# Species composition and relative seasonal abundance of spiders from the field and tree layers of the Roodeplaat Dam Nature Reserve

ANNA S. DIPPENAAR-SCHOEMAN, ALIDA M. VAN DEN BERG and ANNETTE VAN DEN BERG

Dippenaar-Schoeman, Anna S., Alida M. van den Berg and Annette van den Berg. 1989. Species composition and relative seasonal abundance of spiders from the field and tree layers of the Roodeplaat Dam Nature Reserve. — *Koedoe* 32 (1): 25-38. Pretoria. ISSN 0075-6458.

A survey of spiders was carried out at the Roodeplaat Dam Nature Reserve near Pretoria. Over a 4-year period 10 270 spiders were collected from grasses, herbs and trees. A total of 82 genera of spiders representing 27 families were recorded. Of all the spiders caught, 29,3 percent belonged to the Tetragnathidae, 22,7 percent to the Araneidae and 21,4 percent to the Salticidae. The proportion of spiders in each of the remaining 24 families did not exceed 6 percent of the total catch. The species composition and seasonal abundance are discussed.

Key words: Spiders, Araneae, seasonal changes, Roodeplaat Dam Nature Reserve, arachnid ecology.

*Anna S. Dippenaar-Schoeman, Alida M. van den Berg and Annette van den Berg, Plant Protection Research Institute, Private Bag X134, Pretoria, 0001 Republic of South Africa.*

## Introduction

Spider communities in temperate regions have been widely studied by Duffey (1962, 1963), Merrett (1967, 1968) and Russell-Smith & Swann (1972) but apart from the studies of Blandin (1971,1972) and Blandin & Célérier (1981) in the Ivory Coast, Malaisse & Benoit (1979) on Miombo woodland in Zaire, Russell-Smith (1981) on Mopane woodland and floodplain grassland in Botswana and Russell-Smith, Ritchie & Collins (1987) on arid bushland in Kenya, little is known of spider communities in the tropical and sub-tropical regions of Africa. Knowledge of South African spiders has largely depended on casual collecting and species descriptions. Very little is known about local spider communities other than the studies on agro-ecosystems by Dippenaar-Schoeman (1977, 1979). To obtain information on spider communities in protected habitats, that is in areas not affected by pesticides, fire or grazing, monthly surveys were carried out at Roodeplaat Dam and Rustenburg Nature Reserves (Dippenaar-Schoeman *in prep.*) in Transvaal from 1980 to 1983.

Spiders were collected from grasses, herbs and trees for the study of spider communities in different habitat zones. Population parameters such as relative abundance, density and dominance were measured and a check list of the spider fauna was compiled. As part of an on-going study this paper deals with the collecting techniques, species composition and seasonal changes of spiders collected at the Roodeplaat Dam Nature Reserve from January 1980 to August 1983.

## Methods

(i) *Study area*
The study was carried out at the Roodeplaat Dam Nature Reserve (28°22'S, 25°37'E), 1 225 m above sea level. The reserve is situated 32 km north-east of Pretoria and is 1 706 ha in extent. The surface area of the dam is 395 hectares.

The nature reserve has a sub-tropical climate with a wet summer (average rainfall 686 mm) and a dry winter (Fig. 1). Rainfall records kept since October 1949 indicate that the rainy season starts in November, maximum rainfall occurs in November and January, and little or no rain falls from May to August. The mean annual temperature is 18,2 °C with the highest maximum temperature recorded at 37,4 °C and the lowest minimum at - 6,7 °C.

The nature reserve is generally a rather open savanna with *Acacia caffra* (Willd.) the dominant tree, in a fairly tall and dense grassveld dominated by *Cymbopogon plurinodis* (Stapf) Stapf ex Burtt Davy, B., *Themeda triandra* Forsk., *Elionurus argenteus* Nees and *Hyparrhenia* spp. Acocks (1975) classified the veld as Veld Type 19 (Sourish Mixed Bushveld) that often occurs as an irregular belt on gentle mountain slopes between grassveld and bushveld.

Spiders were collected during the survey period from 10 ha situated on the north-eastern side of the reserve.

(ii) *Field Survey*
Collections were made in three layers (a) soil and litter (b) grass and herbs and (c) trees. Only the last two layers were collected on a quantitative basis. The sampling techniques used provided estimates of relative and not absolute abundance.

(a) Soil and litter: it was difficult to maintain pit traps in areas open to the public, therefore, spiders were collected sporadically by hand and sometimes extracted with a Berlese Funnel. The population data of spiders collected from soil were not analysed but species collected are given in the check list.

(b) Grass and herb layer: this layer was sampled using a standard sweepnet, 34 cm in diameter with a 75 cm handle. Each sweep covered an arc of approximately 1,5 m through the vegetation. A sample unit consisted of 30 sweeps and 20 such units were taken each month. Collecting started in January 1980 and ended in August 1983 during which time a total of 880 sample units were taken. The deficiencies of the sweepnet as a sampling method are discussed by several authors such as Turnbull (1973), Southwood (1978) and Tonkyn (1980). This method is unsuitable for synecological work as related species may differ in their availability for sweeping, the vertical distribution of adults and instars may differ and only those individuals on the top of the vegetation that do not fall off on the approach of the collector are caught. Sweepnetting is, however, a simple and quick method to sample active arthropods so that a rough estimate of their numbers can be obtained.

(c) Tree layer: spiders were mainly collected from *Acacia caffra* with a beating tray (Dippenaar-Schoeman, Genis, Van Ark & Viljoen 1978). Different trees of approximately equal size and form, occurring in the same area were chosen at random each month. A sample unit of four branches per tree were beaten ten times over a tray and all dislodged spiders collected. Ten sample units per month were collected from September 1980 to August 1983.

