Habitat preferences and seasonal activity of the Microstigmatidae from Ngome State Forest, South Africa (Arachnida: Araneae)

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As part of the South African National Survey of Arachnida (SANSA) inventories are underway to determine the arachnid biodiversity of various biomes. A survey of ground-living spiders was conducted over a year period (1992-1993) at Ngome State Forest, KwaZulu-Natal, South Africa. Spiders were collected with 180 pitfall traps from five different habitat types ranging from indigenous forest to a pine plantation and grassland. A total of 186 specimens of the rare Mygalomorphae family Microstigmatidae were sampled, representing 2 % of the total spider fauna collected during the study. Two species, *Microstigmata longipes* (Lawrence) and *M. zuluensis* (Lawrence), occur sympatrically. Both species were more active in the indigenous forest, and were absent or present in low numbers in the open grass and pine plantation. *Microstigmata zuluensis* was slightly more abundant (59 % of total) and was recorded from three of the five habitats, while *M. longipes* (41 %) was found in four of the habitat types. Both species were active throughout the year with the lowest numbers recorded in winter (June to August). The males of *M. longipes* peaked in November while those of *M. zuluensis* peaked in April.

Key words: Afromontane forest, Araneae, biodiversity, Microstigmatidae, *Microstigmata*, spiders, South Africa National Survey of Arachnida.

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Introduction

The Microstigmatidae is a small family of spiders represented by seven genera and 13 species known from Africa, Central and South America (Platnick 2005). In Africa it is represented by a single genus *Microstigmata*, which is known only from South Africa (Dippenaar-Schoeman 2002; Griswold 1985). In a revision of the genus, Griswold (1985) recognised six species with their distribution restricted mainly to the forest regions of the eastern parts of South Africa.

The *Microstigmata* are small (4–13 mm), free-living mygalomorph spiders. They are the only members of the Mygalomorphae in the Afrotropical Region that do not live in silk-lined burrows or retreats. They are wanderers and found when turning stones and logs or sifting leaf litter and humus. Specimens are usually encrusted with earth due to sand particles adhering to their clavate body setae. Although widely distributed throughout the eastern parts of South Africa, they are shy animals and are rarely collected. Little is known about their behaviour and natural history (Griswold 1985).

During a 12-month survey of the cryptofauna at Ngome State Forest in KwaZulu-Natal, South Africa, 186 microstigmatids were sam-

pled with pitfall traps. This represented about 2 % of the total number of spiders collected during the study (Van der Merwe *et al.* 1996). As very little information is available on the ecology of most mygalomorph spiders, data on the habitat preferences and seasonal activity of the two *Microstigmata* species collected are presented here. This is the third paper on the ground-living spider fauna of the Ngome State Forest (Van der Merwe 1994; Van der Merwe *et al.* 1996) and the first quantitative survey of microstigmatids in South Africa. This survey forms part of the South African National Survey of Arachnida (SANSA) that was initiated in 1997. The main aim of this umbrella project is to make an inventory of the arachnid fauna of South Africa (Dippenaar-Schoeman & Craemer 2000). Thrusts within SANSA are focused on inventories of the arachnid fauna of the different floral biomes (here the Forest Biome), provinces, conserved areas and agro-ecosystems.

Study area

Ngome State Forest (27º49'S; 31º26'E) is situated on the escarpment of northern KwaZulu-Natal, South Africa, at an altitude of 405–1365 m above sea level. Rainfall averages 1507 mm/year, with January the wettest (227 mm) and June the driest (26 mm). The mean maximum temperatures are 26.6 ºC (January/February) and 18.6 ºC (June/July).

The five different habitat types sampled were: 'open grass' consisting of grass surrounded by indigenous forest; 'open forest' comprising closed canopy indigenous forest characterised by the absence of significant undergrowth; 'dense forest' consisting of closed canopy indigenous forest with dense undergrowth; 'ecotone pine' with mature pine plantation surrounded and penetrated by indigenous forest vegetation, and a pine plantation not directly surrounded by indigenous forest. For more detail on the habitat types see Van der Merwe *et al.* (1996).

Methods

Pitfall traps (n = 180) consisting of a plastic container (10 cm diameter) sunk to ground level with a funnel leading to a honey jar, and filled with 70 % alcohol–5 % glycerol mixture, was used. The traps were spaced 5 m apart in a 3x3 grid pattern with four grids (36 pitfall traps) placed in each of the five habitats. Traps were continuously open and emptied in the middle of each month, from January 1992 to January 1993. Voucher specimens are deposited in the National Collection of Arachnida at the ARC-Plant Protection Research Institute, Pretoria.

