KOEDOE - African Protected Area Conservation and Science
ISSN: (Online) 2071-0771, (Print) 0075-6458

Spiders (Arachnida: Araneae) of a wildlife and cattle savanna ranch in South-Western Zimbabwe

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Dates:
Received: 24 Jan. 2023
Accepted: 22 Sept. 2023
Published: 20 Dec. 2023

How to cite this article:
Sebata, S., Haddad, C.R., FitzPatrick, M.J. & Foord, S.H., 2023, 'Spiders (Arachnida: Araneae) of a wildlife and cattle savanna ranch in South-Western Zimbabwe', *Koedoe* 65(1), a1756. https://doi.org/10.4102/koedoe.v65i1.1756

In order to contribute to spider diversity distribution records within Zimbabwe, spiders were sampled at a mixed wildlife and cattle ranch using pitfall traps and sweep-netting. Sampling was conducted from June 2017 to April 2018. A total of 2328 spiders representing 25 families, 94 genera, and 166 species were recorded. The most species-rich families were Salticidae (33 spp.), followed by the Gnaphosidae (28 spp.) and Lycosidae (20 spp.), while eight families were represented by a single species. Pitfall traps accounted for 1857 individuals overall, with the ground-dwelling fauna dominated by *Stenaelurillus guttiger* (37.86% of the total abundance). Sweep-nets accounted for 471 individuals overall, with the grass-dwelling fauna dominated by *Thyene thyenioides* (15.29% of the total abundance). The most abundant functional group was the free-living ground-dwellers (n = 1809, 77.71%), followed by free-living plant-dwellers (n = 266, 11.43%) and orb-web builders (n = 186, 7.98%). The current study contributes to the knowledge of a megadiverse group of predatory arthropods in the region.

Conservation implications: Sampling and monitoring of rangelands is essential, as the former aids in the identification of new species not previously recorded, as well as increasing knowledge on the distribution of spider species, which if not adequately conserved could face significant threats to their survival even before their documentation.

Keywords: conservation planning; invertebrates; monitoring; rangelands; spider biodiversity; surveys.

Introduction

With roughly 51 000 described species (World Spider Catalog 2023), spiders are found in almost all terrestrial biotopes, are easy to collect, and are essential predators (Turnbull 1973). According to the African Arachnological Database, there are presently 454 species known from Zimbabwe (Dippenaar-Schoeman et al. 2015), representing 0.89% of the global species richness (World Spider Catalog 2023). This is far below the 2253 species recorded from the neighbouring country of South Africa (Foord et al. 2020). In contrast, it is higher than the 250 species from the neighbouring Botswana and 183 from Malawi (Jocqué, Alderweireldt & Dippenaar-Schoeman 2013). Despite that within the Afrotropical region, Zimbabwe is amongst the top 10 countries in terms of the highest spider species richness (Jocqué et al. 2013), its known richness can be regarded as low compared to the rest of the region. Jocqué et al. (2013) suggest that the documented spider species richness of any country more strongly reflects the effort placed on studying its fauna than its size, mainly because countries with approximately similar sizes have recorded very contrasting levels of species richness (Jocqué et al. 2013).

The inclusion of spiders into conservation programmes requires correct and regularly updated checklists (Dippenaar-Schoeman et al. 2015). The latter expedited the inclusion of South African spiders in the National Spatial Biodiversity Assessment (NSBA) in 2010 (Dippenaar-Schoeman et al. 2015) and the subsequent preparation of a National Red List (Foord et al. 2020). However, in Zimbabwe, limited checklists (FitzPatrick 2001) and partial surveys have contributed distribution data on species (Cumming & Wesołowska 2004; Wesołowska & Cumming 2011), which unfortunately have not yet been included in any Government of Zimbabwe National Reports on biodiversity and conservation. Additionally, vast areas of the country are still poorly sampled, thus limiting the knowledge of distribution records and the identification of endemic species.

Therefore, there is a need to document more species distributions within Zimbabwe. Furthermore, the augmentation of spider biodiversity information, particularly species richness, can also be applied through activities that include the examination of unidentified material in museums and increasing awareness through engagement with the public (Dippenaar-Schoeman et al. 2015). Such activities encourage interest and research on invertebrates, such as spiders.