ISSN 0075-6458



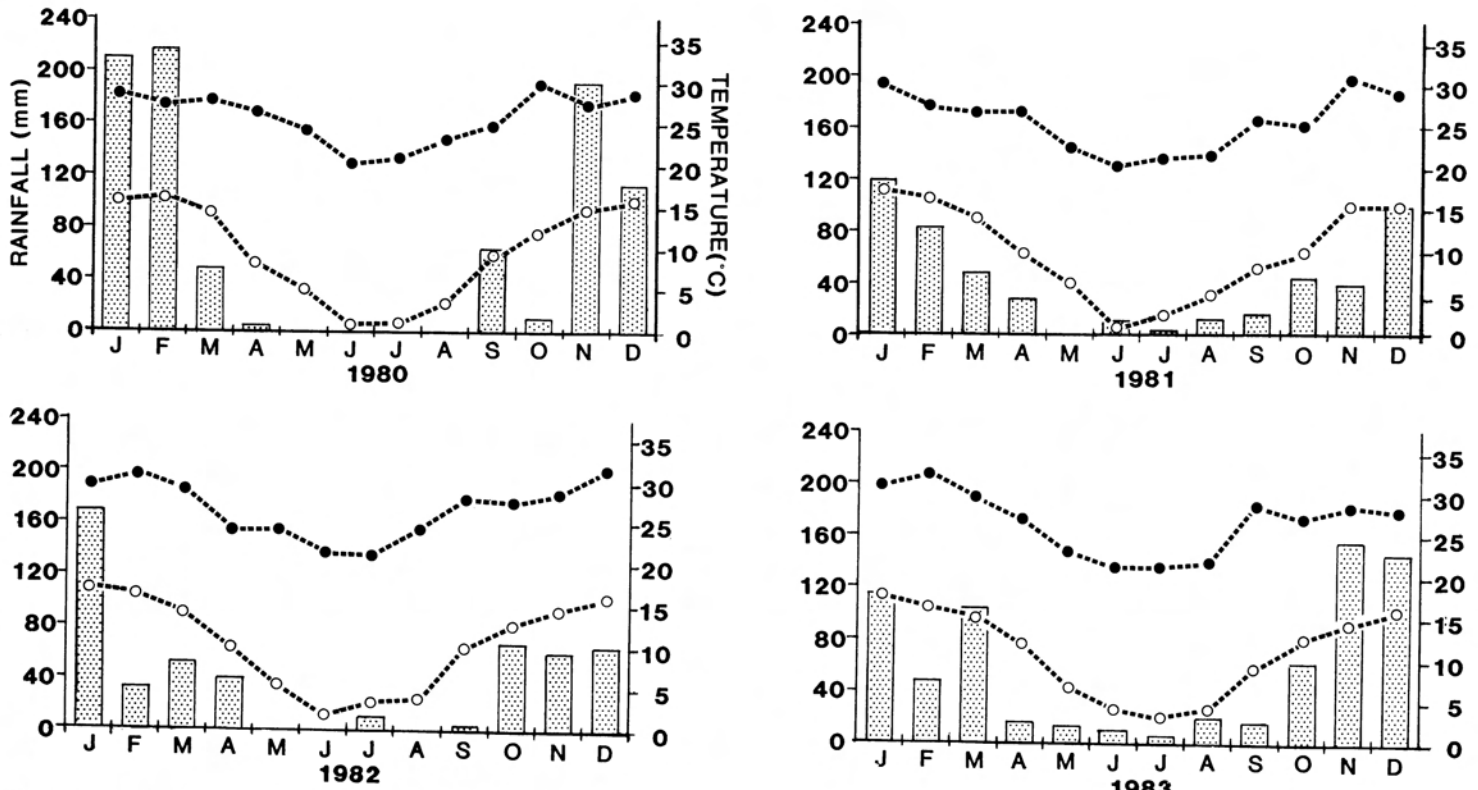


Fig. 1. Mean monthly maximum and minimum temperatures and mean monthly rainfall at Roodeplaat Dam Nature Reserve for January 1980 to December 1983 (closed circles, maximum temperatures, °C; open circles, minimum temperatures, °C; histogram, rainfall, mm)

The deficiencies of beating as a sampling method are discussed by Southwood (1978). Like the sweepnet it is only a relative collecting method for most groups.

(iii) *Treatment of samples taken*
Most samples were collected between 08h30-11h00. Specimens were transferred to 70 percent alcohol with a camel-hair brush. The species, sex and stage of development of each specimen was recorded and the juveniles of some species were reared to maturity. All the material collected has been deposited in the National Collection of Arachnida (NCA), Plant Protection Research Institute, Pretoria.

(iv) *Additional collecting*
Hand collecting was done on a few occasions to sample those spider species not frequently recovered by beating or sweeping. These species are listed in the check list (Table 1) but abundance was not estimated.

(v) *Statistical analysis*
Multiple regression analyses were carried out for the total catches and separate families on the mean monthly temperature and the total monthly rainfall. The heteroscedasticity and non-normality usually present for such catches were evident for all total catches as well as for the catches representing the separate families. All catches were therefore transformed to $\log_{10}$ $(X + 1)$ and re-analised, resulting in acceptable model criteria. In the final analyses, backward selection of independent variables and possible swopping of variables were employed, using the probability of $P = 0,1$. No significant outliers at $P = 0,2$ were detected for any data set. The program utilised was (LSTATS)P/REGPAC, written by Jacqueline S. Galpin and available in the program library of the Directorate of Biometric and Datametric Services, Pretoria for use on a Burroughs B7900 mainframe.

