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RESEARCH ARTICLE

PREY COMPOSITION OF COMMUNAL SPIDER *STEGODYPHUS SARASINORUM* (KARSCH) NEAR HUMAN HABITATION IN SIGUR PLATEAU

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ABSTRACT

The present study emphasizes on the prey composition of the communal spider *Stegodyphus sarasinorum* Karsch in four different stations of Sigur Plateau. Hence the biological pest control potency of *S. sarasinorum* was remarkable in the study area. Spiders are the best predators to regulate pest population in a sustainable manner. The investigation reveals that the spider species captured six different order of the prey from the roadsides and fencings of different study sites. Mostly the Hemiptera and Hymenoptera prey species were subsequently fed by the spider *S. sarasinorum*, while the Diptera species was found as least group.

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INTRODUCTION

Spiders are the first group with terrestrial adaptation and one of the most diverse groups of organisms belonging to phylum arthropoda. Spiders peculiarly have different sizes and colors, which can be located easily in different habitats. Among various arthropods, spiders are well known for their comprehensive dependence on predation of small insects and arachnids. A number of entomologists have agreed the importance of spiders as one of the best predators in regulating the pests of different crops (Gajbe, 2004). Spiders contribute greatly to biodiversity in sustaining ecological equilibrium. Also they are important for natural pest control activity (Symodson *et al.,* 2002). Spiders are the predators which serve as buffers to limit the exponential growth of pest populations in various ecosystems (Kritani *et al.,* 1972; Mansour *et al.,* 1981; Nyffeler and Benz, 1981; Wolgang, 1983; Young and Edwards, 1990; Eswaramoorthy *et al.,* 1994; Pointing, 1996; Geetha and Gopalan, 1999; Mathirajan and Regupathy, 2003; Ghavami, 2008; Sankari and Thiyagesan, 2010). Usually farmers use pesticides to control the pests in the crop, where those pest get tolerant to such pesticides.

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Hence, Spiders are the bioindicators as biological pest control activity and also a better economic value to man because of their ability in suppressing the multiplication of pest, abundantly in agro ecosystem. Most Spiders feed on smaller prey relating to its own size (Wise, 1993). But few web building spiders prey on large size insects (Dolly and Shivakumar, 2014; Jones and Parker, 2000). Spiders use their silk, which contains a protein material called fibroin to construct the web and also use the silk to catch the prey species. *Stegodyphus sarasinorum* (Karsch, 1891) is one of the permanently social spider found in various parts of India. They are usually found in dry and shrubby habitats (Jambunathan, 1905; Jacson and Joseph 1973; Kraus and Kraus 1988). *S. sarasinorum* feeds on insects which was several times larger than its own size, due to its nature of communal feeding where the prey simultaneously fed upon by several individual spiders. The investigation was focused on the prey composition of the communal spider *S. sarasinorum* from the human habitats associated with Sigur plateau of Nilgiris.

MATERIALS AND METHODS

Study Area: The Present Study was conducted from November 2014 to October 2015 at four different regions of Sigur Plateau. The area has moderated temperature throughout the year with moist deciduous forest. Depends upon the elevational gradient the areas were distributed as follows.

Station 1 is Mavanalla which lies at the geographical position of 11°32'35.55"N latitude, 76°40'51.23"E Longitude and the elevation is 918m above MSL. Station 2 is Vazhaithottam lies at the geographical position of 11°31'49.56"N latitude, 76°41'31.41"E Longitude and the elevation lies at 925m above MSL. Station 3 was Masinagudi lies at the position of 11°34'04.87''N latitude, 76°38'20.54"E Longitude and the elevation lies at 948m above MSL. Station 4 was Bokkapuram lies at the geographical position of 11°32'33.62''N latitude, 76°38'58.29"E Longitude and the elevation lies at 968m above MSL.

Collection of web: The communal spider *S. sarasinorum* was selected for the present study. Spiders are found in road sides and fencings of the field. They are located in the habitat such as plants, shrubs, branches of trees *etc.,* Spiders were observed by using visual searching by following (Sebastian *et al.*, 2005) and aerial hand collection methods (Tikader, 1987; Coddington *et al.,* 1996).

Identification of prey composition: Prey captured by the communal spider *S. sarasinorum* was observed by carefully dissecting collected webs. Old webs were subjected for prey preference. Remaining exoskeletons of insects collected from the web were used to identify the prey species in order level using standard keys of Ramalingam (2003). Once the observation was completed the webs were again replaced to the habitat. Few insect skeletons could not be identified because of damage were recorded as unidentified. The total number of prey in each category was counted carefully and recorded.

