrieved 2008