Species composition and abundance of the spider fauna of the Hillside Dams Conservancy, Bulawayo. Zimbabwe.

Sebata S

Department of Crop and Soil Sciences, Lupane State University, P.O. Box AC255, Bulawayo. Zimbabwe
sicelosebata@gmail.com

Abstract: The objective of the study was to describe the spider species composition and abundance of a semi arid protected area in Zimbabwe, the Hillside Dams Conservancy. The paper aims to introduce a neglected group of invertebrates –the arachnids which is primarily unknown to science particularly in Zimbabwe. Spiders were collected in ten weekly sessions from last week of July to September 2012, using sweep nets and beating trays. A total of 663 individuals belonging to 28 species distributed among 11 families were found in the conservancy. The Oxyopidae was the most abundant (n = 230) representing 35% of all spiders sampled, followed by Philodromidae (n = 140) with 21%, Thomisidae (n = 124) with 19%, and Salticidae (n = 87) with 13%. The most abundant species was an Oxyopidae *Oxyopes sp* (n = 186) representing 28% of the total, followed by a Philodromidae *Philodromus sp* (n = 120) with 18.1%, a Salticidae *Salticidae sp* (n = 82) with 12.4%. The Thomisidae was the most species rich family with twelve species, followed by Philodromidae with four species and the Oxyopidae with three species. Observed spiders belonged to five functional groups: stalkers, foliage wanderers, ambushers, orb weavers and ground wanderers in the ratio of 3: 3: 6:2:1 with regards to species richness. Spider diversity in protected areas in Zimbabwe is not yet well known despite their usefulness as indicators of the overall species richness and status of ecosystems, therefore this study sought to fill the existing void of Arachnology literature for the state and apprise future investigators of the spider fauna of Zimbabwe.
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Key words: spider diversity, protected areas, species richness, spider families and functional groups

1. Introduction

Human impact on protected areas has led to the loss and degradation of habitats as well the introduction of invasive alien species. This has led to increased pressure on native biodiversity and as a result, species are threatened by extinction and many species are being lost unnoticed due to poor documentation. (Salafsky and Wollenberg, 2000). Globally there is a consensus that information is lacking on the biodiversity of arachnids (Floren and Dee-leman- Reinhold, 2005) with perhaps only a fifth of the entire spider assemblage having being described (Codington *et al,.* 1991). Due to less awareness about spiders in Zimbabwe, their diversity remains unexplored and remains poorly known, regardless of their ecological and economic importance. Ecologically spiders are important as predators feeding on mosquitoes and cockroaches and by being prey for birds, lizards, wasps and other animals and economically through their potential for drug development (Sharma *et al.,* 2010).

Spiders are good subjects for studying biodiversity patterns mainly due to their great abundance in nature as compared to other arthropods (Majer *et al* 1994). Their assemblage communities are useful and recommended indicators of whole biocenosis biodiversity (Willet, 2001) as their richness correlates with the abundance of other animals (gastropods, orthopterans, carabids, birds) and can be applied in conservation ecology. Nevertheless their study has always remained largely neglected by conservation professionals and the general public because of lack of taxonomic and distributional data as well as the widespread belief that spiders are 'nasty' and 'dangerous' (New, 1999).There have not been documented in print at the species level for any protected area in Zimbabwe. Currently, in Zimbabwe known species stand at about 202 which are named by checklists (Fitzpatrick, 2001). Therefore to such efforts, this study seeks to fill an important information gap by documenting the spider diversity in one of the protected areas in this country by examining the species composition and abundance of the spider fauna of the major habitats found in the Hillside Dams Conservancy in Zimbabwe.