## Results and Discussion

### (i) *Species Present*

During the 44-month survey of grass and herb layers, 7 995 spiders were collected with sweepnets while 2 275 spiders were collected from trees by beating over a 36-month period. A check list of all the spiders collected is presented in Table 1 with notes on their foraging mode and abundance. A total of 17 families were collected with a sweepnet from grass and herbs, 10 families with a beating tray from trees and 16 families by hand from the soil surface and webs. This probably represents only a small proportion of the total spider fauna of Roodeplaat Dam Nature Reserve, because according to Volker (1980), who compared different sampling methods, only 10,5 percent of the arthropod fauna in a grass ecosystem is collected with a sweepnet. The total number of families collected (27) is slightly higher than that found in other African habitats. Russell-Smith *et al.* (1987) collected 20 families in Kenya and 22 families from Botswana (Russell-Smith 1981). In a preliminary comparison between fauna of sub-tropical regions and temperate regions Russell-Smith (1981) suggested that sub-tropical spider faunas are likely to be richer in species than those of equivalent temperate areas.

Of the 110 species collected (Table 1) 38 percent were wanderers; 34,5 percent web-builders; 22 percent ambushers and 2,7 percent lived in burrows. One kleptoparasite *Argyrodes* sp. and a web invader *Mimetus* sp. were also collected. Of the wanderers 76 percent of the taxa sampled were found on plants. Two species of wolf spiders, *Pardosa crassipalpis* Purcell,

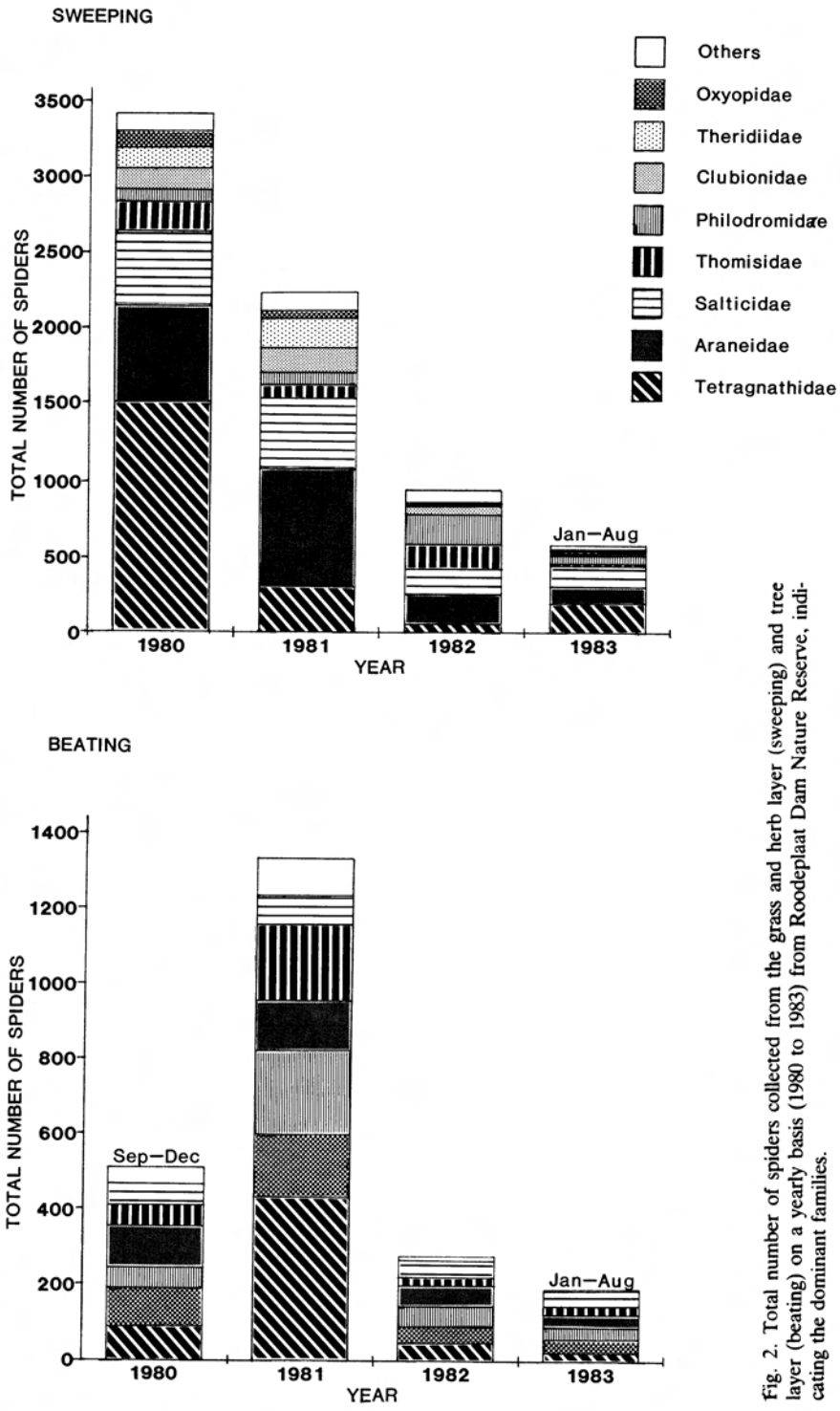


Fig. 2. Total number of spiders collected from the grass and herb layer (sweeping) and tree layer (beating) on a yearly basis (1980 to 1983) from Roodeplaat Dam Nature Reserve, indicating the dominant families.

