

# Seasonal Activity, Habitat Selection and Species Richness of Solifugae (Arachnida) on the Gravel Plains of the Central Namib Desert

E. Griffin

State Museum, P. O. Box 1203, Windhoek, 9000 Namibia

A survey of Solifugae on the gravel plains in the central Namib Desert provided information on seasonality, species richness and habitat preference of sixteen species.

Greatest species richness was recorded for the family Daesiidae (four genera and seven species), followed by the Melanoblossidae (one genus and four species) and the Solpugidae (three genera and three species). *Solpugiba lineata* was the most commonly trapped species, followed by *Blossia falcifera*, *Solpugista bicolor*, and an undescribed species of *Lawrencega*. Highest numbers of solifuges were trapped on rocky hillsides, while highest species richness occurred at sites on the desert floor. Greatest solifuge activity occurred during March.

## INTRODUCTION

Solifuges are found in hot, arid climates worldwide (Cloudsley-Thompson, 1977). Approximately one-quarter of the known species are from southern Africa (Newlands, 1978), and Namibia probably supports the highest number of species in the world for an area of its size. Namibia also accommodates the largest and smallest known species of Solifugae (Lawrence, 1963). Females of the genera *Solpuga* and *Zeria* can attain a body length of 75 mm whereas the smallest species, in the genus *Lawrencega*, has a body length of 5 mm (personal observation). Little is known about the biology and ecology of solifuges. The only biological study of a Namibian solifuge was carried out on the central Namib Desert dune-living solpugid *Metasolpuga picta* (Kraepelin) (Wharton, 1987). Detailed biological data have been published for only four of the approximately 1000 described solifuge species (Wharton, 1987). This paper provides the results of an intensive pitfall trapping survey of the solifuge fauna on the gravel plains of the central Namib Desert.

## STUDY AREA AND METHODS

Solifugae were collected on a monthly basis from May 1984 to May 1985 in three habitats on the gravel plains at Rössing Mine, 22° 29' S, 15° 01' E, approximately 60 km east of Swakopmund. Descriptions of this area can be found in Logan (1960) and Ward, Seely and Lancaster (1983). The study site, as a whole, had an average of 5.9 % live plant cover (Craven, 1986). Habitats sampled were as follows: 1) horizontal, flat desert floors, composed of quartzitic pebbles on poorly developed sandy soil; 2) dry water courses, the substrate of which was almost exclusively stream bed alluvium; and 3) rocky hillsides, i.e., outcrops of mica schist and alaskite.

Two pitfall trapping sites were set up in each habitat. At all

sites, except one of the rocky hillside sites, nine 5-litre buckets (20 cm in diameter at rim), each containing 2 l of mono-ethylene glycol, were placed in a more or less straight line at 60 m intervals, with their rims flush with the surrounding soil. The remaining rocky hillside had six pitfall traps. Traps were collected and replaced monthly from May 1984 to May 1985.

Identifications of the solifuge species were done by myself using existing literature and some type material. Many females and most juveniles could not be identified owing to inadequate taxonomic documentation on the Namibian solifuge fauna.

Relative humidity, temperature and wind speed and direction are monitored on a daily basis at a central location at Rössing Mine.

## RESULTS AND DISCUSSION

Muma (1974, 1975, 1980) discussed inherent problems of sampling solifuge populations with pitfall traps. He pointed out that males are more active than females and therefore more likely to be trapped and that some genera were more prone to capture than others. Accordingly, only habitat preference and activity periods are analysed below.

### Species trapped

The survey, encompassing an area of 48 sq km, yielded 16 species of Solifugae belonging to five families (Table 1): the Hexisopodidae, which is endemic to southern Africa; the Melanoblossidae and Gylippidae, which occur in both southern Africa and Asia; the Solpugidae, which occurs throughout Africa and in Arabia, and the Daesiidae, which occurs in Africa, Europe and India (Kaestner, 1980).