As part of the PhD study of the first author, spiders were sampled in several biotypes as part of two kraaling impact studies. Sampling proceeded over a period of approximately 1 year, using mainly two methods (pitfall traps and sweep netting). Detailed information on the response of spiders to short-duration kraaling has been published (Sebata et al. 2022), and this article provides an annotated checklist of the spiders sampled at the Debshan Ranch.

Materials and methods

The study was conducted at a mixed cattle and wildlife ranch called Debshan (29º 15′ E, 19º 35′ S), located 100 km north-east of Bulawayo along the Bulawayo-Harare road in the Insiza district, Matabeleland North Province. Rainfall falls between October and April, with an annual average of 639 mm (Dunham et al. 2003). Average daily humidity is 55% and the annual average temperature is 18°C, with the hottest month being October (average 21°C) and the coldest being July (average 12.4°C). The ranch lies at an elevation of between 1230 m and 1414 m above sea level (Dunham et al. 2003).

The landscape of the ranch is moderately undulating, with coarse-grained, yellowish-brown loamy sands. Some sections have ultramafic or mafic rocks that that give rise to productive red and dark brown clayey soils (Robertson 2013). The soils support floral types that are normally dispersed in a chain-like pattern (Dunham et al. 2003), including *Colophospermum* bushlands, *Julbernadia-Stereochlaena* woodland, *Combretum hereroense-Hyparrhenia* mixed bushlands, dominated by *Combretum hereroense* and other species of *Combretum* mixed with *Vachellia* species, *Terminalia-Schizachyrium* bushlands, and wooded grasslands (Robertson 2013).

Spider sampling was conducted from June 2017 to April 2018 utilising pitfall traps and sweep netting following the sampling design reported in Sebata (2020), which was part of a PhD study on the kraaling impact on spider diversity that focused on only ground-dwelling and grass-dwelling spiders. At the end of the collecting period, the contents were collected and emptied into plastic bottles with 70% ethanol for sorting in the laboratory. All adult specimens were sorted to morphospecies and identified to species level, where possible. Voucher specimens were deposited in the Arachnology collection of the Natural History Museum in Bulawayo, Zimbabwe.

Ethical considerations

This article does not contain any experimental studies with human or animal participants, and informed consent is not applicable.

Results and discussion

A total of 2328 spiders representing 25 families, 94 genera, and 166 species were recorded during the study (Table 1). The most species-rich families were Salticidae (33 spp.), followed by the Gnaphosidae (28 spp.) and Lycosidae (20 spp.), while eight families were represented by a single species (Table 2). Overall, pitfall traps accounted for 1857 (79.77%) individuals, and the ground-dwelling fauna was dominated by Salticidae (*n* = 703; 37.86%), Gnaphosidae (*n* = 494; 26.26%), and Lycosidae (*n* = 275; 14.81%) with the jumping spider, *Stenaelurillus guttiger* (Salticidae; 37.86%) being the dominant species. Sweep-nets accounted for 471 (20.23%) individuals, and the grass-dwelling fauna was dominated by Araneidae (*n* = 175; 37.58%), Salticidae (*n* = 136; 28.88%), and Thomisidae (*n* = 70; 14.86%) with *Thyene thyenioides* (Salticidae; 15.29%) being the dominant grass-dwelling species. The most abundant functional group was the free-living ground-dwellers (*n* = 1809, 77.71%), dominated by *S. guttiger* and *Asemesthes paynteri* (Gnaphosidae), followed by the free-living plant-dwellers (*n* = 266, 11.43%), which were dominated by *T. thyenioides* and *Runcinia flavida* (Thomisidae). The dominant web-building group was the orb-web builders (*n* = 186, 7.98%). The remaining functional groups were mostly different web-builders that together

TABLE 1: Family composition of the spider fauna collected from Debshan Ranch, Zimbabwe.

Families	Genera	Species	PT (%)	SN (%)
Agelenidae	2	2	0.16	0.00
Araneidae	8	12	0.75	37.58
Cheiracanthiidae	1	2	0.05	0.00
Corinnidae	2	2	0.27	1.91
Ctenidae	1	1	0.05	0.00
Cyrtaucheniidae	1	1	0.05	0.00
Entypesidae	1	1	0.05	0.00
Eresidae	1	1	0.00	0.21
Gnaphosidae	13	28	26.60	0.64
Hersiliidae	1	1	0.05	0.00
Liocranidae	1	2	0.27	0.00
Lycosidae	11	20	14.81	3.61
Oxyopidae	2	7	1.67	1.06
Philodromidae	4	5	0.70	0.21
Pisauridae	4	5	0.59	0.43
Prodidomidae	1	2	2.69	0.43
Salticidae	16	33	37.86	28.88
Scytodidae	1	1	0.05	0.00
Segestriidae	1	1	0.05	0.00
Selenopidae	1	1	0.05	0.00
Sicariidae	1	1	0.05	0.00
Sparassidae	3	5	0.59	0.21
Theridiidae	4	8	0.27	9.34
Thomisidae	9	16	2.91	14.86
Zodariidae	4	8	9.37	0.64
Total	**94**	**166**	**~100.00**	**~100.00**

PT, Pitfall traps; SN, Sweep nets.