Statistical analysis were conducted using the statistical program GenStat (2000) to determine if significant differences existed in the abundance of the two species in the different habitat types, as well as during different seasons, using 2x3, 2x4 and one sample *Chi*-squared tests.

Results

Species numbers

A total of 9 369 spiders were collected during the survey, of which 186 belonged to the Microstigmatidae. Two species, *M. longipes* (Lawrence) and *M. zuluensis* (Lawrence), occur sympatrically. A total of 110 individuals of *M. zuluensis* were collected, representing 59 % of all microstigmatids collected, while 76 specimens of *M. longipes* were collected, representing 41 % of the total (Table 1).

Habitat preferences

Microstigmata zuluensis was collected from three of the five habitats (Table 1). They were absent from the open grass and pine plantation, and more active (n = 45) in the open forest. They represented 41 % of the total, followed by the dense forest (n = 42) with 38 %, and ecotone pine (n = 23) with 21 %.

Microstigmata longipes was active in four of the five habitats, being absent only from the open grass (Table 1). They were more active in the dense forest (n = 37) representing 49 % of the total, followed by the open

Table 1
Microstigmata spp. collected from 180 pitfall traps from five habitat types at the Ngome State Forest, KwaZulu-Natal, South Africa during 1992-1993

Species	Open grass	Pine plantation	Ecotone	Dense forest	Open forest	Total	%
M. zuluensis	0	0	23	42	45	110	59
M. longipes	0	2	5	37	32	76	41
Total	0	2	28	79	77	186	100

forest (n = 32) with 42 % and 9 % in the ecotone pine and pine plantations.

Both species prefer closed canopy indigenous forest. A total of 79 % of microstigmatids were collected from the two indigenous forest habitats compared to the 21 % from the ecotone pine and pine plantation. The cover of the forest floor plays a less important role; 41 % in total were active in the forest habitat characterised by the absence of significant undergrowth, compared to the 43 % collected from forest with dense undergrowth. The *Chi*-squared tests indicated that the relative activity of the two *Microstigmata* spp. differed significantly in open forest, dense forest and ecotone pine at the 0.05 test level (χ^2 = 5.991, p <0.05), and that the distribution of the two species differed significantly between the dense forest and ecotone pine (χ^2 = 5.737, p <0.05).

Seasonal activity

Microstigmata zuluensis was active throughout the year (except in July), but their numbers fluctuated to show an increase in surface activity during autumn and early winter (April to June) when 42 % were collected,

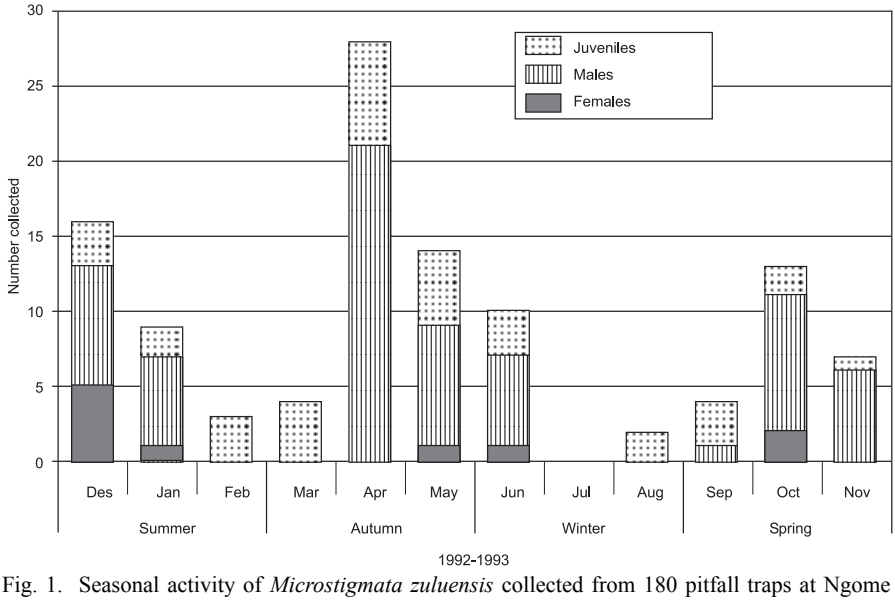

Fig. 1. Seasonal activity of *Microstigmata zuluensis* collected from 180 pitfall traps at Ngome State Forest, KwaZulu-Natal, South Africa during 1992-1993.

