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Spider Diversity Pattern and Community Composition in the South Eastern Nigeria: An Analysis of Habitat Differences

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ABSTRACT: Spider diversity plays an important role in the balance of nature. Thus, a study on the diversity of spiders was carried out in Awka, Anambra State in the South Eastern Nigeria from January, 2018 to June, 2018. Spiders were collected from three habitats which include: residential areas, farmlands and forest regions in the study area using handpicking and vegetative beating methods. A total of one hundred and twenty-five (125) spiders belonging to ten (10) families and comprising of thirteen (13) species were identified. Ninety-three (93) spiders were collected from residential areas, twenty-one (21) from farmlands and eleven (11) from forest regions. Results of the relative abundance of spider species in different habitat showed that *Physocyclus globosus* has the highest abundance of species having 71.2% with composition of eighty-nine (89) spiders. Residential areas recorded the highest abundance of spiders having 74.4% and species composition of ninety-three (93) spiders. Forest regions recorded the highest species diversity index (*H*) of 1.7202. The study revealed that spider diversity is influenced by the type of habitat, vegetation and environmental disturbances.

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Among the Arthropods, spiders are the most abundant predators in many terrestrial ecosystems, playing an important role in ecosystem functioning throughout habitats (Tikader, 1977). Spiders are the largest order of Arachnids and rank seventh in total species diversity among all orders of organisms. Spiders are found worldwide on every continent except for Antarctic and have become established in nearly every habitat with the exception of air and sea colonization. As at November 2015 at least 45,700 spider species have been recorded by taxonomist (Plantnick and Raven, 2013). Although spiders are widely feared, only a few species are dangerous to people (Vetter *et al.,* 2008). Possible medical uses for spider venoms are being investigated, for the treatment of cardiac arrhythmian (Novah, 2001), Alzheimer's disease, (Lewis and Gaarcia, 2003) strokes, (Bogin, 2005) and erectile dysfunction (Andrade *et al.,* 2008).Spiders can also be used as food. Cooked tarantula spiders are considered a delicacy in Cambodia, (Ray, 2002) and by the Piaroa Indians of Southern Venezuela-provided the highly irritant hairs, the spiders' main defense system, are removed (Weil, 2006).

Although the fossil record of spiders is considered poor, (Selden *et al.*, 2009) almost 1000 species have been described from fossils (Dunlop *et al.,* 2008). Due to softness of spiders' bodies, the vast majority of fossil spiders have been found preserved in amber (Dunlop *et al.,* 2008). The oldest known amber that contains fossil arthropods dates from 130 million years ago in the early cretaceous period (Hecht, 2008).Despite the ecological role in many ecosystems, high diversity, documented threats and the known imperilment of some species, spiders have received little attention from the conservation community (Selden *et al.*, 2009).However, it is important that the imperiled and vulnerable spiders are not left out of conservation planning. While lack of attention may be related to negative public attitude towards spiders, a paucity of compiled information on spiders' conservation status and distribution may be a more important issue. There is also lack of knowledge and ability to identify the different species of spiders despite their distribution and level of occurrence in our homes, surroundings, farm lands, forests etc. owing to negligence. The aim of the study was to investigate the Spider Diversity Pattern and Community Composition in the South Eastern, Nigeria: An Analysis of Habitat Differences.

MATERIALS AND METHODS

The Study Area: The study was carried out in three different habitats namely: residential areas (comprises

of offices, classrooms and hostels in Nnamdi Azikiwe University, farmlands and forest regions in Agu-Awka, and they are all in Awka, Awka South Local Government Area, Anambra State, South Eastern, Nigeria. The area falls within the geographical co-ordinate of Latitude 06°12'35" North and Longitude 07°12'30" East. The Awka metropolis stretches 8km in an East highway and about 5km in North-South (Okoye, 2016). The area is within the tropical zone which experiences dry and rainy seasons. The temperature is usually hot and humid in the range 27-28°C during December, rising to 35°C between February and April (Okoye, 2016).