TABLE 2: Checklist of the spiders caught on previously kraaled sites and their surrounding vegetation from June 2017 to April 2018 at Debshan Ranch, Shanghani, Zimbabwe.

Family	Genera and species	Functional group	Pitfall traps	Sweep nets	Total
Agelenidae	*Benoitia ocellata* (Pocock 1900)	FWB	1	0	1
	Mistaria lawrencei (Roewer 1955)	FWB	2	0	2
Araneidae	*Argiope australis* (Walckenaer 1805)	OWB	8	43	51
	Argiope trifasciata (Forsskal 1775)	OWB	1	3	4
	Cyrtophora citricola (Forsskàl 1775)	MOWB	0	1	1
	Larinia chloris (Audouin 1826)	OWB	0	60	60
	Nemoscolus affinis (Lessert 1933)	OWB	0	1	1
	Nemoscolus cotti (Lessert 1933	OWB	0	2	2
	Neoscona hirta (C.L. Koch 1844)	OWB	1	0	1
	Neoscona subfusca (C.L. Koch 1844)	OWB	0	3	3
	Pararaneus spectator (Karsch 1885)	OWB	1	0	1
	Singa albordosata (Kauri 1950)	OWB	0	26	26
	Trichonephila inaurata (Walckenaer 1841)	OWB	0	16	16
	Trichonephila senengalensis (Walckenaer 1841)	OWB	1	20	21
	Cheiracanthium furculatum (Karsch 1879)	FPW	2	2	4
Cheiracanthiidae	*Cheiracanthium minshullae* (Lotz 2007)	FPW	1	0	1
Corinnidae	*Copa flavoplumosa* (Simon 1886)	FGW	4	9	13
	Graptartia granulosa (Simon 1896)	FGW	1	0	1
Ctenidae	*Afroneutria velox* (Blackwall 1865)	FGW	1	0	1
Cyrtaucheniidae	*Ancylotrypa nuda* (Hewitt 1966)	BGW	1	0	1
Entypesidae	*Gandanameno purcelli* (Tucker 1920)	RWB	1	0	1
Eresidae	*Stegodyphus africanus* (Blackwall 1866)	RWB	0	1	1
Gnaphosidae	*Ammoxenus daedalus* (Dippenaar & Meyer 1980)	FGW	27	0	27
	Asemesthes fodina (Tucker 1923)	FGW	2	0	2
	Asemesthes lineatus (Purcell 1908)	FGW	90	1	91
	Asemesthes paynteri (Tucker 1923)	FGW	245	0	245
	Asemesthes windhukensis (Tucker 1923)	FGW	9	0	9
	Camilllina maun (Platnick & Murphy 1987)	FGW	1	0	1
	Drassodes solitarius (Purcell 1907)	FGW	42	2	44
	Drassodes splendens (Tucker 1923)	FGW	24	0	24
	Ibala bulawayensis (Tucker 1923)	FGW	4	0	4
	Ibala declani (FitzPatrick 2009)	FGW	1	0	1
	Ibala minshullae (FitzPatrick 2009)	FGW	17	0	17
	Megamyrmaekion transvaalense (Tucker 1923)	FGW	2	0	2
	Nomisia varia (Tucker 1923)	FGW	9	0	9
	Scotophaeus relegatus (Purcell 1907)	FGW	1	0	1
	Setaphis makalali (FitzPatrick 2009)	FGW	1	0	1
	Trephopoda aplanita (Tucker 1923)	FGW	1	0	1
	Trephopoda parvipalpa (Tucker 1923)	FGW	1	0	1
	Urozelotes rusticus (L. Koch 1872)	FGW	1	0	1
	Xerophaeus aurariarum (Purcell 1907)	FGW	1	0	1
	Xerophaeus druryi (Tucker 1923)	FGW	1	0	1
	Xerophaeus vickermani (Tucker 1923)	FGW	1	0	1
	Zelotes bastardi (Simon 1896)	FGW	3	0	3
	Zelotes brennanorum (FitzPatrick 2007)	FGW	4	0	4
	Zelotes corrugatus (Purcell 1907)	FGW	2	0	2
	Zelotes frenchi (Tucker 1923)	FGW	1	0	1
	Zelotes mosioatunya (FitzPatrick 2007)	FGW	1	0	1
	Zelotes tuckeri (Roewer 1951)	FGW	1	0	1
	Zelotes scrutatus (O. Pickard-Cambridge 1872)	FGW	1	0	1
Hersiliidae	*Hersilia sericea* (Pocock 1898)	SWB	1	0	1
Liocranidae	*Rhaeboctesis secundus* (Tucker 1920)	FPW	3	0	3
	Rhaeboctesis trinotatus (Tucker 1920)	FPW	2	0	2
Lycosidae	*Allocosa faberrima* (Simon 1910)	FGW	1	0	1
	Allocosa lawrencei (Roewer 1951)	FGW	9	0	9
	Allocosa schoenlandi (Pocock 1900)	FGW	12	0	12
	Allocosa umtalica (Purcell 1903)	FGW	111	0	111
	Amblyothele ecologica (Russell-Smith, Jocqué & Alderweireldt 2009)	FGW	1	0	1
	Evippomma plumipes (Lessert 1936)	FGW	1	0	1
	Evippomma squamulatum (Simon 1898)	FGW	4	0	4
	Foveosa fovelata (Purcell 1903)	FGW	0	1	1
	Lycosa gigantea (Roewer 1960)	FGW	6	0	6

