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SPIDER ASSEMBLAGE IN ASKOT WILDLIFE SANCTUARY: A HIGH ALTITUDE ECOSYSTEM

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ABSTRACT

Spiders have a great ecological importance (such as bio-pesticides, prey for predators) and thus need thorough study and conservation. This is a study to build up a primary database for the Askot Wildlife Sanctuary (AWLS) region, collected from various habitats to assess the diversity and distribution. A total numbers of 40 quadrats were selected and sampled using semi-quantitative collection techniques such as: vegetation beating, ground hand collection, aerial hand collection and litter sampling. Overall 21 families (total 497 individuals) of spiders were recorded from AWLS area. Family composition varied substantially across the habitats with Oxyopidae (36.02%) being the most dominant group found followed by Lycosidae (22.33%) and then Salticidae (9.66%). We also reported families: Deinopidae, Hersiliidae, Nephilidae, Pisauridae, and Scytodidae that are some interesting records for the region. This is the first inventory of spider fauna from this region including several undescribed species.

Key words: Spiders, Bio-indicators, Diversity, Family, Conservatio.

Introduction

Spiders are one of the dominant macro-invertebrate predator groups in most terrestrial environments, which play an important role in ecosystem functioning (Ferris *et al.,* 2000; Van Hook, 1971). They are found from marine intertidal zones to tundra and rocky peaks. This makes them one of the key components of all ecosystems. Thus, it is very essential to understand the patterns of diversity of such organisms to conserve their biodiversity. Spiders are well studied worldwide. There are about 46058 species known from the world belonging to 3988 genera under 114 families (World Spider Catalog, 2016). From Indian subcontinent, there are 1,520 species belonging to 377 genera under 60 families (Sebastian and Peter, 2009; Siliwal *et al.,* 2005). But in India, the knowledge on diversity and distribution of spiders is sparse.

Spiders are good indicators of environmental health (Chetia and Kalita, 2012). They are very sensitive to habitat loss, climatic change and environmental upheavals. A spider kills as much as 50 times of the prey it actually consumes, thus it limits the initial exponential growth of the pest population (Kajak, 1978). Spiders as a group may even provide useful conservation tools as ecological indicators or in rapid biodiversity measurement. Because of their high abundance and insectivorous foraging, spiders are considered as the major bio-control agents for controlling insect populations (Nyffeler and Benz, 1980; Riechert and Lockley, 1984).

Himalayan spider fauna is diverse, but effective conservation is impeded by lack of taxonomic knowledge. Few comprehensive works on spiders have been conducted in Nanda Devi Biosphere Reserve (NDBR) region of the Western Himalaya (Quasin, 2012; ZSI, 1997), but there is no such work done before in AWLS. Considering the role of spiders in the ecosystem, the present study aims at building up a primary database for the region on diversity of spiders. This study attempts to make an inventory of the spider families in different sites of the sanctuary region with respect to altitudinal gradient and various micro environments (such as litter percentage, vegetation percentage). It also emphasizes the need for conservation of spider biodiversity by characterizing genetic diversity.

Study area

The AWLS is located in the north of Pithoragarh District of State Uttarakhand in Kumaun (Western Himalaya) and lies between the coordinates 29°35'0'' to 30°35'0''N Latitude and 80°10'0'' to 81°0'0''E Longitude. It shares the international boundaries with Nepal, India and Tibet (China). The northern boundary of the Landscape runs in a straight line near Lipu Lekh and goes west to the Lissar Yangti River. The Eastern boundary is marked by the River Kali from Nabhidang to Jauljibi along with Indo-Nepal border moving south-west. The Western boundary runs with River Gori from Jauljibi till Ralam Gadh. It also includes the entire Ralam basin.

A study to build up a primary database for the Askot Wildlife Sanctuary (AWLS) region in Kumaon western Himalaya (Uttarakhand).

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The total region is approximately 120 km long and 51.5 km wide which cover around 4463 km^2 area with an altitudinal variation ranging from 560 m above msl at Jauljibi to 7434 m at the summit of Nanda Devi East.

Methodology

Sampling was carried out in mainly five villages and their adjacent areas, namely Askot, Dhutibagar, Jauljibi, Kimkhola and Kumrari, all falling within Askot Wildlife Sanctuary region. Sample sites (total 40 quadrats) belonged to an altitudinal range of 610 m amsl to 1390 m amsl and the plots (5m×5m in size) were selected randomly.