Table 1

*Check list of spiders collected at the Roodeplaat Dam Nature Reserve from 1980 to 1983. Sampling method: SN = sweepnet (grass and herb layer), B = beating (tree layer), A = additional collecting (hand collecting, either soil or web living spiders)*
*Abundance: 1= frequent, 2= occasional, 3= rare*

| Family | Sampling Method | Foraging Mode | Abundance |
|---|---|---|---|
| 1. Agelenidae | | | |
| *Olorunia ocellata* (Pocock,1900) | A | funnel-web | 3 |
| 2. Araneidae | | | |
| *Afraranea* spp. | B, SN | orb-web | 2 |
| *Argiope aurocincta* Pocock, 1898 | SN | orb-web | 3 |
| *A. nigrovittata* Thorell, 1859 | SN | orb-web | 3 |
| *A. trifasciata* (Forskal, 1775) | SN | orb-web | 3 |
| *Caerostris corticosa* Pocock, 1902 | SN, A | orb-web | 3 |
| *Cyclosa insulana* (Costa, 1834) | SN | orb-web | 3 |
| *Cyclosa* sp. | SN | orb-web | 3 |
| *Cyrtophora citricola* (Forskal, 1775) | A | tent-web | 3 |
| *Gasteracantha* sp. | SN, A | orb-web | 3 |
| *Isoxya* sp. | SN, A | orb-web | 3 |
| *Larinia hewittii* Lessert, 1930 | SN | grass orb-web | 3 |
| *L. simillima* Lessert, 1915 | SN | grass orb-web | 2 |
| *L. trifida* Tullgren, 1910 | SN | grass orb-web | 2 |
| *Nemoscolus tubicola* (Simon, 1887) | SN, A | orb-web (stone retreat) | 2 |
| *Neoscona (Neoscona) moreli* (Vinson, 1863) | SN, | orb-web | 3 |
| *N. (N). subfusca* (C. L. Koch, 1837) | SN, | orb-web | 2 |
| *Neoscona (Afraranea) triangula* (Keyserling, 1864) | SN | orb-web | 1 |
| *Singa lawrencei* (Lessert, 1930) | SN | orb-web | 3 |
| 3. Clubionidae | | | |
| Clubioninae | | | |
| *Chiracanthium lawrencei* Roewer, 1951 | SN, B | wanderers | 2 |
| *Chiracanthium* sp. | SN, B | wanderers | 2 |
| *Clubiona* spp. | SN, B | wanderers | 2 |
| Corinninae | | | |
| *Ceto tridentata* Lessert, 1923 | A | wanderers | 3 |
| 4. Ctenizidae | | | |
| *Stasimopus* sp. | A | trapdoor | 3 |
| 5. Dictynidae | | | |
| *Archaeodictyna* sp. | SN | web (tip of plants) | 3 |
| 6. Eresidae | | | |
| *Stegodyphus dumicola* Pocock, 1898 | A | community nest (trees) | 3 |
| 7. Gnaphosidae | | | |
| *Aphantaulax inornatus* Tucker, 1923 | SN, B | wanderers | 2 |
| *Nodocion* sp. | SN | wanderers | 3 |
| 8. Heteropodidae | | | |
| *Olios* sp. | SN, B | wanderers | 3 |
| *Pseudomicrommata* sp. | SN | wanderers | 3 |
| 9. Idiopidae | | | |
| *Gorgyrella* sp. | A | trap door (wafer lid) | 3 |
| 10. Linyphiidae | | | |
| *Microlinyphia sterilis* (Pavesi, 1883) | SN | sheet-web | 2 |

| | | | |
|---|---|---|---|
| *Toschia minuta* Jocqué, 1984 | SN | sheet-web | 3 |
| *Tybaertiella kruegeri* (Simon, 1894) | SN | sheet-web | 3 |
| 11. Lycosidae | | | |
| *Pardosa crassipalpis* Purcell, 1903 | SN, A | wanderers | 2 |
| *Pardosa oncka* Lawrence, 1927 | SN, A | wanderers | 3 |
| *Lycosa* sp. | A | wanderers | 2 |
| Lycosinae sp. indet. | A | wanderers | 3 |
| 12. Mimetidae | | | |
| *Mimetus sp.* | S | web invaders | 3 |
| 13. Oecobiidae | | | |
| *Oecobius annulipes* Lucas, 1846 | SN, A | star-shaped web | 2 |
| 14. Oonopidae | | | |
| *Opopaea australis* (Hewitt,1915) | A | wanderers | 3 |
| 15. Oxyopidae | | | |
| *Oxyopedon* sp. | SN, B | wanderers | 3 |
| *Oxyopes bothai* Lessert, 1915 | SN, B | wanderers | 2 |
| *O. jacksoni* Lessert, 1915 | SN | wanderers | 2 |
| *Peucetia fasciiventris* Simon, 1890 | SN, | wanderers | 3 |
| 16. Palpimanidae | | | |
| *Palpimanus* sp. | A | wanderers | 3 |
| 17. Philodromidae | | | |
| *Philodromus* spp. | SN, B | wanderers | 2 |
| *Thanatus* sp. | SN, B | wanderers | 3 |
| *Tibellus vossioni* Simon, 1884 | SN | wanderers | 2 |
| *Tibellus hollidayi* Lawrence, 1952 | SN | wanderers | 2 |
| 18. Pholcidae | | | |
| *Pholcus phalangioides* (Fuesslin, 1775) | A | web | 3 |
| 19. Pisauridae | | | |
| *Euprosthenops vuattouxi* Blandin, 1977 | SN, A | web | 3 |
| *Voraptus* sp. | SN | wanderers | 3 |
| 20. Salticidae | | | |
| *Festucula australis* Lawrence, 1927 | SN | wanderers | 2 |
| *F. lawrencei* Lessert, 1933 | SN | wanderers | 2 |
| *Marengo* spp. | SN | wanderers | 2 |
| *Myrmarachne solitaria* Peckham & Peckham,1903 | SN, B | wanderers | 3 |
| *M. uvira* Wanless, 1978 | SN | wanderers | 3 |
| 21. Selenopidae | | | |
| *Anyphops tuckeri* (Lawrence, 1940) | A | on rocks | 2 |
| 22. Tetragnathidae | | | |
| *Eucta isidis* (Simon, 1880) | SN | orb-web | 3 |
| *Tetragnatha demissa* L. Koch, 1871 | SN, B | orb-web | 1 |
| *T. nitens* (Audouin, 1827) | SN, B | orb-web | 3 |
| *T. subsquamata* Okuma, 1985 | SN, B | orb-web | 3 |
| 23. Theraphosidae | | | |
| *Coelogenium* sp. | A | burrow-living | 3 |
| 24. Theridiidae | | | |
| *Argyrodes* sp. | SN, B | cleptoparasite | 3 |
| *Episinus* sp. | SN | web | 3 |
| *Euryopis* sp. | SN | web | 3 |
| *Dipoena* sp. | SN | web | 3 |
| *Latrodectus indistinctus* Cambridge, 1904 | SN, A | web | 3 |
| *L. rhodesiensis* Mackay, 1972 | A | web | 3 |
| 25. Thomisidae | | | |
| *Diaea* sp. | SN | ambushers | 2 |
| *Dieta* sp. | SN | ambushers | 3 |
| *Heriaeus latifrons* Lessert, 1919 | SN | ambushers | 3 |