Statistical Analysis of Data: Collected data were statistically analyzed ANOVA using MINITAB software.

RESULTS AND DISCUSSION

The present study is a preliminary assay to understand the prey selection of selected spider species *S. sarasinorum*. Spiders usually feed on insects. Among the 12 months of study period 6 different order of the prey captured by the communal spider *S. sarasinorum* were observed in all the four stations. The prey species recorded *viz.,* Coleoptera, Dictyoptera, Diptera, Hemiptera, Hymenoptera, Lepidoptera. In station 1 Hymenoptera species were highly captured by the spider *S. sarasinorum* which was followed by Hemiptera>Coleoptera> Diptera>Lepidoptera>Dictyoptera respectively throughout the study period. Some of the unidentified were found to be the least. In the month of January and June the Hymenoptera species found as great amount in the diet. While the Hemiptera species shows the highest in the month of October. The other three prey species shows the least amount of diet in all the twelve months when comparing to Hymenoptera and Hemiptera species. (Fig 1). The analysis of variance reveals that there is a significant difference in prey composition of different prey species feed by *S. sarasinorum* throughout the year. Hymenoptera species shows the significant among other prey ($P<0.01$) (Table 1). Throughout the study period, Station 2 shows that high prey number was captured found as Hemiptera which was followed by Hymenoptera> Lepidoptera>Coleoptera>Dictyoptera>Diptera. In the study the Hemiptera species found to be highest in the month of November and September. This was closely followed by the Hymenoptera species in the month of November 2014. The other prey species shows huge number of variations in the diet while comparing to the species Hemiptera and Hymenoptera. (Fig 2).In station 2 the analysis of variance shows an significant difference between the prey species of *S. sarasinorum* during the study period. Hemiptera species shows the significant among other prey ($P<0.01$) (Table 2). While in station 3 Hemiptera species shows the highest number that was followed by Hymenoptera almost lies close to Hemiptera. They were shows in the range of Lepidoptera>Dictyoptera>Diptera. The abundance of Hemipteran species was highin the month of November 2014. The Hymenoptera species forms large amount of prey in November 2014 and October 2015. While the remaining four prey species were found least in diet throughout the year (Fig 3). In Station 3 there is a significant difference between the different types of prey species of *S. sarasinorum*. Hemiptera species was the dominant, which was close with Hymenoptera while comparing to other prey species ($P<0.01$) (Table 3).

Station 4 shows that the abundant number of prey species captured were Hymenoptera and Hemiptera respectively. The other prey species were found to be the least which represented as Coleoptera>Lepidoptera>Dictyoptera>Diptera. In the station 4 the Hymenoptera species was found highest in January 2015. The Hemiptera species found to be highest in November 2014 and January 2015. The prey species such as Coleoptera, Lepidoptera, Dictyoptera and Diptera were found least prey in the twelve months of the study period. (Fig 4). The analysisof variance of station 4 revealed that there is a significant difference in prey composition of *S. sarasinorum* throughout the year. Here the Hymenoptera species was abundant among the other prey ($P<0.01$) (Table 4). The investigation reveals that the spider species *S. sarasinorum* prefer to feed on the insects belongs to the order Hymenoptera and Hemiptera in all the study areas during the study period. The prey capture depends upon the monsoon of the particular area and also the habitat richness in the particular area at the time of observation. Web spiders are stationary predators that usually wait for their prey to come to them. A large proportion of web spiders spin aerial webs, with which they filter the aerial plankton (Kajak, 1965; Chacon and Eberhard, 1980; Nentwig, 1980; Nyffeler, 1999).The biocontrol potential and economic evaluation of the communal spider is evaluated only after the assessment of the potential of spider species on its all prey species, whether they are harmful or beneficial (Nentwig, 1985).

Dolly and Yashkamal, (2011) reported that the *S. sarasinorum* species feed on insects belonging to 8 taxonomic orders. Among the prey species Hemiptera, Diptera and Orthoptera comprises about 75% of the prey. Apart from that the species such as Coleoptera, Dictyoptera, Hymenoptera, Odonata and Lepidoptera also feed by *S. sarasinorum*. Thus the social spiders are important in regulating the population of large sized insect prey. Pekar, (2000) also reported that the orders of Hemiptera, Diptera and Orthoptera comprised as the major portion of diet trapped in the webs of social spider. The present study reveals that the spiders are one of the potential to regulate the pest population in the agro ecosystem. Hence it is advisable that the spider webs which were located near the field or on the fencings of the field which should not be disturbed and it will be useful to control the pests in the field. Generally the spider webs are removed or destroyed from its habitat without having knowledge in biological pest control potential.