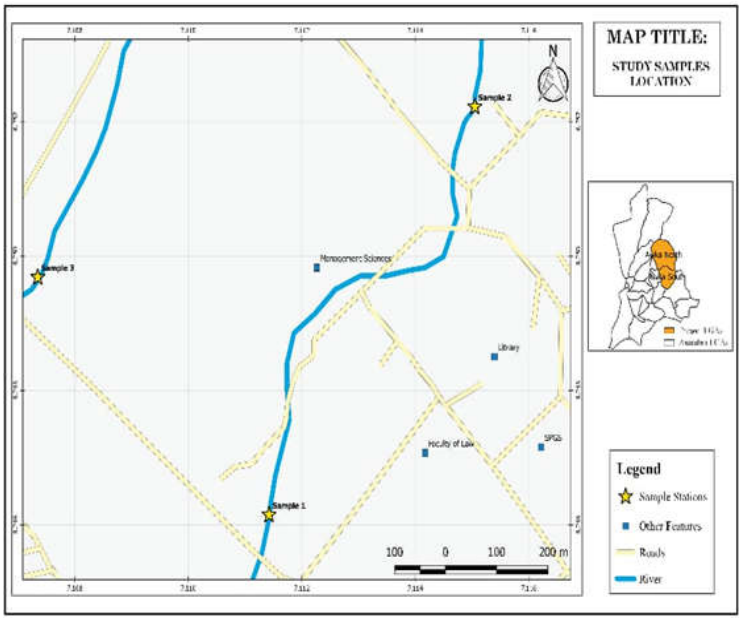


Fig 1: Map of Awka showing the study locations

Sample Collection: The collection of spider samples was carried out at different sample locations within the study habitats which include sample 1 (farm lands), sample 2 (forest regions) and sample 3 (residential areas) such as offices, classrooms and hostels. Spiders were collected by hand picking using hand gloves especially in offices, classrooms and hostels. Vegetative beating method was also employed to collect spiders living in shrubs, high herb vegetation, bushes and small trees and tree branches by beating the vegetation with a stick and collecting the samples on a cloth then picking with hand or forceps (Oyewole and Oyelade, 2014).

Preservation: The collected specimens were preserved in different vials filled with 70% - 80% alcohol for wet preservation in a glass specimen tubes with water-tight stoppers since alcohol prevents spiders from drying out (Oyewole and Oyelade, 2014).

Identification: The collected specimens were identified using African Spiders Identification Manual and Bug Guide US and with the help of an authority in the field. Photographs of specimens were taken using macro extension tube set (Oyewole and Oyelade, 2014).

Statistical Analysis: Estimation of species abundance, diversity and dominance of spiders within the three habitats were calculated using Shannon -Weiner Diversity Index (*H)*(Shannon and Weaver, 1963) and Simpson's Dominance Index (D).

RESULTS AND DISCUSSION

A total number of 125 Spiders belonging to 10 different spider families and 13 different species were found in the study area. From the table above, the result shows that *physocyclus globosus* recorded the highest abundance of spiders having 71.2% with a total number of 89 spiders while *Gasteracantha cancriformis* and *Loxosceles recluse* recorded the lowest abundance of 0.8% with a total number of one (1)each.

The residential area habitat recorded the highest relative abundance of species (74.4%) with a total number of 93 spiders while the forest habitats recorded the lowest relative abundance of species (8.8%) with a total number of eleven (11) spiders.

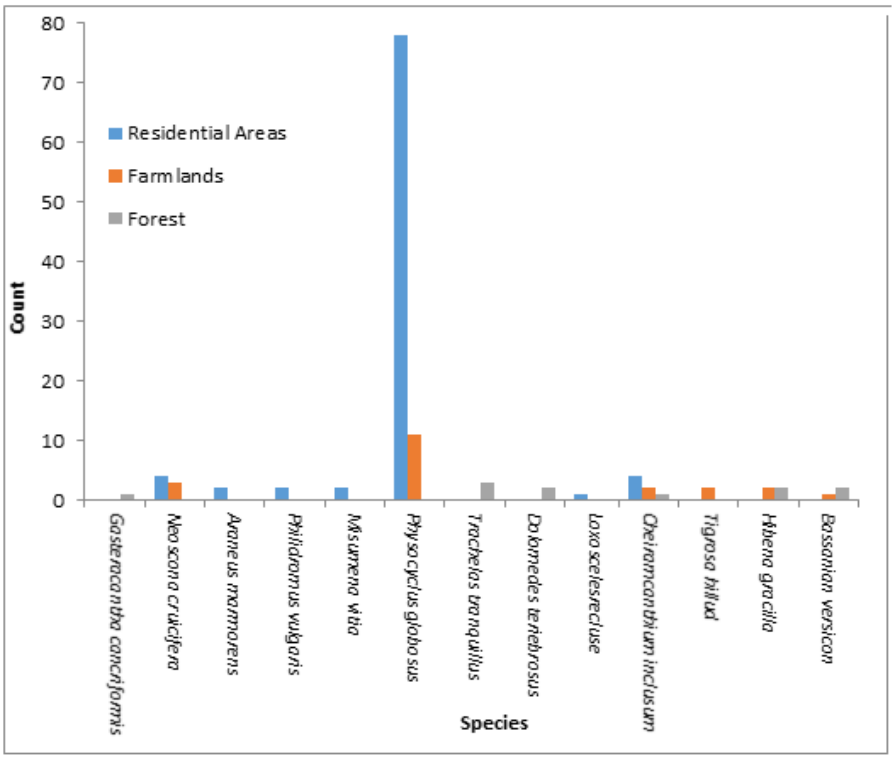
Table 1: Composition and relative abundance of spider species sampled in the Study Area