2. Materials and methods

Study site: The study was a survey on natural populations conducted at Hillside Dams Conservancy, situated 6 km south of Bulawayo (20°10′12″S 28°34′48″E) within Bulawayo Metropolitan Province in Zimbabwe (Figure 1). The conservancy lies an altitude of 1400 m above sea level with a total coverage of 86 hectares of land that is surrounded mostly by residential sites. The climate is subtropical with three broad seasons; hot, wet season cold, dry

season, and hot, dry season with a mean annual temperature of 19.6℃ and an average of 590 mm of rain per year. The natural indigenous woodland vegetation is dominated by *Terminalia*, *Acacia, Burkea, Sclerocara* and *Peltaphorum* with a greater variety of species amongst the rocks or along the streams. Unfortunately there are very few wild animals present except for the small animals such as squirrels *Funambulus sublineatus* and the hare *Lepus nigricollis*.

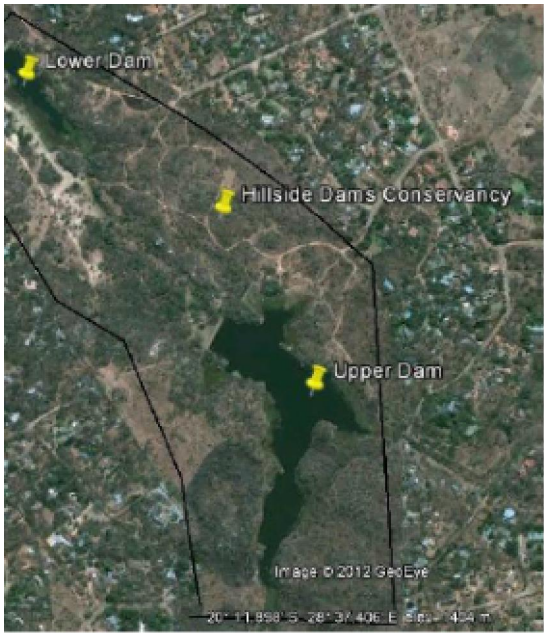

Figure 1. Satellite image of the Hillside Dams Conservancy and its surrounding areas.

Field collection and lab analysis: The survey was conducted in two main habitats open grassy area and rocky woodland. In each site 50 m transect strips were randomly established. Spiders were collected in ten weekly sessions from last week of July to September 2012 by adopting two standard sampling techniques beating and sweeping. Beating trays and sweep nets are an excellent collecting device for invertebrates as there are simple, not expensive and quick methods to sample active arachnids (Russell-Smith, 1999) and have been successfully used in many invertebrate studies (Dippennear-Schoeman *et al*, 2002 and Sorenson *et al*,2002). Ten trees in each transect were beaten 10 times with a beating stick and a white collecting tray (80 cm x 80 cm) was held beneath to collect specimens that dropped from each tree (modified from Codington *et al* 1999). An aspirator was used to capture small specimens. A sweep net was brushed through the vegetation 20 times while walking along each transect. Specimens were preserved in 70% ethanol. All surveys were conducted in the morning hours between 7: 00 am to 10:00 am. All individuals caught were identified to family level and to genus/species whenever possible. Identification was done following keys and taxonomic guides in Dippennear- Schoeman (1997). Additionally reference specimens from the Natural History Museum Bulawayo collections were also used for identification.

The spider fauna was also put into functional groups that merely explain the different manner in which spiders forage for a common resource. Studying functional groups can be useful to investigate assemblage response to habitat disturbance .The collected spider families were grouped into five guilds. These are (i) orb weavers (OW): Araneidae, Dictynidae, Tetragnathidae (ii) stalkers (S) : Oxyopidae and Salticidae : (iii) ground wanderers (GW): Lycosidae and Gnaphosidae (iv) foliage wanderers (FW) : Clubionidae, Philodromidae and Heteropodidae (v) ambushes (A) : Thomisidae

3. Results and Discussion

A total of 663 individuals belonging to 28 species distributed among 11 families were recorded during the three month survey of the Hillside Dams' Conservancy (Table 1). The recorded arachnids represent 14% of the total reported 202 species already named by checklists in Zimbabwe. (Fitzpatrick, 2001). Therefore the present study brings out only a portion of the diversity of the spider wealth that remains concealed in the landscapes of Zimbabwe. This reveals the importance of our biological wealth and the need to continue research of documentation of invertebrate fauna within Zimbabwean protected areas.