The family Daesiidae was represented by four genera (Table 1): *Biton*, *Blossia*, *Hemiblossia* and *Namibesia*. Wharton (1981) reported that *Blossia falcifera* Kraepelin occurs in rocky areas on non- or sparsely vegetated gravel plains

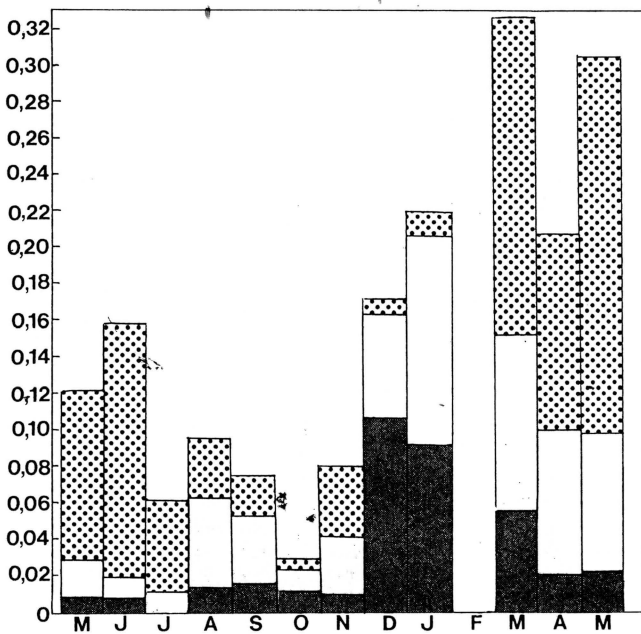


Fig. 1

Number of all solifuges trapped per trap-day from May 1984 to May 1985 on rocky hillsides (dots), gravel plains (light stippling), and in watercourses (dark stippling).

throughout central Namibia, and in the northeastern Cape and Zimbabwe. *Blossia planicursor* Wharton is known only from non- or sparsely vegetated gravel plains in the central Namib Desert. The only species of *Hemiblossia* trapped, *H. etosha* Lawrence, was previously recorded only from northwestern and central Namibia (Wharton, 1981). *Namibesia pallida* Lawrence is believed to be widely distributed in Namibia (Wharton, 1981), preferring non- or sparsely vegetated gravel plains in the Namib Desert.

Only one species of Gylippidae, *Trichotoma michaelsoni* Kraepelin, was trapped. Wharton (1981) suggested that this species occurs only on non- or sparsely vegetated gravel plains along the edges of the Namib Desert's southern dune field.

The Hexisopodidae was represented by a single immature specimen of *Hexisopus*. Hexisopodidae are small, round solifuges with legs specially adapted for burrowing. The genus *Hexisopus* is found throughout Namibia.

The Melanoblossidae was represented by four species in the genus *Lawrencega*: *L. minuta* Wharton, previously known only from interdune valleys and non- or sparsely vegetated gravel plains along the northern edge of the central Namib Desert dune sea; *L. solaris* Wharton, previously known only from vegetated gravel plains near the Namib Research Institute, Gobabeb; *L. longitarsis*, previously recorded only from non- or sparsely vegetated gravel plains in the central Namib Desert; a fourth species, which is undescribed, was mainly found on rocky outcrops.

One species in each of three genera of Solpugidae, *Zeria*, *Solpugista* and *Solpugiba*, were trapped. *Zeria lawrencei* (Roewer) appears to be limited to non- or sparsely vegetated gravel plains of southern Angola and the northern and central