Sampling required a combination of methods, so four different collection techniques, namely, vegetation beating, litter sampling, ground hand collection, and aerial hand collection (Coddington *et al.,* 1996; Coddington and Levi, 1991) were employed. The methods were employed for 30 minutes in the same sampling plot and the time was measured with a stop watch. Aerial sampling (for upper layer spiders up to 1.5 m) involved searching leaves, branches, tree trunks, and spaces in between, from knee height up to maximum overhead arm's reach. Ground collection (for ground layer spiders) involved searching on hands and knees, exploring the leaf litter, logs, rocks, and plants below low knee level. Beating (for middle layer spiders up to 1 m) consisted of striking vegetation with a 1m long stick and catching the falling spiders on a white umbrella held below the vegetation. Litter sampling was done by manually sorting spiders from leaf litter collected in a litter collection tray. Specimens were identified up to family, genus and species level when possible. All the above methods were carried out during morning and afternoon, 9am to 3pm as night sampling was not possible in the area.

Results

In this present study, the primary aim was to assess the diversity of spider families present in the region. We found a total number of 497 spider individuals belonging to 21 families namely: Araneidae, Clubionidae, Corinnidae, Deinopidae, Dictynidae, Gnaphosidae, Hersiliidae, Linyphiidae, Lycosidae, Nephilidae, Oxyopidae, Pholcidae, Pisauridae, Salticidae, Scytodidae, Selenopidae, Sparassidae, Tetragnathidae, Theridiidae, Thomisidae and Uloboridae. Among these, Oxyopidae was the most abundant group (36.02%) followed by Lycosidae (22.33%) and Salticidae (9.66%), whereas Clubionidae, Deinopidae, Nephilidae, Pisauridae, Scytodidae, Selenopidae and Uloboridae were represented by single individuals (0.20%) (Fig. 1).

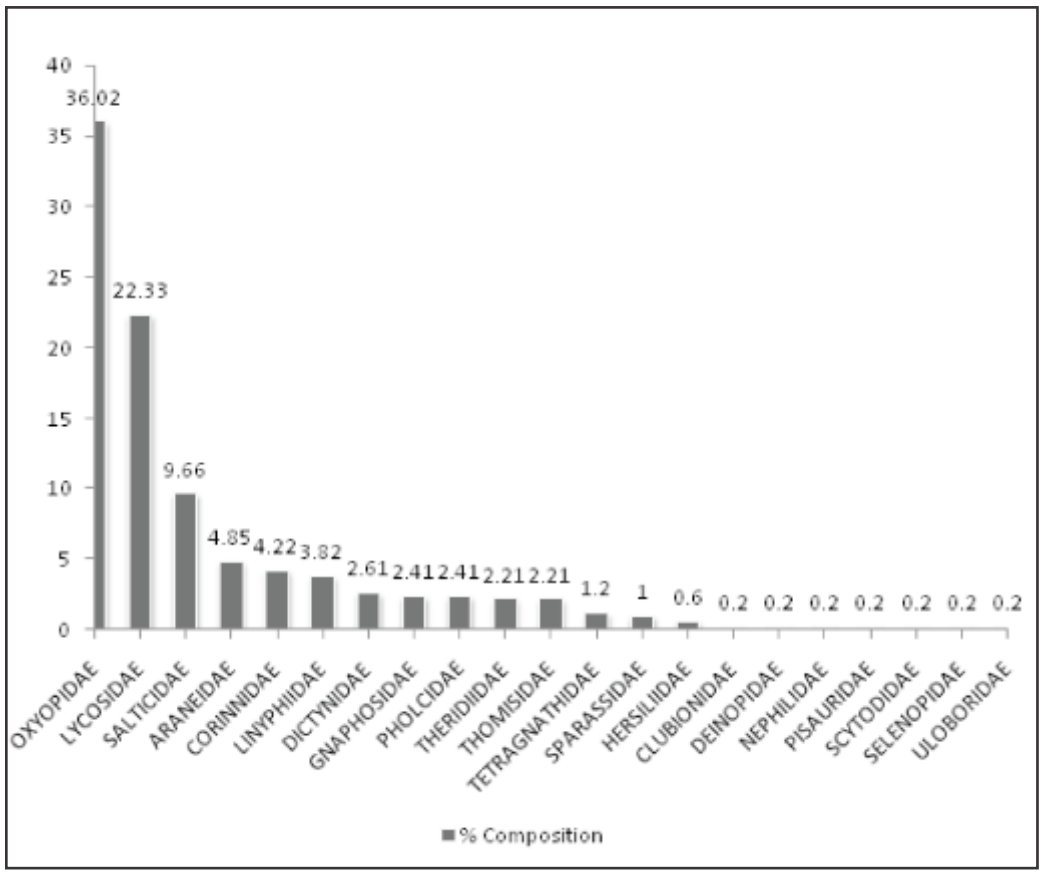

Fig. 1: Percentage composition of the families

The authors have also studied the average number of individuals and average number of family present across the various sites which helped to understand the diversity pattern in the region.