Table 2 continues on the next page →

TABLE 2 (Continues...): Checklist of the spiders caught on previously kraaled sites and their surrounding vegetation from June 2017 to April 2018 at Debshan Ranch, Shanghani, Zimbabwe.

Family	Genera and species	Functional group	Pitfall traps	Sweep nets	Total
	Lycosa palliata (Roewer 1960)	FGW	5	0	5
	Pardosa crassipalpis (Purcell 1903)	FGW	46	14	60
	Pardosa injucunda (O. Pickard-Cambridge 1876)	FGW	1	0	1
	Pardosa leipoldti (Purcell 1903)	FGW	1	0	1
	Proevippa albiventris (Simon 1898)	FGW	9	0	9
	Proevippa fascicularis (Purcell 1903)	FGW	6	0	6
	Schizocosa darlingi (Pocock 1998)	FGW	6	1	7
	Trabea purcelli (Roewer 1951)	FGW	1	0	1
	Wadicosa manubriata (Simon 1898)	FGW	54	0	54
	Zenonina albocaudata (Lawrence 1952)	FGW	1	0	1
	Zenonina mystacina (Simon 1898)	FGW	0	1	1
Oxyopidae	*Oxyopes bothai* (Lessert 1915)	FPW	22	4	26
	Oxyopes dumonti (Vinson 1863)	FPW	1	0	1
	Oxyopes hoggi (Lessert 1915)	FPW	1	0	1
	Oxyopes jacksoni (Lessert 1915)	FPW	2	0	2
	Oxyopes pallidecoloratus (Strand 1906)	FPW	2	0	2
	Oxyopes russoi (Caporiacco 1940)	FPW	3	0	3
	Peucetia striata (Karsch 1878)	FPW	0	1	1
Philodromidae	*Hirriusa arenacea* (Lawrence 1927)	FGW	4	1	5
	Hirriusa variegata (Simon 1895)	FPW	1	0	1
	Suemus punctatus (Lawrence 1938)	FGW	3	0	3
	Thanatus dorsilineatus (Jezequel 1964)	FGW	3	0	3
	Tibellus minor (Lessert 1919)	FPW	2	0	2
Pisauridae	*Euprothenopsis armata* (Strand 1913)	FWB	1	0	1
	Maypacius roeweri (Blandin 1975)	FPW	2	0	2
	Nilus margaritatus (Pocock 1898)	FGW	2	0	2
	Perenethis simoni (Lessert 1901)	SWB	5	2	7
	Perenethis symmetrica (Lawrence 1927)	SWB	1	0	1
Prodidomidae	*Theuma fusca* (Purcell 1907)	FGW	49	2	51
	Theuma parva (Purcell 1907)	FGW	1	0	1
Salticidae	*Baryphas ahenus* (Simon 1902)	FPW	1	0	1
	Bianor albobimaculatus (Lucas 1846)	FGW	0	2	2
	Euophrys purcelli (Peckham & Peckham)	FPW	1	0	1
	Evarcha flagellaris (Haddad & Wesołowska 2011)	FGW	1	13	14
	Evarcha ignea (Wesołowska & Cumming 2008)	FGW	1	0	1
	Evarcha prosimilis (Wesołowska & Cumming 2008)	FGW	1	1	2
	Evarcha striolata (Wesołowska & Haddad 2009)	FGW	0	3	3
	Evarcha zimbabwensis (Wesołowska & Cumming 2008)	FGW	11	0	11
	Heliophanus pistaciae (Wesołowska 2003)	FPW	0	4	4
	Heliophanus transvaalicus	FPW	5	2	7
	Hyllus argyrotoxus (Simon 1902)	FPW	8	6	14
	Hyllus dotatus (Peckham & Peckham 1903)	FPW	2	4	6
	Hyllus brevitarsis (Simon 1902)	FPW	1	0	1
	Langelurillus minutus (Wesołowska & Cumming 2011)	FGW	4	0	4
	Langona bethae (Wesołowska & Cumming 2011)	FGW	6	0	6
	Langona tortuosa (Wesołowska 2011)	FGW	17	0	17
	Langona zimbabwensis (Wesołowska & Cumming 2011)	FGW	2	0	2
	Mexcala angolensis (Wesołowska 2009)	FGW	1	0	1
	Nigorella hirsuta (Wesołowska 2009)	FGW	1	0	1
	Nigorella manica (Peckham & Peckham 1903)	FGW	3	0	3
	Parajotus obscurofemoratus (Peckham & Peckham 1903)	FGW	1	0	1
	Pellenes bulawayoensis (Wesołowska 1999)	FGW	5	0	5
	Pellenes tharinae (Wesołowska 2006)	FGW	5	2	7
	Phlegra langanoensis (Wesołowska & Tomasiewicz 2008)	FGW	1	0	1
	Phlegra procera (Wesołowska & Cumming 2008)	FGW	1	0	1
	Phlegra simplex (Wesołowska & Russell-Smith 2000)	FGW	5	0	5
	Stenaelurillus guttiger	FGW	482	8	490
	Stenaelurillus termitophagus (Wesołowska & Cumming 1999)	FGW	131	3	134
	Thyene australis (Peckham & Peckham 1903)	FPW	1	0	1
	Thyene inflata (Gerstacker 1873)	FPW	1	15	16
	Thyene mutica (Simon 1902)	FPW	0	1	1

Table 2 continues on the next page →

TABLE 2 (Continues...): Checklist of the spiders caught on previously kraaled sites and their surrounding vegetation from June 2017 to April 2018 at Debshan Ranch, Shanghani, Zimbabwe.