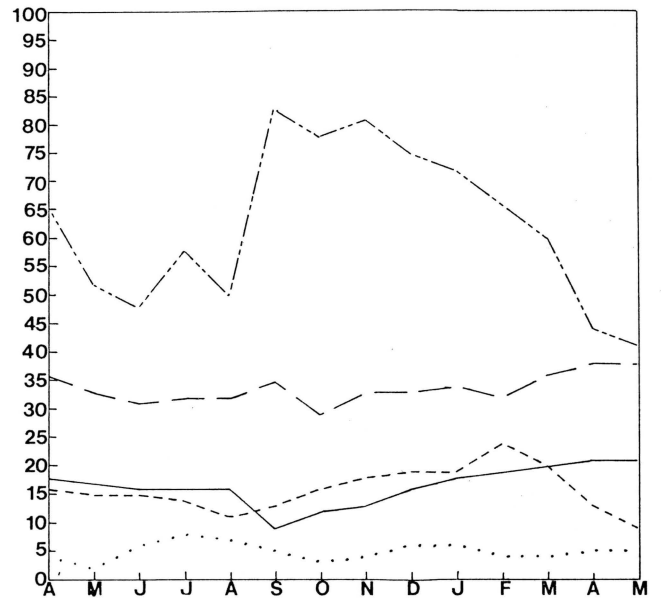


Fig. 2

Mean maximum temperature, °C (— —), mean minimum temperature, °C (— —), mean maximum relative humidity, % (— — —), mean minimum relative humidity (— — —), and mean wind speed, m/s (. . . .) from April 1984 to May 1985. The same scale was used for each parameter.

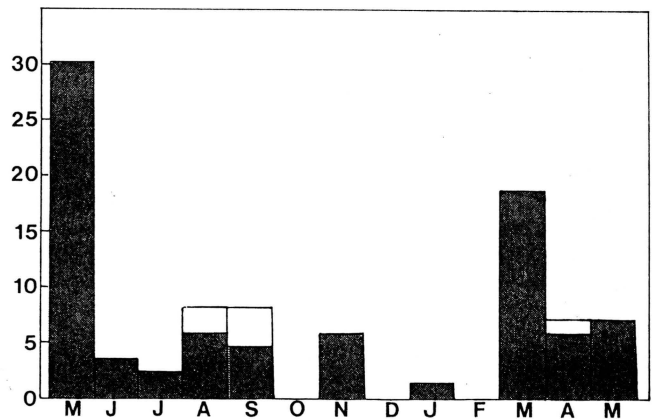


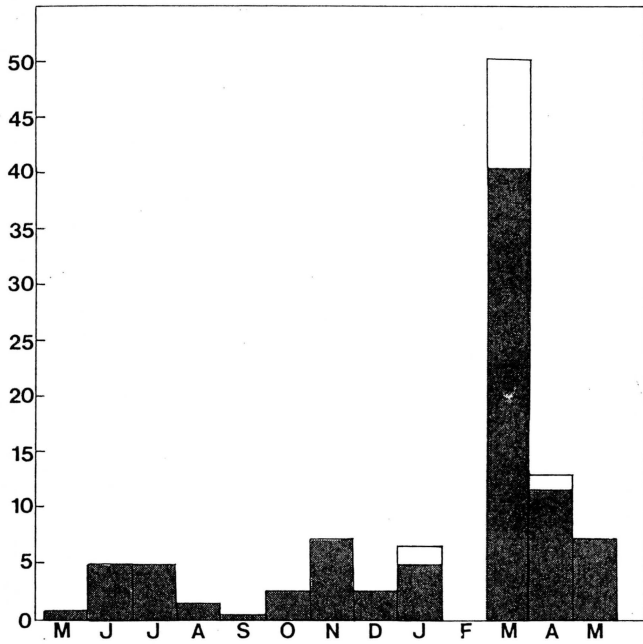
Fig. 3

Number of individuals of *Blossia falcifera* Kraepelin (Daesiidae) trapped per month, from May 1984 to May 1985, expressed as a percentage of the total number of individuals trapped. Dark stippling = adults, light stippling = juveniles.