Species	Residential Areas		Farmlands		Forest		Total	
	No	Abundance (%)	No	Abundance (%)	No	Abundance (%)	No	Abundance (%)
Gasteracantha cancriformis	0	0.0	0	0.0	1	0.8	1	**0.8**
Neoscona cruicifera	4	3.2	3	2.4	0	0.0	7	**5.6**
Araneus marmorens	2	1.6	0	0.0	0	0.0	2	**1.6**
Philidromus vulgaris	2	1.6	0	0.0	0	0.0	2	**1.6**
Misumena vitia	2	1.6	0	0.0	0	0.0	2	**1.6**
Physocyclus globosus	78	62.4	11	8.8	0	0.0	89	**71.2**
Trachelastran quillus	0	0.0	0	0.0	3	2.4	3	**2.4**
Dolomede steriebrosus	0	0.0	0	0.0	2	1.6	2	**1.6**
Loxosceles recluse	1	0.8	0	0.0	0	0.0	1	**0.8**
Cheiracanthiumincluzum	4	3.2	2	1.6	1	0.8	7	**5.6**
Tigrosa hillud	0	0.0	2	1.6	0	0.0	2	**1.6**
Hibena gracilla	0	0.0	2	1.6	2	1.6	4	**3.2**
Bassanian versicon	0	0.0	1	0.8	2	1.6	3	**2.4**
Total	**93**	**74.4**	**21**	**16.8**	**11**	**8.8**	**125**	**100**

Table 2: Diversity indices of spiders in the Study Area

Habitat	Simpson dominance index (D)	Shannon–Weiner diversity index (*H*)
Residential Area	0.7086	0.7146
Farmlands	0.3242	1.4335
Forest	0.191	1.7202

The result of the Simpson dominance index for the habitats shows that residential area recorded the highest Simpson dominance of 0.7086 and the forest habitat recorded the lowest having 0.191. The Shannon –Weiner diversity index result showed that forest habitat recorded the highest spider diversity having an index of 1.7202 while the residential area recorded the lowest diversity having an index of 0.7146.



Fie 2: Species distribution in the three locations

The checklist of 10 spider families and the 13 species encountered during the study are presented in Table 3.All the spider collected have the record of biting and transferring venom to human but not all are dangerous to people as spiders will only bite in self-dense. The most recorded with medical importance is *Loxosceles recluse* of family Sicaridae which is encountered most often in buildings. Out of the 10 different spider families collected, family Arenidae recorded the highest number of species (3) followed by family Philodromedia (2) and other families had 1 species each. This is similar to the findings of Oyewole and Oyelade (2014) in their study on the diversity and distribution of spider in southwestern Nigeria, using the campus of Obafemi Awolowo University, Ile-Ife, Nigeria as their study area where they recorded the highest abundance and richness values in the Family Araneidae which represented 45% of the spiders collected (1824 spider belonging to 19 different families).

Table 3: Checklist of spider species found in the Study Area

	Family	Genus	Species	Common Name
1.	Areneidae	*a. Gasteracantha*	*cancriformis*	Spiny Orbweaver
		b. *Neoscona*	*cruicifera*	Arboreal Orbweaver
		c. *Araneus*	*marmorens*	Marble Orbweaver
2.	Philodromidae	a. *Philidromus*	*vulgaris*	Common running crab spider
		b. *Misumena*	*vitia*	Golden rod crab spider
3.	Pholcidea	*Physocyclus*	*globosus*	Round Bodied cellar spider
4.	Corimnidae	*Trachelas*	*tranquillus*	Broad faced sac spider
5.	Pisauridae	*Dolomedes*	*teriebrosus*	Forest Nursery web spider
6.	Sicaridae	*Loxosceles*	*recluse*	Brown Recluse
7.	Clubionidae	*Cheiramcanthium*	*inclusum*	Agraian Sac Spider
8.	Lycosidae	*Tigrosa*	*hillud*	Field wolf spider
9.	Anyphaenidae	*Hibena*	*gracilla*	Garden Ghost Spider
10.	Thomisidae	*Bassanian*	*versicon*	Bark crab spider