Family	Genera and species	Functional group	Pitfall traps	Sweep nets	Total
	Thyene natali (Peckham & Peckham 1903)	FPW	2	0	2
	Thyene thyenioides (Lessert 1925)	FPW	2	72	74
Scytodidae	*Scytodes quarta* (Lawrence 1927)	FGW	1	0	1
Segestriidae	*Ariadna corticola* (Lawrence 1952)	TWB	1	0	1
Selenopidae	*Selenops kruegeri* (Lawrence 1940)	FGW	1	0	1
Sicariidae	*Loxosceles simillima* (Lawrence 1927)	FGW	1	0	1
Sparassidae	*Olios brachycephalus* (Lawrence 1938)	FPW	2	1	3
	Olios correvoni (Lessert 1921)	FPW	5	0	5
	Olios freyi (Lessert 1929)	FPW	1	0	1
	Panaretella minor (Lessert 1919)	FPW	2	0	2
	Pseudomicrommata vittigera (Simon 1897)	FPW	1	0	1
Theridiidae	*Argyrodes convivans* (Lawrence 1937)	GWB	0	9	9
	Argyrodes sextuberculosis (Strand 1908)	GWB	0	1	1
	Argyrodes zonatus (Walckenaer 1841)	GWB	0	3	3
	Euryopis episinoides (Walckenaer 1847)	GWB	0	1	1
	Latrodectus geometricus (C.L. Koch 1841)	GWB	5	8	13
	Latrodectus renivulvatus (Dahl 1902)	GWB	0	16	16
	Latrodectus rhodesiensis (Mackay 1972)	GWB	0	2	2
	Phoroncidia eburnea (Simon 1895)	GWB	0	4	4
Thomisidae	*Heriaeus crassispinus* (Lawrence 1942)	FPW	1	0	1
	Misumenops rubrodecoratus (Millot 1942)	FPW	0	4	4
	Monaeses austrinus (Simon 1910)	FPW	0	1	1
	Monaeses gibbus (Dippenaar-Schoeman 1984)	FPW	0	2	2
	Monaeses griseus (Pavesi 1897)	FPW	0	3	3
	Monaeses paradoxus (Lucas 1846)	FPW	0	4	4
	Mystaria savannensis (Lewis & Dippenaar-Schoeman 2014)	FPW	0	1	1
	Runcinia flavida (Simon 1881)	FPW	0	49	49
	Simorcus cotti (Lessert 1936)	FPW	1	0	1
	Thomisus congoensis (Comellini 1957)	FPW	0	1	1
	Thomisus daradiodes (Simon 1890)	FPW	1	0	1
	Thomisus granulatus (Karsch 1880)	FPW	0	4	4
	Thomisus scrupeus (Simon 1886)	FPW	1	0	1
	Thomisus stenningi (Pocock 1900)	FPW	0	1	1
	Tmarus africanus (Lessert 1919)	FPW	1	0	1
	Xysticus havilandi (Lawrence 1982)	FGW	49	0	49