The average number of individuals found varied hugely with weather conditions (mainly in cloudy and sunny days) in all the sites except Askot.

Another interesting finding of the study is the relationship of spider individuals found along with increasing vegetation pattern. It is clearly seen that the average number of the individuals are increasing with the increase in vegetation percentage in the plots.

Although the authors have tried to study and estimate the pattern of availability of spiders along with altitude, but for some unforeseen circumstances and due to rough terrain of the region, only selective classes of altitude have been sampled (Table 1).

Table 1: Average number of individuals with respect to altitude

Altitude range (m)	Number of plots	Average no. of individuals
600 to 1000	28	14.35
1000 to 1400	12	7.91

Discussion

As this study was the first inventory of spider fauna in the region, a total number of 21 families have been reported which is 35% of total (60) families found in India (Sebastian and Peter, 2009). A total number of 497 spider individuals belonging to these 21 families were captured and preserved for this study and future correspondence. As most of the individuals were juvenile or sub-adult, species level identification was not possible in most cases because the species characteristics mostly depends on the structure of the genitalia of an adult specimen. Among these 497 specimens, more than one third (36.02%) belong to the family Oxyopidae and most of them are *Oxyopes* sp. and *Peucetia* sp. The second largest group found was Lycosidae with a percentage of 22.33 of total individual found followed by Salticidae (9.66%) (Fig. 1). It is very interesting to note that some of the families such as Clubionidae, Deinopidae, Nephilidae, Pisauridae, Scytodidae, Selenopidae and Uloboridae are the most rarely found ones and were represented by a very low number of specimens. However, this might be a co-incidence or due to under-sampling in a particular plot.

It is observed that the average number of families and average number of individuals varied differently in all the sites but in case of proper Kimkhola village area there were a significant difference (Fig. 2). This could be due to under sampling in the particular region. Weather conditions also contributes to the availability of spiders as we have seen that all the regions showed same pattern that is high availability in sunny days compared to cloudy ones except from Askot (Fig. 3), which could be due to high altitude where weather conditions remain more or less same as compared to low altitude regions.

In this study, it has already been mentioned that the most dominant group was Oxyopidae which is mainly

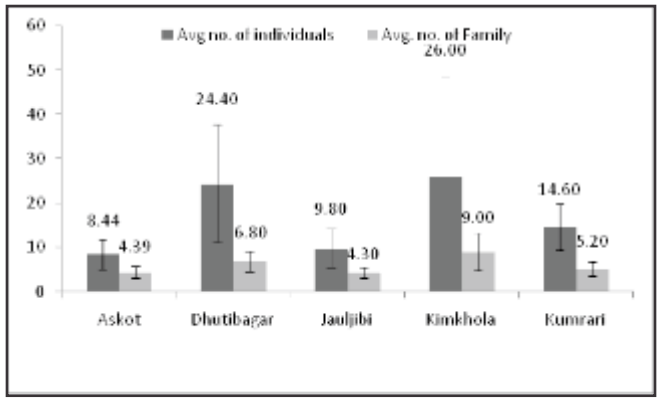

Fig. 2: Average number of individuals and average number of families in different sites

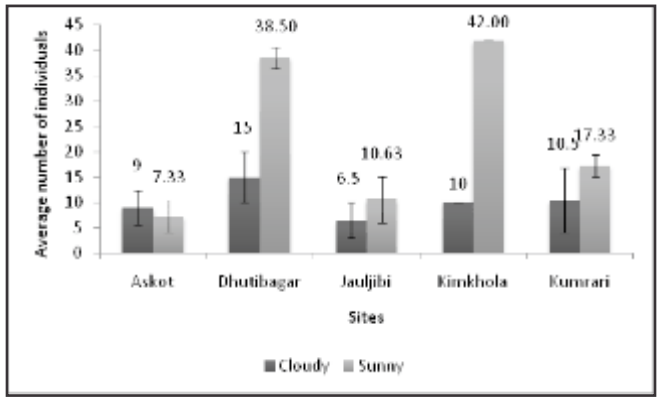

Fig. 3: Average number of individuals with respect to cloudy and sunny weather conditions