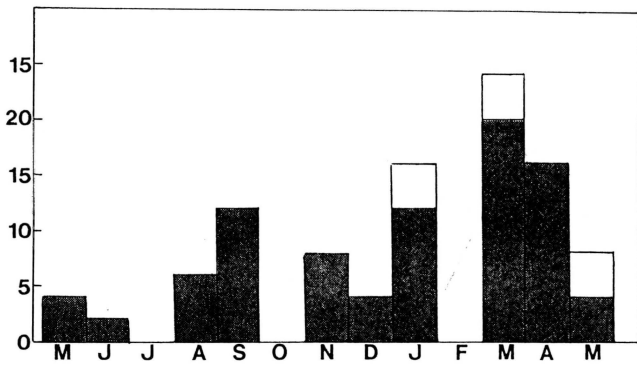
Namib Desert in Namibia (Wharton, 1981). *Solpugista bicolor* (Lawrence) is distributed throughout Namibia and South Africa (Lawrence, 1955; Wharton, 1981). In the central Namib Desert it occurs on vegetated gravel plains.

#### Habitat preference

Proportions of solifuge species found in each of the three

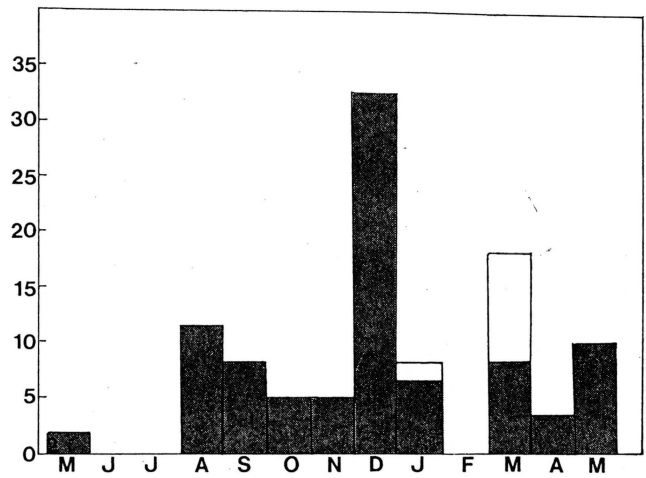


**Fig. 4**  
Number of individuals of *Hemiblossia etosha* Lawrence (Daesiidae) trapped per month, from May 1984 to May 1985, expressed as a percentage of the total number of individuals trapped. Dark stippling = adults, light stippling = juveniles.

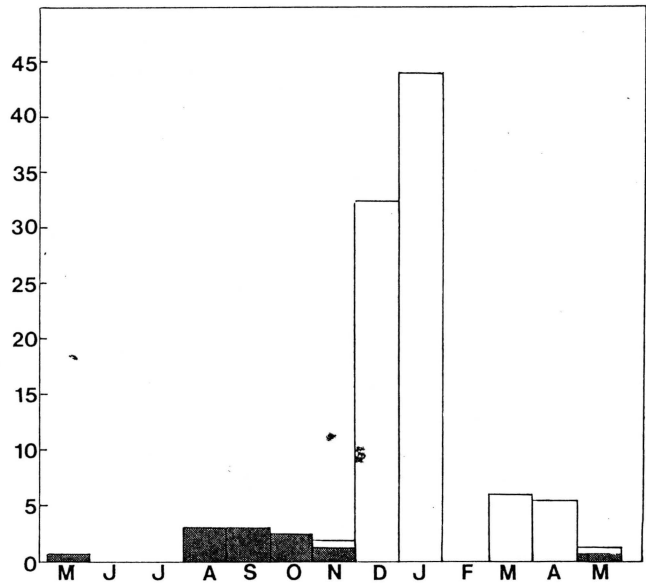


**Fig. 6**  
Number of individuals of *Solpugista bicolor* (Lawrence) (Solpugidae) trapped per month, from May 1984 to May 1985, expressed as a percentage of the total number of individuals trapped. Dark stippling = adults, light stippling = juveniles.