The family composition of the spider fauna as a whole is shown in Figure 2. The most abundant family was Oxyopidae (n = 230) representing 35 % of all spiders sampled, followed by the Philodromidae (n = 140) representing 21%, the Thomisidae (n = 124) representing 19%, and Salticidae (n = 87) representing 13%. The remaining seven families, namely Clubionidae, Araneidae, Gnaphosidae, Lycosidae, Dictynidae and Heteropodidae were low in abundance and none exceeded 7 % of the total. (Figure 2). It is not shocking that dominant families collected from the Hillside Dams Conservancy are some of the most diverse families of spiders in South Africa and India. Thomisidae and Salticidae and Philodromidae were consistently the most abundant in all grass types and tree species of the Erfenis Dan Nature Reserve (Fourie *et al* 2013). Oxyopidae was also amongst the most dominant families recorded in semi arid habitat of Agra in India (Anjali and Prankash, 2012).

Table 1. Spider species recorded from the Hillside Dams conservancy.

Spider Families	Species	Total
Araneidae		
	Araneidae sp 1	20
Clubionidae		
	Clubiona sp	47
Dictynidae		
	Dictyna sp	2
Gnaphosidae		
	Gnaphosidae sp 1	4
Heteropodidae		
	Heteropodidae sp 1	3
Lycosidae		
	Lycosidae sp 1	1
Oxyopidae		
	Oxyopes sp	186
	Peucetia sp	35
	Oxyopidae sp 3	9
Philodromidae		
	Philodromus sp	120
	Tibelus sp	1
	Philodromidae sp 3	12
	Philodromidae sp4	7
Salticidae		
	Salticidae sp 1	82
	Salticidae sp2	5
Tetragnathidae		
	Tetragnathidae sp 1	5
Thomisidae		
	Bominae sp	5
	Camaricus sp	6
	Cynathea sp	5
	Dieta sp	54
	Granulutus sp	1
	Monases sp	4
	Misumenops sp	2
	Runcinia flavida (Simon,1881)	1
	Simorcus africanus	19
	Synaema sp	2
	Tmarus africanus (Lessert, 1919)	17
	Thomisius scrupeus (simon,1886)	8
Grand Total		**663**

The Thomisidae was the most species rich family with twelve species, followed by Philodromidae with four species, the Oxyopidae with three species and the Salticidae with two species. Seven families were represented by a single species (Table 1). The most abundant spider species of the spider fauna is shown in Figure 3. The most abundant species was an Oxyopidae *Oxyopes sp* (n = 186) representing 28% of the total, followed by a Philodromidae *Philodromus sp* (n = 120) with 18.1%, a Salticidae *Salticidae sp 1* (n = 82) with 12.4% and the Thomisidae *Dieta sp* (n = 54) with 8.1% . The *Oxyopes sp* was mostly represented by juveniles suggesting that breeding may have just started in July-August based on the sizes of by the instars collected. The least abundant species that recorded single individuals each were the *Lycosidae sp1*, *Tibelus sp*, *Granulutus sp* and *Runcinia flavida (*Simon, 1881).

