Department of Zoology
Christ College (Autonomous)
Irinjalakuda, Kerala, India

FAUNAL DIVERSITY AND RECENT TRENDS in ANIMAL TAXONOMY

Editor
Dr. Sudhikumar A.V.

Sponsored by

Kerala State Council for Science, Technology and Environment

Kerala State Biodiversity Board

2018

ISBN 978-81-930507-6-7

Chapter 10

PRELIMINARY STUDY ON SPIDER FAUNA OF RIPARIAN HABITAT NEAR JOJARI RIVER, RAJASTHAN, INDIA

Kashmeera N.A.* and Sudhikumar A.V.
Centre for Animal Taxonomy and Ecology, Department of Zoology,
Christ College, Irinjalakuda, Kerala-680125
**kashmeera.n.a@gmail.com*

ABSTRACT

A preliminary study was conducted to document spiders of Jojari river, a tributary of Luni river, the only river that flows through western part of Rajasthan state. Total 10 species belonging to 9 genera and 6 families were documented from this area. Salticidae and Lycosidae were found to be the most species rich family. Guild structure analysis yielded 4 feeding guilds namely Stalkers, Ambushers, Space-web builders and Ground runners.

Key words: Spiders, riparian ecosystem, pollution, bioindicator

INTRODUCTION

Spiders have been extensively used as ecological indicators in nature conservation and management. They are the dominant predators and stabilizers of the prey-predator balance in natural ecosystem (Schmitz et al., 2010). Besides having undoubtedly great value to the environment spiders are comparatively neglected organisms in biodiversity research. While considering the escalating level of anthropogenic threats to biodiversity, an inventory and proper documentation of biodiversity, especially on the neglected groups like arachnids is needed urgently. Accelerating rate of species extinction due to anthropogenic activities increase urgent need to conserve biodiversity. Most important step in conserving biodiversity is identifying its critical components. However till date only a small fraction of millions of species thought to exist have been identified and catalogued. Spiders of riparian habitat is very less documented in the World. Some of the first studies on riparian spiders were done by Schenkel (1932), Knülle (1953) and Casemir (1962). Some other works were reported by Beyer 1995; Beyer & Grube 1997; Framenau 1995; Hugenschütt 1996; Ruzicka & Hajer 1996; Steinberger 1996. Spider fauna of riparian habitat near Jojari river, Rajasthan was analysed in this study.

METHODOLOGY

Jojari is a tributary of Luni river, the only river that flows through western part of Rajasthan state. Spiders were collected from December 2016 to December 2017. The following methods were adopted for the collection of spiders.

1. Hand picking method

This method involves ground hand collection or “looking down” method and aerial hand collection method or “looking up” method. In ground hand collection method all the spiders visible on the ground i.e.

below knee level will be collected. This sampling method will be used for collection of spiders inhabiting leaf litter, forest floor debris, plant surface, under logs of wood and stones (Coddington et al., 1996, Sorensen et al., 2002; Scharff et al., 2003). Spiders visible from knee level to as high as a person can reach are collected in aerial hand method (Sorensen et al., 2002; Scharff et al., 2003). This method will be applied for the collection of web-building spiders and foliage dwellers. In both methods specimens are knocked down into collection vial using soft paint brush or cotton swab.

2. Kerchief method

Spiders will be collected by throwing a kerchief above it and transferring to collecting vial by carefully holding with hand (Sebastian et al., 2006).

3. Beating

Spiders on sturdy vegetation will be collected by placing a beating tray or inverted open umbrella beneath the vegetation and beating or shaking the twigs. Spiders which fall to the tray should be collected before it escapes (Tikader, 1987).

4. Aspiration

Spiders that hide in cracks of stones or barks can be collected by this method. An aspirator consists of a glass vial topped with a rubber stopper that has two tubes - one long and one short-emerging from it. The short tube is placed near spider and it is sucked into the vial through long tube by inhalation. The long tube is covered with a screen inside the vial to prevent the entry of the specimen to collector's mouth (Sebastian & Peter, 2009).