gravel plain habitats varied (Table 1). Eight of the 16 species of solifuges encountered in this study were found predominantly or exclusively in desert floor habitat: *Biton* sp. (undescribed), *Blossia planicursor* Wharton, *Trichotoma michaelsoni* (Kraepelin), *Lawrencegea solaris* Wharton, *L. longitarsis* Lawrence, *L. minuta* Wharton, *Solpugista bicolor* (Lawrence), and *Zeria lawrencei* (Roewer). *Blossia* sp. B



**Fig. 5**  
Number of individuals of *Zeria lawrencei* (Roewer) (Solpugidae) trapped per month, from May 1984 to May 1985, expressed as a percentage of the total number of individuals trapped. Dark stippling = adults, light stippling = juveniles.



**Fig. 7**  
Number of individuals of *Solpugiba lineata* (C. L. Koch) (Solpugidae) trapped per month, from May 1984 to May 1985, expressed as a percentage of the total number of individuals trapped. Dark stippling = adults, light stippling = juveniles.

(undescribed) was found only, and *Solpugiba lineata* predominantly, in dry water courses. Four species of solifuges were trapped almost exclusively on rocky hillsides: *Blossia falcifera* (Kraepelin), *Blossia* sp. A (undescribed), *Namibesbia pallida* Lawrence, and *Lawrencegea* sp. (undescribed)

*Hemiblossia etosha* Lawrence was the only species that had an even distribution throughout the three habitat types.

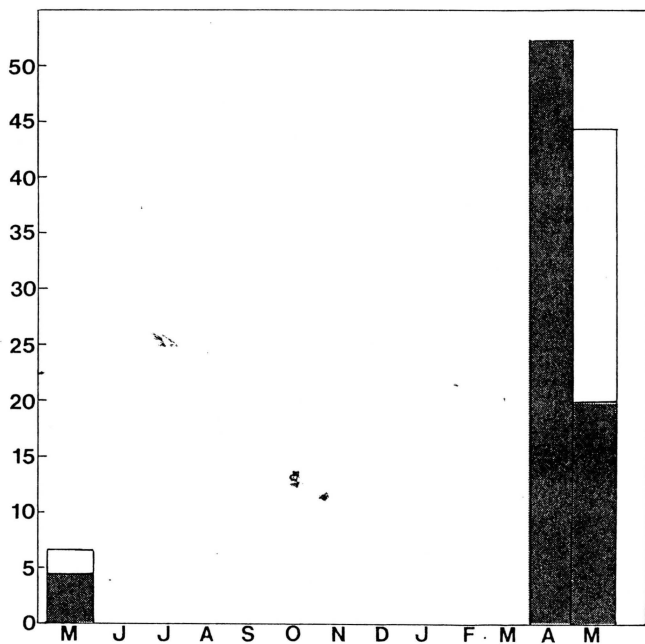


Fig. 8

Number of individuals of *Trichotoma michaelseni* (Kraepelin) (Gylippidae) trapped per month, from May 1984 to May 1985, expressed as a percentage of the total number of individuals trapped. Dark stippling = adults, light stippling = juveniles.