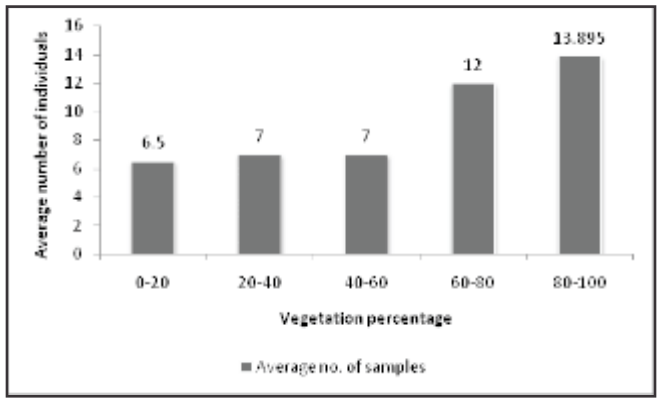

Fig. 4: Average number of individuals in different vegetation coverage

found in grasslands. The vegetation pattern of the region varied in a large scale though, being it dominated by Pine (*Pinus roxburghii)* trees in the Askot belt and mainly Sal *(Shorea robusta)* trees in the other study plots, presence of agricultural lands might be a great reason of finding grassland spiders in such a large scale. It was clearly seen that with the increase in vegetation percentage, the average number of individuals increased (Fig. 4), but there was no such significant trend observed with respect to average grass height (in m.) in the plots. The various range of grass heights showed almost the same pattern.

Plots belonging to a particular altitude class (600-1000 m amsl and 1000-1400 m amsl) were studied for spider family abundance and spider individual presence. A visible trend is observed with the available data that the spider diversity and availability of individuals gradually decreases with increase in altitude, which also supports the previous observations available from literature (Quasin, 2012).

Conclusion

The AWLS has a very rich and ubiquitous spider fauna. So, the study primarily aimed to prepare a catalogue to assess the spider diversity of the area while focussing on the various environmental factors (vegetation coverage, weather conditions) which play a key role in case of assemblage of spiders. The major findings of the work are presence of 21 families with large availability of plant wanderers in the region. It also depicted an increasing number of individuals with increase in vegetation percentage and decreasing number of individuals with increasing height.

However, future studies may focus on the other important contributing factors, such as habitat type, habitat degradation, microclimate variability and anthropogenic disturbance factors which may seriously affect the faunal diversity in a large scale. This could come up with some important findings which may help resolving regional biodiversity problems and bring a change to conventional conservation pattern.

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अस्कोट वन्यजीव अभयारण्य : एक उच्च ऊँचाई पारितंत्र में मकड़ी जमाव

उत्तरन बन्ध्योपाध्याय, शाजिया क्वेसिन एवं वी.पी. उनियाल

सारांश

मकड़ियों का अत्यधिक पारिस्थितिकीय महत्व (जैसे जैव पीड़कनाशी, परभक्षियों के लिए शिकार) है। अत: इनके सम्पूर्ण अध्ययन एवं संरक्षण की आवश्यकता है। यह अध्ययन विभिन्न आवासों से एकत्रित अस्कोट वन्यजीव अभयारण्य क्षेत्र के लिए एक प्राथमिक आँकड़ा आधार का निर्माण करने के लिए किया गया ताकि विविधता एवं वितरण का मूल्यांकन किया जा सके। कुल 40 क्वाड्रेटों का चयन किया गया तथा अर्ध मात्रात्मक संग्रहण तकनीकों, जैसे–वनस्पति विस्पंदन, धरातल हस्त संग्रहण, वायवीय हस्त संग्रहण एवं खरपतवार सैम्पलिंग, का उपयोग करके सैम्पल लिए गए। अस्कोट वन्यजीव अभयारण्य क्षेत्र से मकड़ियों के कुल 21 कुलों (कुल 497 एकल) को अभिलिखित किया गया। ऑक्सीओपिडा (36.02 प्रतिशत), जो पाया गया सबसे प्रधान समूह है, इसके बाद लाइकोसिडा (22.33 प्रतिशत)और तब साल्टिसिडा (9.66 प्रतिशत) हैं, के साथ आवासों के आर पार कुल संयोजन पर्याप्त रूप से भिन्न–भिन्न था। हमने कुल : डिनोपिडा, हर्सिलिडा, नीफिलिडा, पिसेयूरिडा और साइटोडिडा को भी सूचित किया है, जो क्षेत्र के लिए कुछ रोचक अभिलेख हैं। यह अनेकों गैर वर्णित प्रजातियों सहित इस क्षेत्र से मकड़ी प्राणिजात की पहली सूची है।

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