The relative abundance of spider species in different habitat in this study showed that Physocyclus *globosus* recorded the highest abundance of the species having 71.2% and a total number of 89 spiders. The residential area habitat also recorded the highest abundance of spiders having 74.4% a total number of 93 spiders. This is contrary with the findings of Oyewole and Oyelade, (2014) who recorded the highest number in cultivated areas comprising of farmland and forest. From their study, the cultivated area has the highest distribution of spider species amongst hills, buildings, open fields used as study sites. Residential areas in this study recorded the highest Simpson dominance index of 0.7086 while forest regions showed the highest Shannon-Weiner diversity index of 1.7202 which may suggest the effect of agricultural plants on spider population. According to Ziesche and Roth (2008), spiders in forest ecosystem contribute to the maintenance of species and the composition of assemblages is significantly influenced by environmental conditions. Lower spider diversity in farmlands in this study may be attributed to the findings of Mithali and Pai, (2018) who stated that distribution and occurrence of spiders are influenced by habitat structure and vegetation parameters hence, alteration of the habitat by anthropogenic activities can cause degradation of habitat and even cause extinction of the species which results in the suppression of the number of spiders. Since the farmlands are usually disturbed due to agricultural activities, the lower diversity of species there justifies the findings of Culin and Yeargan, (1983) that species diversity is used to assess the quality of the habitat. Abundance and species richness of spiders are higher in not heavily manipulated ecosystem which is supported by the present findings, where reduction in spider diversity was observed when there were anthropogenic activities such as application of herbicide in farmlands.

Conclusion: The lower number of spiders recorded throughout the study compared to other studies can be related to fumigation usually carried out on some part of study area as well as peoples' perception of spider as human enemy which could also be a factor decreasing spider diversity. Hence, knowledge of the diversity and abundance of spiders are of great importance in monitoring the disturbances in different habitats.

REFERENCES

Bogin, O. (2005). Venom peptides and their mimetics as potential drugs. *Modulator,* (19): 14-20.

Culin, JD and Yeargan, KV. (1983). Comparative study of spider communities in alfalfa and soybean ecosystems: ground surface spiders. *Annals of the Entomological Society of America* 76(5): 832-838.

Dunlop, JA; David, PO; Eritk, T and Lyall, IA. (2008). How many species of fossil arachnids are there? *The J. Arachnol.* 36(2):267-72.

Lewis, RJ and Garcia, ML. (2003). Therapeutic potential of venom peptides. *Nature Rev. Drug Discov.* 2 (10): 790-802.

Mithali, MH and Pai, I. (2018). Distribution, Diversity and ecology of spider species at two different habitats. *Int. J. Environ. Sci. Nat. Res.* 8(5): 555747.

Novah, K. (2001). Spider venom helps keep their rhythm. *Nat. Med.* 7 (155): 155

Okoye, CO. (2016). Comparative limnological studies of Unizik and Amansea streams in Awka South L. G.A, Anambra State, Nigeria. *Sci. Rev.* 2(4): 53-56

Oyewole, OA and Oyelade, OJ. (2014). Diversity and distribution of spiders in Southwestern Nigeria. *Nat. Resource. 5*: 926-935

Platnick, NI and Raven, RJ. (2013). Spider systematics: past and future. *Zootaxa, 3683*, 595-600.

Ray, N. (2000). *Lonely Planet Cambodia*. Lonely Planet publications.Pp.308

Selden, PA; Anderson, HM and Anderson, JM. (200 9). "A review of the fossil record of spiders (Araneae) with special reference to Africa, and description of a new specimen from the Triassic molteno formation of south Africa. *African invertebrates*, 50 (1): 105-16

Shannon, CE and Wiener, W. (1963).*The mathematical theory of communication*. Urban: University of Illinois Press. Pp.117.

Simpson, EH. (1949).*Measurement of Diversity*. London: Nature. Pp. 163-188.

Tikader, BK. (1977). Studies on spider fauna of Andaman & Nicobar Islands, Indian Ocean. *Rev. Zool. Surv. India, 72*: 153-212

Weil, C. (200). *Fierce Food*. Plume. ISBN 0-452-28700-6

Ziesche, TM and Roth, M. (2008). Influence of environmental parameters on small-scale distribution of soil-dwelling spiders in forests: What makes the difference, tree species or microhabitat?. *Forest. Ecol. Manage. 255* (3-4):738-752.