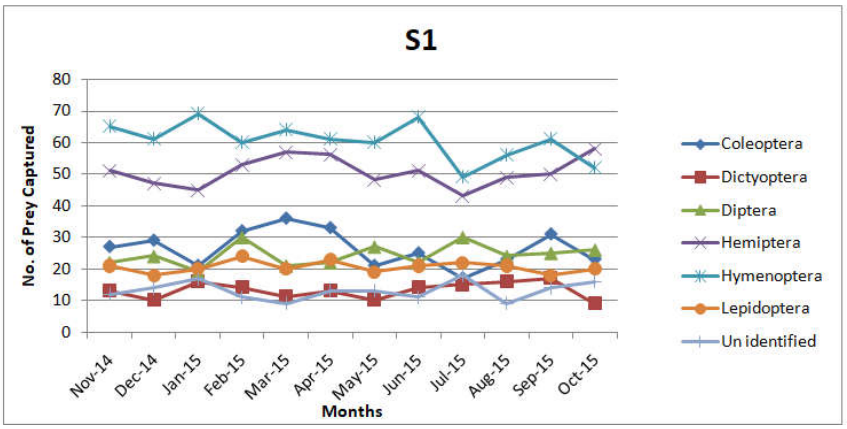

Fig 1. Seasonal variation in the composition of Prey species were captured by the communal spider *S. sarasinorum* in station 1.

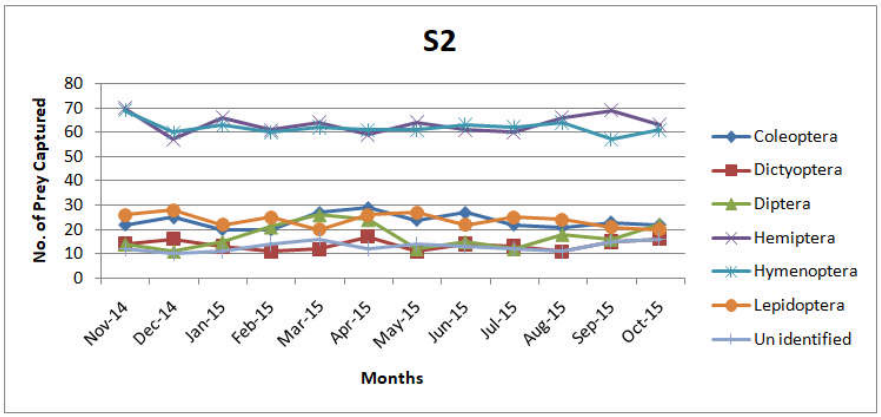

Fig 2. Seasonal variation in the composition of Prey species were captured by the communal spider *S. sarasinorum* in station 2

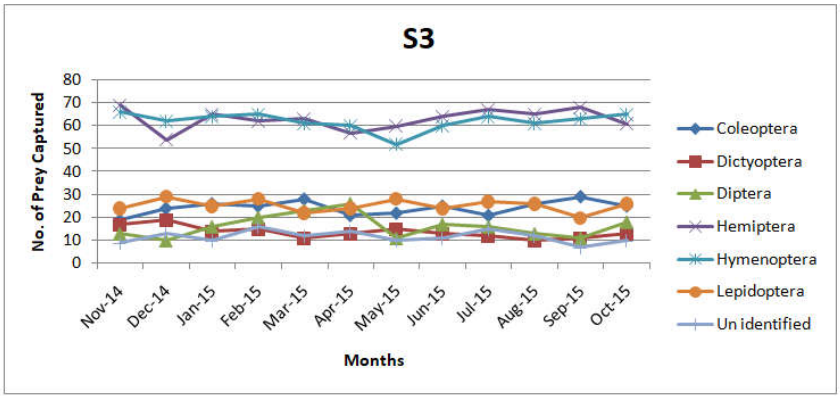

Fig 3. Seasonal variation in the composition of Prey species were captured by the communal spider *S. sarasinorum* in station 3.