| | | | |
|---|---|---|---|
| *Hewittia gracilis* Lessert, 1928 | SN | ambushers | 3 |
| *Misumenops rubrodecorata* Millot, 1941 | SN | ambushers | 2 |
| *Monaeses gibbus* Dippenaar-Schoeman, 1984 | SN | ambushers | 3 |
| *M. quadrituberculatus* Lawrence, 1927 | SN | ambushers | 3 |
| *Parasmodix quadrituberculatus* Jézéquel, 1966 | SN | ambushers | 3 |
| *Runcinia aethiops* (Simon, 1901) | SN | ambushers | 3 |
| *R. depressa* Simon, 1906 | SN | ambushers | 3 |
| *R. flavida* (Simon,1881) | SN | ambushers | 1 |
| *R. tropica* (Simon,1907) | SN | ambushers | 2 |
| *Synaema diana* (Audouin) | SN, B | ambushers | 2 |
| *Synaema* spp. | SN | ambushers | 2 |
| *Thomisops pupa* Karsch, 1879 | SN, B | ambushers | 2 |
| *Thomisus blandus* Karsch, 1880 | SN, B | ambushers | 1 |
| *T. citrinellus* Simon, 1875 | SN, B | ambushers | 3 |
| *T. daradioides* Simon, 1890 | SN, B | ambushers | 3 |
| *T. granulatus* Karsch, 1880 | SN, B | ambushers | 3 |
| *T. kalaharinus* Lawrence, 1936 | SN, B | ambushers | 3 |
| *T. spiculosus* Pocock, 1901 | SN, B | ambushers | 3 |
| *T. scrupeus* (Simon, 1886) | B | ambushers | 2 |
| *T. stenningi* Popock, 1900 | SN, B | ambushers | 3 |
| *Tmarus cameliformis* Millot, 1941 | B | ambushers | 3 |
| *Xysticus* spp. | A | ambushers | 3 |
| 26. Uloboridae | | | |
| *Miagrammopes brevicauda* Cambridge, 1882 | SN | single-line web | 3 |
| *Uloborus plumipes* Lucas, 1846 | SN, A | orb-web | 2 |
| 27. Zodariidae | | | |
| *Caphaeris* sp. | A | wanderers | 3 |

1903 and *P. oncka* Lawrence, 1927 were collected from both the field and the soil surface, while the three *Tetragnatha* species were recorded from both the field and tree layer.

It was not possible to identify all the spiders found in this survey to species level because of the large number of juveniles present, and the existing taxonomic problems within certain groups of spiders. Russell-Smith *et al.* (1987) identified only 28 of the 68 taxa collected from arid bushland in Kenya to generic level because of the poor taxonomic state of many African taxa. In this study the families Dictynidae, Lycosidae, Philodromidae, Salticidae and Theridiidae included numbers of currently unidentifiable species. Only 65 percent of the taxa collected could be identified to generic level.

Spiders collected at the Roodeplaat Dam Nature Reserve during this survey have been included in several revisionary studies such as those of Dippenaar-Schoeman (1980, 1983, 1984, 1985), Grasshoff (1986), Jocqué (1984) and Okuma & Dippenaar-Schoeman (1988). Most species collected were new records for the area.

(ii) *Numbers Present*

(a) Grass and herb layer: The total number of spiders collected with a sweepnet each year is shown in Fig. 2, with an indication of the numeri-

cally dominant families. In terms of total numbers caught over the entire survey period the Tetragnathidae were the dominant family containing 27,6 percent of all spiders collected, followed by Araneidae (21,4 percent) and Salticidae (20,2 percent). Each of the remaining families contained less than 6 percent of all spiders caught. However, on an annual basis, tetragnathids were the dominant family in 1980 only, when they represented 44 percent of the total catch. In 1981 the Araneidae were the dominant family representing 34 percent of the total catch with the tetragnathids second. In 1982, 32 percent of spiders caught belonged to the Salticidae, 16 percent to the Araneidae and 5 percent to the Tetragnathidae. In 1983 the Salticidae were again the dominant family with 40 percent of the total catch followed by the Tetragnathidae (22 percent).