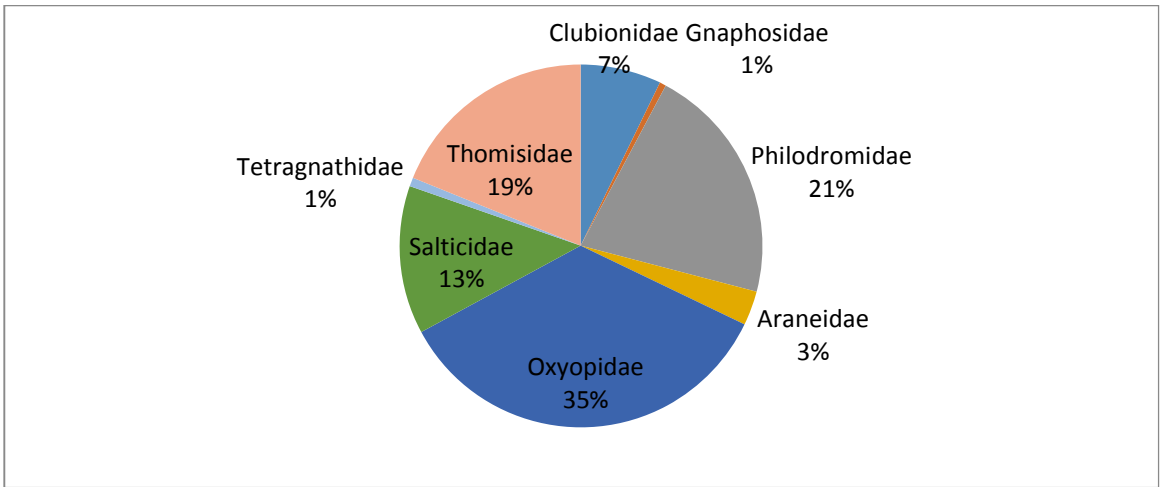

Figure 2. Percentage composition of spider families recorded at Hillside Dams Conservancy.

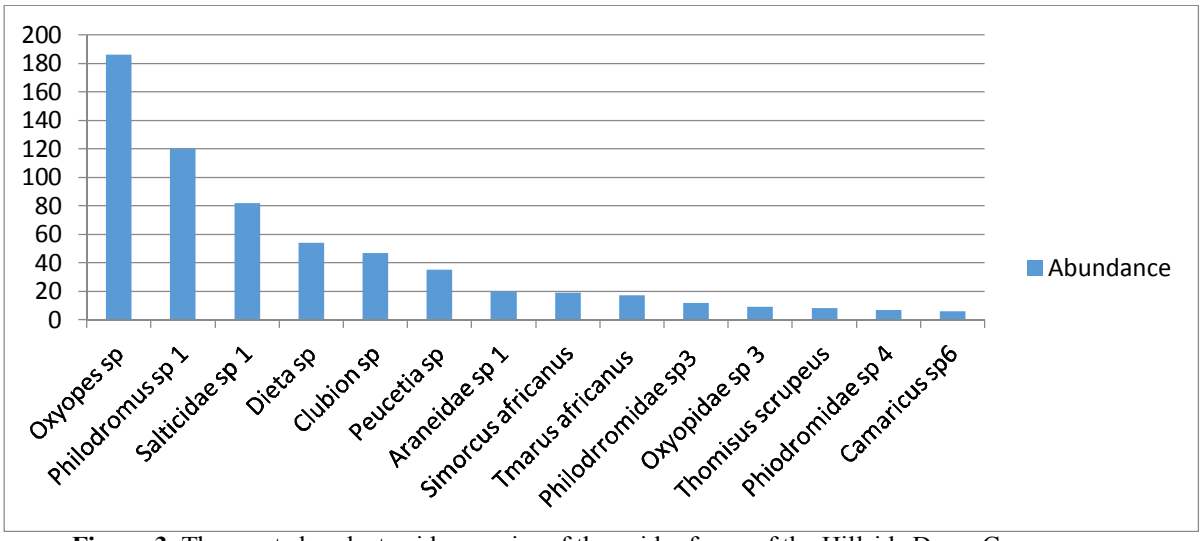

Figure 3. The most abundant spider species of the spider fauna of the Hillside Dams Conservancy.