Zodariidae	*Capheris decorata* (Simon 1904)	FGW	1	0	1
	Capheris fitzsimonsi (Lawrence 1936)	FGW	107	1	108
	Diores magicus (Jocqué & Dippenaar-Schoeman 1992)	FGW	4	1	5
	Diores rectus (Jocqué 1900)	FGW	5	0	5
	Diores salisburyensis (Tucker 1920)	FGW	1	0	1
	Hermippus loricatus (Simon 1893)	FGW	1	0	1
	Hermippus tenebrosus (Jocqué 1986)	FGW	51	1	52
	Ranops caprivi (Jocqué 1991)	FGW	4	0	4

Guild: FWB, funnel-web builders; OWB, orb-web builders; MOWB, modified orb-web builders; BGW, burrow-dwelling ground wanderers; FGW, free-living ground wanderers; RWB, retreat-web builders; FPW, free-living plant wanderers; SPWB, space-web builders; TWB, tube-web builders; GWB, gumfoot-web builders; P, Pitfall traps; S, Sweep nets.

constituted less than 2.87% (n = 67) of the total spider fauna, individually contributing less than 2% (Figure 1).

The dominant ground-dwelling families at Debshan Ranch are also fairly similar to those found in earlier studies in African grasslands (Haddad et al. 2015) and savannas (Haddad 2022). They are usually generalist predators, with some species having evolved specialised diets on termites, ants, mosquitoes, and other spiders (Pekár et al. 2012). They are also common epigeal species in agroecosystems in South Africa (Dippenaar-Schoeman et al. 2013) and Zimbabwe (Mashavakure et al. 2019), and are considered an important group in pest control. In this study, the grass-dwelling fauna was dominated by Araneidae (n = 175; 37.16%), Salticidae (n = 136; 28.88%) and Thomisidae (n =

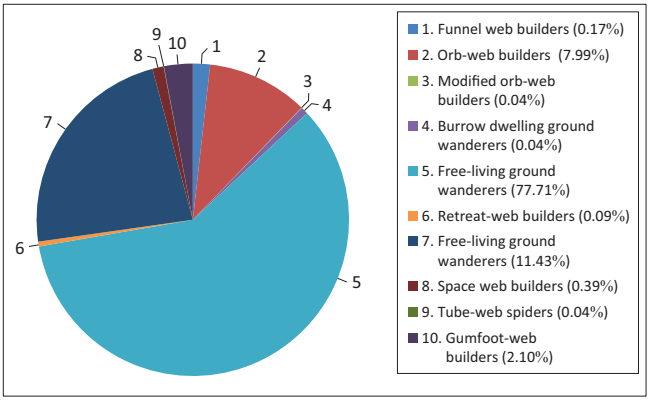

FIGURE 1: Relative proportion of each functional group sampled by pitfall trapping and sweep-netting in the Miombo woodlands at Debshan Ranch, Zimbabwe from June 2017 till April 2018. Classification of spiders into functional groups was adapted from Foord et al. (2011).