The highest number of spiders was caught in 1980 when an average of 285 was collected per month. This number declined to 186 per month in 1981, 93 per month in 1982 and 98 per month for the first eight months of 1983. These fluctuations in the mean number of spiders caught per month could be related to the incidence of rain. In 1980 a total of 826 mm rain was recorded, 20 percent higher than the mean annual rainfall (Fig. 1). In 1981 the rainfall declined to 510 mm, 75 percent of the annual mean and in 1982 the rainfall declined to 483 mm, 70 percent of the annual mean. In 1983 the mean annual rainfall was 709 mm, 23 mm higher than the average. The drier conditions of 1981 and 1982 could especially have had an adverse effect on the numbers of Tetragnathidae, which are commonly found in wet areas (Lawrence 1964). In 1981, when the rainfall declined to 75 percent of the average, the tetragnathid numbers declined to 18 percent of the total catch for that year. As mentioned previously they declined further to 5 percent of the total catch in 1982. In 1983, when the mean annual rainfall was slightly above average, 22 percent of the total catch were tetragnathids.

The multiple regression analyses carried out for the total catches and separate families on the mean monthly temperature and the total monthly rainfall were, however, inconclusive. The significance of a relation between two or more variables is meaningless in the biological context if only a small part of the variation for the dependent variable (catches) can be accounted for. Attempt at interpreting such relationships are usually only made when the adjusted *R*-value is at least 0,5 (50 percent variation accounted for). Only the log-total catches of spiders in the grass and herb layer approach this criterion and approximately 45 percent of the variation in catch-sizes were related to changes in the mean monthly temperature. The conclusion is made that the data presented do not lend themselves to climatic interpretation, especially because only monthly climatic data were utilised, while daily or hourly climatic data directly relating to population and activity changes are usually utilised to explain variation in sizes of catches.

Various observations have previously been made on the effect of climatical conditions on spider populations. Blandin (1971, 1972) found that adult spiders were normally most abundant at the beginning of the long rainy season and also in the short rainy season in the Ivory Coast. The onset of

rain appeared therefore to be important in the maturation of adult spiders. Huhta (1971) reported that the summer weather plays an important role in determining the population density of spiders in the following season. Luczak (1963) found that rainfall and temperature had a marked effect on juvenile mortality during hatching and dispersal, while Russell-Smith (1981) found that for the ground-living spiders it is rising temperature rather than rainfall that is more important in relation to adult activity of the spiders.

(b) Tree layer: The total number of spiders collected from trees in the study area each year is shown in Fig. 2, with an indication of the numerically dominant families. On average 125 spiders were collected per month over a 3-month period in 1980, 109 spiders per month in 1981, 23 spiders per month in 1982 and 22 spiders over an 8-month period in 1983.

Tetragnathidae were the dominant family (24,6 percent) followed by Oxyopidae (15,7 percent), Philodromidae (15,5 percent), Araneidae (14,2 percent) and Thomisidae (13,3 percent). The other families represented less than 7 percent of the total catch. Tetragnathids were only dominant in the tree layer in 1981 when they represented 32 percent of the total catch. In 1980 and 1982 the araneids were dominant and in 1983 the salticids.

(iii) *Seasonal Change*

(a) Grass and herb layer: The total number of spiders collected per month from 1980 to 1983 is shown in Fig. 3. Maximum numbers were found during summer (October to May) when temperatures and rainfall were highest. From 1980 to 1982 the grass and herb layer was characterised by distinctly lower counts of spiders in winter (June to August). In 1983, however, the number of spiders caught per month was highest in July and August but the reasons for this are not clear. In 1980 the highest number of spiders was caught from December to May and in 1981 from November to December. The highest count was made in November 1981 with an average of 40 spiders per sweepnet sample and the lowest in June 1982 with 1,3 spiders per sweepnet.

In temperate zones distinct seasonal peaks of activity of adult spiders were observed. It was found to be also true for sub-tropical regions. Russell-Smith (1981) found that 76 percent of species recorded had major peaks during the summer months (September to March; 15 °C - 36 °C) while only 12 percent had peaks of activity in the winter (April to August; 6 °C - 27 °C).

(b) Tree layer: The total number of spiders collected per month from trees in the Roodeplaat Dam Nature Reserve is shown in Fig. 3. At the start of the survey, spider numbers were high, an average of 128 spiders per month being collected from September 1980 to February 1981. This figure declined to 51 per month in March 1981, increased from April to June 1981 to decline to only 14 per month in November 1981. On average the numbers of spiders in the tree layer remained fairly constant in 1982 and 1983.