5. Litter sampling

This method will be used to collect spiders from litter. Litter will be collected from sampling sites in plastic bags. Sealed bags will be transported to lab and spiders will be sorted after placing the litter on large canvas sheet or white paper (Coddington et al., 1991; Coddington et al., 1996). The identification of spiders was done following Tikader, 1987; Barrion and Listinger, 1992; Jocqué & Dippenaar-Schoeman, 2006; Sebastian & Peter, 2009).

RESULTS

A total of 10 species belonging to 8 genera and 4 families were collected during the study (Table 1). Salticidae and Lycosidae were the most species rich families. The collected spiders can be divided into four functional groups - Ground runners, Space web builders, Stalkers and Ambushers. The most dominant guild Ground runners is comprised of spiders belonging to the families Gnaphosidae and Lycosidae. Next dominant guild, Stalkers consist of spider family Salticidae. Spiders of the family Oecobiidae and Pholcidae constitute the members of the guild, Space web builders. Family Thomisidae belongs to the guild of Ambushers.

ISBN 9788193050767

Table 1. List of spiders collected

Sl. No.	Family/Species	Guild structure
	Gnaphosidae Pocock, 1898	
1.	*Gnaphosa* sp.	Ground runners
	Lycosidae Sundevall, 1833	
2.	*Hippasa agelenoides* (Simon, 1884)	Ground runners
3.	*Pardosa birmanica* Simon, 1884	
4.	*Pardosa sumatrana* (Thorell, 1890)	
	Oecobiidae Blackwall, 1862	
5.	*Oecobius putus* O. Pickard-Cambridge, 1876	Space-web builders
	Pholcidae C. L. Koch, 1850	
6.	*Crossopriza lyoni* (Blackwall, 1867)	Space-web builders
	Salticidae Blackwall, 1841	
7.	*Hyllus semicupreus* (Simon, 1885)	Stalkers
8.	*Telamonia dimidiata* (Simon, 1899)	
9.	*Plexippus paykulli* (Audouin, 1826)	
	Thomisidae Sundevall, 1833	
10.	*Thomisus pugilis* Stoliczka, 1869	Ambushers

DISCUSSION

Only 10 species belonging to 8 genera and 4 families were collected from the study site. The Jojari river and its premises is heavily polluted by industrial effluents. This may be the reason for this reduced number of species. Vishnoi & Srivastava (2005) collected water samples from three different sites of Jojari river and subjected to hydrobiological studies. They found that the pH, chloride, salinity, total alkalinity, total hardness, dissolved oxygen and TDS were absolutely higher than the standard values of portable water on account of contamination of river due to industrial effluents. They proved that the river has become unsuitable for the growth and survivability of aquatic flora and fauna. Paetzold et al. 2011 proved that the sustained reduction in aquatic insect densities at the polluted reaches resulted in a marked decline in web spider population density and a shift in spider community composition. Sublethal amounts of heavy metals reduce survival, growth and reproduction of spiders (Hendrickx et al. 2003). Spiders can assimilate heavy metals present in the prey, by making them inactive by storing them in intracellular granules in the midgut diverticulae (Van Hook & Yates 1975; Breymeyer & Odum 1969; Hopkin & Martin 1985). This detoxification process enhances survival at polluted sites. But Jones & Hopkin 1998 showed that, this defense mechanism against metal intoxication is at the cost of reduced growth and reproduction. In this study number of spiders observed itself was low in number in the premises of Jojari river.

ACKNOWLEDGEMENT

Authors are grateful to late Fr. Dr. T. M. Jose, CMI, Principal, Christ College, Irinjalakuda, Kerala for the support and encouragement. We would

also like to acknowledge all the lab members of CATE for valuable comments and suggestions.