70; 14.86%); however, Oxyopidae (n = 5; 0.12%) was not as common in this study as in other savanna biotypes (Foord et al. 2002, 2016). In order to enhance their chances of survival within their ideal habitats, some grass-dwelling species have evolved elongate, pale bodies, while ground-dwelling species are cryptically coloured (Dippenaar-Schoeman et al. 2013), for example, in Salticidae (Haddad & Wesolowska 2011).

Conclusion

This study contributes to our knowledge of the geographical distribution of Zimbabwean spiders. The baseline information on the spider assemblages of Debshan Ranch provides a list of 166 species. However, in order to improve on the distributions and the diversity of the spider fauna, inventories should be conducted in all floral biomes in the country, using not only pitfall traps and sweep nets, but a variety of active search methods, that is, hand collecting, beating sheets amongst others. This will ensure that all spider taxa, including those in trees and bushes (left out in the sampling design of this study) are also included. This will allow researchers to determine the species that are endemic and threatened.

Acknowledgements

The authors thank the Oppenheimer family and the Debshan Ranch staff for funding the fieldwork and for their logistical support during this research. Thanks are due as well to the Natural History Museum staff for assistance with fieldwork, sorting invertebrate samples and taxonomic inputs.

This article is partially based on the author's thesis entitled 'Spider ecology in southwestern Zimbabwe, with emphasis on the impact of holistic planned grazing practices' toward the degree of Philosophiae Doctor (Zoology and Entomology) in the Department of Zoology and Entomology, University of the Free State, South Africa, with supervisor(s) Prof. Charles R. Haddad, Prof. Stefan H. Foord and Dr Moira FitzPatrick, received January 2020, it is available here: http://hdl.handle.net/11660/10945.

Competing interests

The authors declare that they have no financial or personal relationships that may have inappropriately influenced them in writing this article.

Authors' contributions

S.S. undertook and conducted the survey, commenced the sorting and identification of sampled materials, and wrote the first draft of the manuscript. C.R.H. assisted in the identification of the sampled materials and in editing the manuscript. M.J.F. is the curator of the Natural History Museums of Zimbabwe and assisted with the sorting, identification & curation of the sampled material, and assisted in the editing of the manuscript. S.H.F. assisted in the editing of the manuscript.

Funding information

This research received a grant from N.F. Oppenheimer and was facilitated by Duncan MacFadyen.

Data availability

The data that support this study will be shared upon reasonable request from the corresponding author.

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References

Cumming, M.S. & Wesołowska, W., 2004, 'Habitat separation in a species-rich assemblage of jumping spiders (Araneae: Salticidae) in a suburban study site in Zimbabwe', *Journal of Zoology* 262(1), 1–10. https://doi.org/10.1017/S0952836903004461

Dippenaar-Schoeman, A.S., Haddad, C.R., Foord, S.H., Lyle, R., Lotz, L.N. & Marais, P., 2015, 'South African National Survey of Arachnida (SANSA): Review of current knowledge, constraints and future needs for documenting spider diversity (Arachnida: Araneae)', *Transactions of the Royal Society of South Africa* 70(3), 245–275. https://doi.org/10.1080/0035919X.2015.1088486

Dippenaar-Schoeman, A.S., Van Den Berg, A.M., Haddad, C.R. & Lyle, R., 2013, 'Spiders in South African agroecosystems: A review (Arachnida, Araneae)', *Transactions of the Royal Society of South Africa* 68(1), 57–74. https://doi.org/10.1080/0035919X.2012.755136

Dunham, K.M., Robertson, E.F. & Swanepoel, C.M., 2003, 'Population decline of tsessebe antelope (*Damaliscus lunatus*) on a mixed cattle and wildlife ranch in Zimbabwe', *Biological Conservation* 113(1), 111–124. https://doi.org/10.1016/S0006-3207(02)00354-3

FitzPatrick, M.J., 2001, 'The spider fauna of Zimbabwe (Arachnida: Araneae)', *Arnoldia Zimbabwe* 10(16), 177–188.