Table 1. One-Way Analysis of Variance shows the prey composition of *S. sarasinorum* in Station 1.

Analysis of Variance

Source	DF	SS	MS	F	P
Factor	6	24716.8	4119.5	237.63	0.000
Error	77	1334.8	17.3		
Total	83	26051.7			

Level	N	Mean	StDev	Individual 95% CIs For Mean Based on Pooled StDev
C1	12	26.500	5.776	(-*)
C2	12	13.167	2.657	(-*)
C3	12	24.333	3.447	(*-)
C4	12	50.667	4.697	(-*)
C5	12	60.500	5.931	(*-)
C6	12	20.583	1.832	(-*)
C7	12	13.083	2.906	(-*)

Pooled StDev = 4.164

15 30 45 60

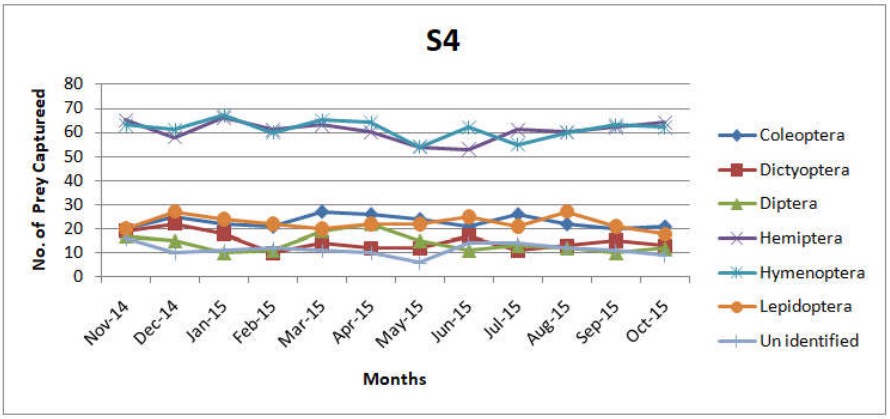

Fig. 4. Seasonal variation in the composition of Prey species were captured by the communal spider *S. sarasinorum* in station 4

Table 2. One-Way Analysis of Variance shows the prey composition of *S. sarasinorum* in Station 2.

Analysis of Variance

Source	DF	SS	MS	F	P
Factor	6	35130.4	5855.1	556.02	0.000
Error	77	810.8	10.5		
Total	83	35941.2			

Level	N	Mean	StDev	Individual 95% CIs For Mean Based on Pooled StDev
C1	12	23.500	2.939	(-*)
C2	12	13.583	2.109	(*)
C3	12	17.167	5.006	(*-)
C4	12	63.333	3.962	(*)
C5	12	61.917	2.875	(*-)
C6	12	23.833	2.758	(*)
C7	12	13.000	2.000	(-*)
Pooled StDev =		3.245		15 30 45 60

Table 3. One-Way Analysis of Variance shows the prey composition of *S. sarasinorum* in Station 3.

Analysis of Variance

Source	DF	SS	MS	F	P
Factor	6	35439.1	5906.5	469.92	0.000
Error	77	967.8	12.6		
Total	83	36407.0			

Level	N	Mean	StDev	Individual 95% CIs For Mean Based on Pooled StDev
C1	12	24.250	2.989	(*-)
C2	12	13.583	2.610	(*)
C3	12	16.167	4.988	(-*)
C4	12	62.917	4.441	(*)
C5	12	61.917	3.728	(*-)
C6	12	25.250	2.633	(-*)
C7	12	11.583	2.610	(-*)
Pooled StDev =		3.545		15 30 45 60

Table 4. One-Way Analysis of Variance shows the prey composition of *S. sarasinorum* in Station 4.

Analysis of Variance

Source	DF	SS	MS	F	P
Factor	6	34390.6	5731.8	507.49	0.000
Error	77	869.7	11.3		
Total	83	35260.2			

Level	N	Mean	StDev	Individual 95% CIs For Mean Based on Pooled StDev
C1	12	22.917	2.539	(*-)
C2	12	14.667	3.627	(-*)
C3	12	13.917	3.801	(*-)
C4	12	60.583	4.010	(*-)
C5	12	61.333	3.774	(*)
C6	12	22.417	2.811	(*)
C7	12	11.333	2.605	(-*)
Pooled StDev =		3.361		15 30 45 60

So it is necessary to maintain the spider webs to maintain ecological equilibrium by stabilizing the pest population and keeping them in control.

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