REFERENCES

Barrion A.T. & Litsinger J.A. 1995. Rice land spiders of south and Southeast Asia. *Int. Rice Res. Inst.*

Beyer W. & Grube R. 1997. Einfluss des Über-flutungsregimes auf die epigäische Spinnen-und Laufkäferfauna an Uferabschnitten im Nationalpark 'Unteres Odertal' (Arach.: Araneida, Col.: Carabidae). *Verhandlungen der Gesellschaft für Ökologie* 27, 349-356.

Breymeyer A. & Odum E.P. 1969. Transfer and bioelimination of tracer 65 Zn during predation by spiders on labeled flies. In: Nelson DJ, Evans FC (eds) *Proceedings of the second national symposium on radioecology*, pp 715–720

Casemir H. 1962. Spinnen vom Ufer des Altrheins bei Xanten/Niederrhein. *Gewässer Abwässer* 30/31, 7-35.

Coddington J.A. & H.W. Levi. 1991. Systematics and evolution of spiders (Araneiae). *Ann. Rev. Ecology and Systematics*; 22: 565-592.

Coddington J.A., Young L.H. & Coyle F.A. 1996. Estimating spider species richness in a southern Appalachian cove hardwood forest. *Journal of Arachnology* 24, 111-128.

Framenau V. 1995. Populationsökologie und Ausbreitungsdynamik von Arctosa cinerea (Araneae, Lycosidae) in einer alpinen Wild-flublandschaft. Diplomarbeit am Fach-bereich Biologie der Phillips-Universität Marburg. *Fachgebiet Naturschutz*.

Hendrickx F., Maelfait J.P., & Van Straalen N.M., 2003. Adaptive reproductive variation along a pollution gradient in a wolf spider. *Oecologia*, 134(2): 189-194.

Hopkin S.P. & Martin M.H. 1985. Assimilation of zinc, cadmium,lead, copper and iron by the spider *Dysdera crocata*, a predator of woodlice. *Bull Environ Contam Toxicol* 34:183-187.

Jocqué R. & Dippenaar-Schoeman A.S. 2006.Spider families of the world.336 pp.

Jones D.T. & Hopkin S.P. 1998. Reduced survival and body size in the terrestrial isopod *Porcellio scaber* from a metal-polluted environment. *Environ Pollut* 99:215-223.

Paetzold A., Smith M., Warren P.H. and Maltby L. 2011. Environmental impact propagated by cross-system subsidy: Chronic stream pollution controls riparian spider populations. *Ecology*, *92*(9): 1711-1716.

Scharff N., Coddington J.A., Griswold C.E., Hormiga G. & Bjørn P.D.P. 2003. When to quit? Estimating spider species richness in a northern European deciduous forest. *Journal of Arachnology*, 31(2): 246-273.

Schmitz O.J., Hawlena D. & Trussell G.C, 2010. Predator control of ecosystem nutrient dynamics. *Ecology Letters*, 13(10):1199-1209.

Schenkel E. 1932. Spinnen am Ufer der Untertrave. In: Das linke Untertraveufer, pp. 410-42

Sebastian P.A., Murugesan S., Mathew M.J., Sudhikumar A.V. & Sunish E. 2006. Spiders in Mangalavanam, an ecosensitive mangrove forest in Cochin, Kerala, India (Araneae). *Acta Zool Bulg*. 1:315-318.

Sebestian P.A. & Peter K.V. 2009.Spiders of India.University Press Publication.

Tikader B.K. 1987. Handbook on Indian Spiders. Zoological Survey of India. 251pp.

Van Hook I. & Yates A.J. 1975. Transient behaviour of cadmium in a grassland arthropod food chain. *Environ Res*. 9:76-83.

Vishnoi S.R. & Srivastava P.N. 2005. Seasonal pollution assessment through comparative hydrobiological studies in river Jojari at Salawas, Jodhpur. *Indian Journal of Environmental Sciences*, *9*(1):33-34.