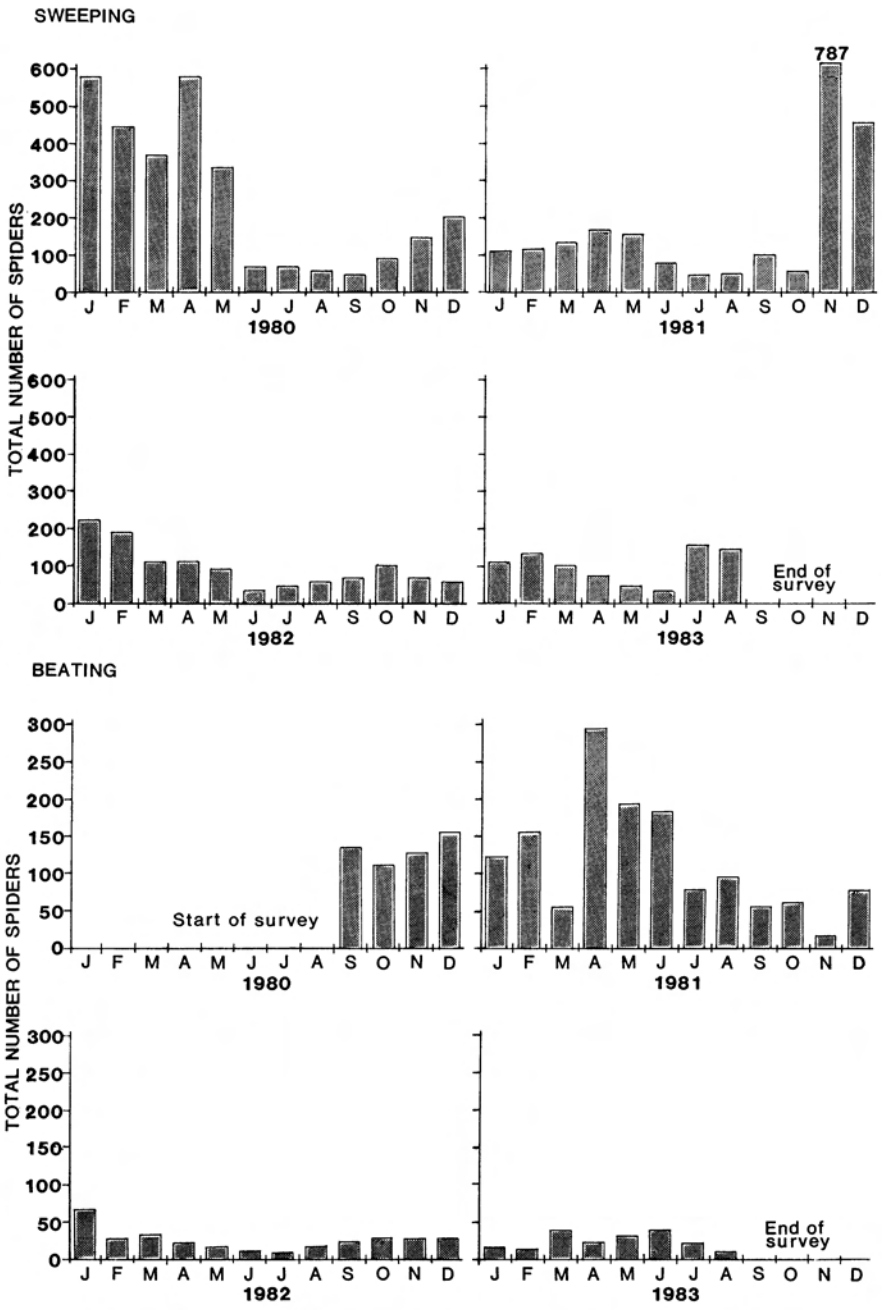


Fig. 3. Total number of spiders collected on a monthly basis (1980 to 1983) from grass and herb layer (sweeping) and tree layer (beating) from Roodeplaat Dam Nature Reserve.

The seasonal abundance of spiders in the tree layer differed from that of the grass and herb layer. From September 1980 to June 1981 the high numbers of spiders recorded in the tree layer did not decline until June. The lowest number of spiders was recorded in November 1981, while in the same month a record number of 787 spiders (Fig. 3) were collected from the grass and herb layer.

From a study of the wolf spider *Pardosa crassipalpis* in an area a few kilometres east from the Roodeplaat Dam Nature Reserve, Dippenaar-Schoeman (1977) found considerable differences in population densities from year to year. Dippenaar-Schoeman (1979) also reported from the same area that of the 14 spider families recorded there were striking differences between seasonal population densities, species composition and the times at which peak densities were attained.

In our on-going study, the phenology of the more common families recorded from Roodeplaat Dam Nature Reserve will be discussed with comments on their distribution and general behaviour.

**Summary and Conclusion**

(i) During the course of the present study 110 species from 27 spider families were collected from Roodeplaat Dam Nature Reserve. Seventeen families were collected with a sweepnet from the grass and herb layer, 10 families with a beating tray from the trees and 16 by hand from the soil surface and webs.

(ii) Over the 4-year period 10 270 spiders were collected from grasses and trees.

(iii) Of the 110 taxa sampled 38 percent were wanderers, 34,5 percent web-builders; 22 percent ambushers and 2,7 percent lived in burrows.

(iv) Of all the spiders sampled 29,3 percent belonged to the Tetragnathidae, 22,7 percent to the Araneidae and 21,4 percent to the Salticidae. The proportion of spiders in each of the remaining 24 families did not exceed 6 percent of the total catch.

(v) The three *Tetragnatha* species were recorded from both field layers. On an annual basis the tetragnathids were the dominant family in 1980 only when they represented 34 percent of the total catch. In 1981 their numbers declined to 18 percent of the total catch and in 1982 to only 5 percent. In 1983 their numbers increased to 22 percent of the total catch.

(vi) The multiple regression analyses carried out for the total catches and separate families on the mean monthly temperature and total monthly rainfall were inconclusive.

(vii) Seasonal peaks of spiders present in the grass layer were observed during the summer months October to May (1980 - 1982), when temperatures and rainfall were highest with distinctly lower counts from June to August.

(viii) The seasonal abundance of the spiders in the tree layer differed from that of the grass layer.

## Acknowledgements

We thank Drs. M.K.P.Smith Meyer and D.P.Keetch of Plant Protection Research Institute, Pretoria, for reading and commenting on the manuscript; Dr. H. van Ark of the Directorate of Biometric and Datametric Services, Pretoria for the statistical analysis; our colleagues at the Plant Protection Research Institute who assisted with field work; Martin Stiller for his assistance with routine maintenance of the spiders and Dr. Martin Filmer and Mrs. Astri le Roy for additional collecting data. Thanks are also due to the Plant Protection Research Institute, and the Department of Agriculture and Water Supply for providing the opportunity and facilities for this investigation and to the Director and staff of the Nature Conservation Division of the Transvaal Provincial Administration for allowing us to carry out the survey at the Roodeplaat Dam Nature Reserve.

## References

ACOCKS, J.P.H. 1975. Veld types of South Africa. 2nd ed *Mem. bot. Surv. S. Afr.* 40: 1-128.

BLANDIN, P. 1971 Recherches écologiques dans la savane de Lamto (Côte d'Ivoire): observations préliminaires sur le peuplement aranéologique. *Terre Vie* 118: 218-239.