Foord, S.H., Dippenaar-Schoeman, A.S. & Haddad, C.R., 2011, 'The faunistic diversity of spiders (Arachnida: Araneae) of the Savanna Biome in South Africa', *Transactions of the Royal Society of South Africa* 66(3), 170–201. https://doi.org/10.1080/0035919X.2011.639406

Foord, S.H., Dippenaar-Schoeman, A.S., Haddad, C.R., Lyle, R., Lotz, L.N., Sethusa, T. et al., 2020, 'The South African National Red List of spiders: Patterns, threats, and conservation', *Journal of Arachnology* 48(2), 110–118. https://doi.org/10.1636/0161-8202-48.2.110

Foord, S.H., Dippenaar-Schoeman, A.S., Jocqué, R., Haddad, C.R., Lyle, R. & Webb, P., 2016, 'South African National Survey of Arachnida: A checklist of the spiders (Arachnida, Araneae) of the Lekgalameetse Nature Reserve, Limpopo Province, South Africa', Koedoe 58, a1405. https://doi.org/10.4102/koedoe.v58i1.1405

Foord, S.H., Dippenaar-Schoeman, A.S. & Van der Merwe, M., 2002, 'A check list of the spider fauna of the Western Soutpansberg, South Africa (Arachnida: Araneae)', *Koedoe* 45(2), 35–43. https://doi.org/10.4102/koedoe.v45i2.25

Haddad, C.R., 2022, 'A preliminary survey of the ground-dwelling spider assemblages of the Ndumo Game Reserve, South Africa (Arachnida: Araneae)', *Arachnology* 19(2), 517–526. https://doi.org/10.13156/arac.2022.19.2.517

Haddad, C.R., Foord, S.H., Fourie, R. & Dippenaar-Schoeman, A.S., 2015, 'Effects of a fast-burning spring fire on the ground-dwelling spider assemblages (Arachnida: Araneae) in a central South African grassland habitat', *African Zoology* 50(4), 281–292. https://doi.org/10.1080/15627020.2015.1088400

Haddad, C.R. & Wesolowska, W., 2011, 'New species and new records of jumping spiders (Araneae: Salticidae) from central South Africa', *African Invertebrates* 52(1), 51–134. https://doi.org/10.5733/afin.052.0105

Jocqué, R., Alderweireldt, M. & Dippenaar-Schoeman, A.S., 2013, 'Biodiversity: An African perspective', in D. Penney (ed.), *Spider research in the 21st century: Trends and perspectives*, pp. 18–57, Siri Scientific Press, Manchester, chapter 1.

Mashavakure, N., Mashingaidze, A.B., Musundire, R., Nhamo, N., Gandiwa, E., Thierfelder, C. & Muposhi, V.K. 2019, 'Spider community shift in response to farming practices in a sub-humid agroecosystem of southern Africa', *Agriculture, Ecosystems and Environment* 272, 237–245. https://doi.org/10.1016/j.agee.2018.11.020

Pekar, S., Coddington, J.A. & Blackledge, T.A. 2012, '*Evolution* of stenophagy in spiders (Araneae): evidence based on the comparative analysis of spider diets', Evolution 66, 776–806. https://doi.org/10.1111/j.1558-5646.2011.01471.x

Robertson, E.F., 2013, *Vegetation monitoring sites on Shangani Ranch: Methods and descriptions of grass species composition and ecological condition for sites 1–27, March–April 2013*, Report prepared for E. Oppenheimer and Son (Pty) Limited and Debshan Pvt Ltd, Shangani.

Sebata, S., 2020, *Spider ecology in southwestern Zimbabwe, with emphasis on the impact of holistic planned grazing practices,* Unpublished Ph.D thesis, University of the Free State, Bloemfontein.

Sebata, S., Haddad, C.R., Foord, S.H. & FitzPatrick, M.J., 2022, 'Weak negative responses of spider diversity to short-term 'kraaling'', *The Rangeland Journal* 44(2), 61–75. https://doi.org/10.1071/RJ22004

Turnbull, A.L., 1973, 'Ecology of the true spiders (Araneomorphae)', *Annual Reviews of Entomology* 18, 305–348. https://doi.org/10.1146/annurev.en.18.010173.001513

Wesołowska, W., 1999, 'New and little known species of jumping spiders from Zimbabwe', *Arnoldia Zimbabwe* 10, 145–176.

Wesołowska, W. & Cumming, M.S., 2011, 'New species and records of jumping spiders (Araneae, Salticidae) from Sengwa Wildlife Research Area in Zimbabwe', *Journal of Afrotropical Zoology* 7, 75–104.

World Spider Catalog, 2023, *Version 23.5 Natural History Museum Bern*, World Spider Catalog, viewed 06 January 2023, from https://wsc.nmbe.ch.