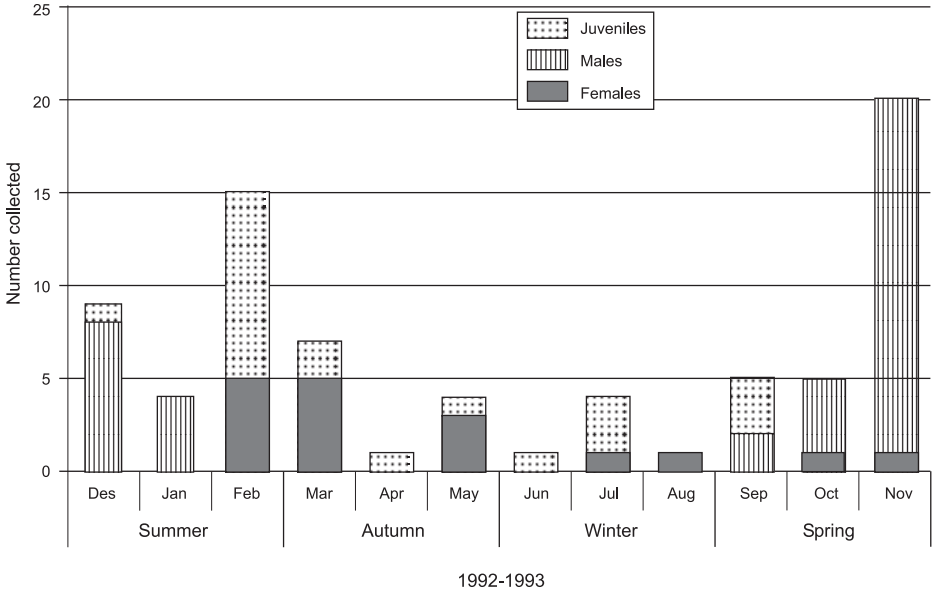

Fig. 2. Seasonal activity of *Microstigmata longipes* collected from 180 pitfall traps at Ngome State Forest, KwaZulu-Natal, South Africa during 1992-1993.

with a peak in April (n = 28). Their numbers declined to a low of 11 % during the winter months (July-August) and increased again in the spring and summer to 26 %. *Microstigmata longipes* was active throughout the year with peaks in February (n = 15) and November (n = 20). Their activity fluctuated from autumn when 16 % were recorded, to a low (8 %) in winter. Activity increased again to reach a high of 40 % in the spring and 37 % in summer.

As expected of pitfall trapping, more males (55 %) were sampled in both species, followed by immature specimens (32 %) and females (13 %). Males of *M. zuluensis* were active during eight months of the year (Fig. 1). They were active in autumn and early winter with a peak (n = 21) in April when 19 % of the specimens were collected and second peaks in October (n = 9) and December (n = 8). Juveniles were active throughout the year (except July) with a slight peak in April (n = 7). The females were collected irregularly during five months of the year.

Males of *M. longipes* were active five months of the year, and their numbers peaked in November (n = 19; 20 %) but were absent from samples between February and August. Juveniles were absent during four months of the year with a peak in February (n = 10). Female numbers peaked in February and March (n = 5; 17 %) (Fig. 2).

Discussion and conclusion

The two species *M. longipes* and *M. zuluensis* are typical cryptofauna of indigenous forest habitats (Griswold 1985; Lawrence 1952). Although the two species occurred sympatrically and both were active throughout the year their reproductive periods differ. The males of *M. zuluensis* peaked in April, compared to the males of *M. longipes* that peaked in November.

Both species preferred the indigenous forest habitats with either dense or low undergrowth where 85 % of the specimens were collected above the open grass habitat or pine forest where only 15 % of the two species were found. Based on general collection information and distribution records Griswold (1985) identified *M. zuluensis* as a more tolerant species occurring also in habitats outside indigenous forests. This observation was confirmed in this study where 12.4 % of *M. zuluensis* was collected from ecotone pine compared to the 3.8 % of *M. longipes* found outside the indigenous forest.

Conservation biologists are starting to recognise the importance of the invertebrate component in the functioning of healthy ecosystems. Of prime importance in any conservation scheme is the identification of species sensitive to changing environmental factors, as found here. In many areas of Africa the planting of exotic trees has supplanted indigenous forest. This has an effect on plant structure at the ground level, which could have an effect on the community structure of the ground-living spider fauna. Since spiders are an important component of the forest floor ecosystem this could have significant effects on other invertebrate groups and plants as well. As only a fraction of South Africa's area (0.2 %) is covered by high evergreen forest (Huntley 1984) the conservation of these undisturbed indigenous forests with their cryptofauna is of utmost importance and should receive high priority for conservation efforts.

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