BLANDIN, P. 1972. Recherches écologique sur les araignées de la savane de Lamto (Côte d'Ivoire): premières données sur les cycles des Thomisidae de la strate herbacée. *Annls Univ. Abidjan* (E) 5: 241-264.

BLANDIN, P. and M.L. CÉLÉRIER. 1981. Les araignées des savanes de Lamto (Côte d'Ivoire). Organisation des peuplements, bilans énergétiques, place dans l'écosystème. *Publ. Lab. Zool. Ec. Norm. Super.* 21: 1- 586.

DIPPENAAR-SCHOEMAN, A.S. 1977. The biology of *Pardosa crassipalpis* Purcell (Araneae: Lycosidae). *J. ent. Soc. sth. Afr.* 40: 225-236.

DIPPENAAR-SCHOEMAN, A.S. 1979. Spider communities in strawberry beds: seasonal changes in numbers and species composition. *Phytophylactica* 11: 1-4.

DIPPENAAR-SCHOEMAN, A.S. 1980. The crab-spiders of southern Africa (Araneae: Thomisidae). 1. The genus *Runcinia* Simon, 1875. *J. ent. Soc. sth. Afr.* 43: 303-326.

DIPPENAAR-SCHOEMAN, A.S. 1983. The spider genera *Misumena, Misumenops, Runcinia* and *Thomisus* (Araneae: Thomisidae) of southern Africa. *Entomology Mem. Dep. Agric. Repub. S. Afr.* 55: 1-66.

DIPPENAAR-SCHOEMAN, A.S. 1984. The crab-spiders of southern Africa (Araneae: Thomisidae). 4. The genus *Monaeses* Thorell, 1869. *Phytophylactica* 16: 101-116.

DIPPENAAR-SCHOEMAN, A.S. 1985. The crab-spiders of southern Africa (Araneae: Thomisidae). 5. The genus *Tmarus* Simon, 1875. *Phytophylactica* 17: 115-128.

DIPPENAAR-SCHOEMAN, A.S., N. DE L. GENIS, H. VAN ARK and J.H. VILJOEN. 1978. The effect of dieldrin coverspraying on some South African spiders and scorpions. *Phytophylactica* 10: 115-122.

DUFFEY, E. 1962. A population study of spiders in lime-stone grassland. Description of study area, sampling methods and population characteristics. *J. Anim. Ecol.* 31: 571-599.

DUFFEY, E. 1963. Ecological studies on the spider fauna of the Malham Tarn area. *Fld Stud.* 1: 1-23.

GRASSHOFF, M. 1986. Die Radnetzspinnen-Gattung *Neoscona in Afrika (Arachnida: Araneae). Ann. Mus. Roy. Afr. Centr., Tervuren Sc. Zool.* 250: 1-123.

HUHTA, V. 1971. Succession in the spider communities of the forest floor after clear-cutting and prescribed burning. *Ann. Zool. Fennici* 8: 485-542.

JOCQUÉ, R. 1984. Linyphiidae (Araneae) from South Africa. Part 1: The collection of the Plant Protection Research Institute, Pretoria. *J. ent. Soc. sth. Afr.* 47: 121-146.

LAWRENCE, R.F. 1964. A conspectus of South African spiders. *Department Agricultural Technical Services. Science Bulletin* 369: 1-64.

LUCZAK, J. 1963. Differences in the structure of communities of web spiders in one type of environment (young pine forest). *Ekologia Polska* 11: 159-221.

MALAISSE, F., and P.L.G. BENOIT. 1979. Contribution à l'étude de l'écosystème Forêt

Claire (Miombo) au Shaba (Zaire). Note 32. Stratégie, effectif et biomasse des Araignées en Miombo. *Revue Zool. afr.* 93: 485-499.

MERRETT, P. 1967. The phenology of spiders on heathland in Dorset. I. Families Atypidae, Dysderidae, Gnaphosidae, Clubionidae, Thomisidae, Salticidae. *J. Anim. Ecol.* 36: 363-374.

MERRETT, P. 1968. The phenology of spiders on heathland in Dorset. Families Lycosidae, Pisauridae, Agelenidae, Mimetidae, Theridiidae, Tetragnathidae, Argiopidae. *J. Zool., Lond.* 156: 239-256.

OKUMA, C and A.S. DIPPENAAR-SCHOEMAN. 1988. *Tetragnatha* (Araneae: Tetragnathidae) in the collection of the Plant Protection Research Institute, Pretoria with a description of a new species. *Phytophylactica* 20: 219-232.

RUSSELL-SMITH, A 1981. Seasonal activity and diversity of ground-living spiders in two African savanna habitats. *Bull. Br. arachnol. Soc.* 5. 145-154.

RUSSELL-SMITH, A., J.M. RITCHIE and N.M. COLLINS. 1987. The surface-active spider fauna of arid bushland in Kora Reserve, Kenya. *Bull. Brit. arachnol. Soc 7:* 171-174.

RUSSELL-SMITH, A., and P. SWANN. 1972. The activity of spiders in coppiced Chestnut Woodland in southern England. *Bull. Brit. arachnol.* Soc. 2(6): 99-103.

SOUTHWOOD, T.R.E. 1978. *Ecological Methods with Particular Reference to the Study of Insect Populations.* 2nd ed. London: Methuen.

TONKYN, D.W.1980. The formula for the volume sampled by a sweep net. *Ann. Entom. Soc. Am.* 73: 452-454.

TURNBULL, A.L. 1973. Ecology of the true spiders. *Ann. R. Entom.* 18: 305-348.

VOLKER, H. 1980. Methoden zur Erfassung der Arthropodenfauna in der Vegetationsschicht von Grasland-Ökosystemen. *Zool. Anz. Jena* 204: 319-330.