This study amongst others has revealed that spider species dominance differs from area to area, as the Hillside Dams Conservancy recorded *Oxyopes sp* as the most abundant representing 28% of the total spider fauna. However, the most abundant species that was obtained in a survey of a herbaceous layer of coastal dune forest at Richards Bay, South Africa was the pisaurid *Charminus atomarius (Lawrence)* representing 18% of the total (Dippennar- Schoeman and Wassennar, 2006), whilst Modiba *et al* (2005) obtained a Thomisidae *Tmarus comellini* Gracia-Neto as the most abundant species representing 10.3% of the total of the spider fauna from Sovenga hill in the Savanna biome in South Africa.

Although all spiders are predators (Wise 1993) feeding structures of most spiders found in Zimbabwe is inadequately known. Findings revealed that spiders of Hillside Dams conservancy contained stalkers as the most abundant and widely distributed functional group, comprising 48% of all spiders sampled. (Figure 4). Foliage wanderers consisted 29%, ambushers were more abundant (19%) than the orb weavers that recorded (4%) of the samples spider fauna. Ground wanderers were the minority group, representing less than one percent of all sampled individuals. Stalkers were dominant in terms of abundance, exhibiting 36 % of the guild composition, whereas in terms of species richness the ambushers were the most abundant exhibiting 36% of the guild composition. (Figure 4). Foliage wanderers were the second most dominant guild both in terms of species richness and abundance and ground wanderers were the minority group.

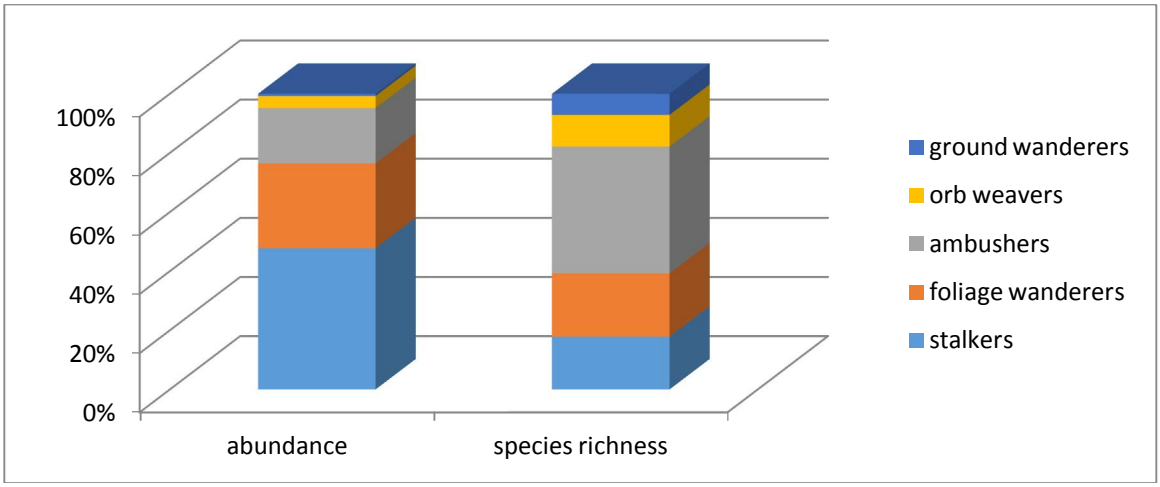

Figure 4. Guild distribution of species of spiders recorded at Hillside Dams Conservancy.

Conclusion and recommendations.

Hillside Dams conservancy recorded 14% of the total reported 202 species already named by checklist which is a good representation of spider species, however, because of the short duration of the present study, the results may not reflect the actual abundance and species richness of the Conservancy, but nevertheless provide an indication of the minimum abundance and richness. Therefore, this study serves as a baseline for future study of spiders in these ecosystems. Further study is required to confer, as this study was conducted only for three months thus no seasonal variation in diversity and abundance of spider fauna was done.

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Correspondence to:
Sebata Sicelo
Lupane State University
Department of Crop and Soil Sciences
P. O. Box AC255 Bulawayo, Zimbabwe.
Telephone: +263 09 883840 ext 130
Emails: sicelosebata@gmail.com

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