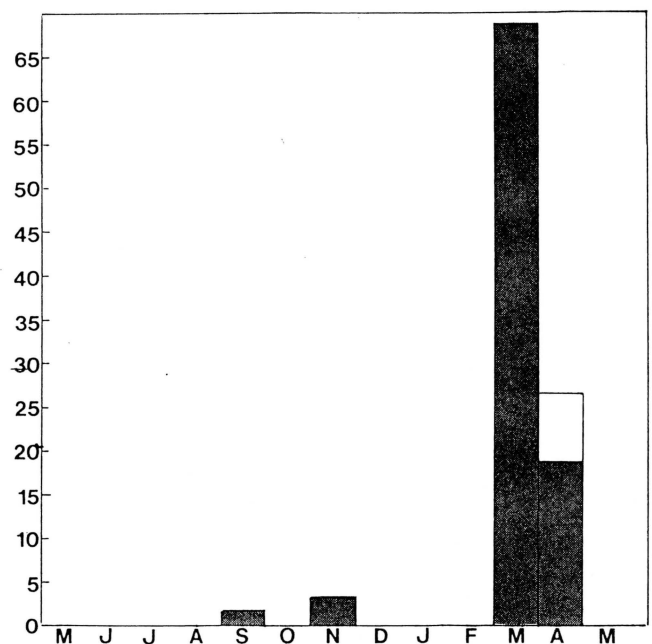


Fig. 9

Number of individuals of *Lawrencegea* sp. (Melanoblossidae) trapped per month, from May 1984 to May 1985, expressed as a percentage of the total number of individuals trapped. Dark stippling = adults, light stippling = juveniles.

*Lawrencegea minuta* Wharton, *Zeria lawrencei* (Roewer) and *Solpugista bicolor* (Lawrence), while occurring predominantly on the desert floor, were also trapped (less than 33 %) in dry water courses. *Solpugista lineata* (C. L. Koch) was predominantly trapped (more than 60 %) in dry water courses but also occurred on desert floor.

There is no obvious explanation for the overall greater occupation of rocky hillsides and desert floor (Fig. 1), but it seems possible that greater habitat diversity, in particular the greater number of retreats, may influence the use of these habitats by solifuges.

#### Activity periods

Meteorological data indicated a lack of distinct seasonality for all parameters except maximum relative humidity (Fig. 2). From September until approximately February, maximum relative humidity remained higher than during the remainder of the year; minimum relative humidity values reached a maximum during February. This pattern probably reflects the more common occurrence of morning fog in the central Namib during the summer months.

Overall activity was inferred from abundance in the traps. The following ten relatively commonly trapped species, with sample sizes > 45, were selected for more detailed analysis: *Biton* sp., *Blossia falcifera* (Kraepelin) (Fig. 3), *Blossia planicursor* Wharton, *Blossia* sp. A, *Hemiblossia etosha* Lawrence (Fig. 4), *Namibesbia pallida* Lawrence, *Lawrencegea minuta* Wharton, *Zeria lawrencei* (Roewer) (Fig. 5), *Solpugista*

*bicolor* (Lawrence) (Fig. 6), and *Solpugista lineata* (C. L. Koch) (Fig. 7).

Several species of solifuges showed seasonal peaks. The most commonly captured solifuges during the period March–May 1985 were: *Hemiblossia etosha* Lawrence (Fig. 4), *Trichotoma michaelseni* (Kraepelin) with juveniles being abundant during May (Fig. 8), *Lawrencegea* sp. (Fig. 9), and a peak of juvenile captures during March for *Zeria lawrencei* (Roewer) (Fig. 5). Most commonly captured during the period June–August 1984 was *Lawrencegea longitarsis* Lawrence. Abundance of none of the species paralleled the varying maximum relative humidity values although *Lawrencegea minuta* Wharton were most commonly captured during the period September–November 1984. Moreover, juveniles of *Namibesbia pallida* Lawrence were abundant during December 1984, *Lawrencegea longitarsis* Lawrence juveniles were caught during January 1985, and *Solpugista lineata* (C. L. Koch) juveniles had a peak during January and February 1985 (Fig. 7). Wharton (1987) found indications of a similar decrease in winter activity for *Metasolpuga picta* in the central Namib.

#### CONCLUSIONS

Sixteen species of solifuges in four families were trapped during the course of a 13 month survey on the gravel plains of the central Namib Desert. The highest numbers of solifuges were trapped at sites on rocky hillsides, the greatest species

**Table 1**  
Percentage Solifugae caught in three central Namib Desert gravel plain habitats from May 1984 to May 1985.

	Water course	Desert floor	Rocky hillside	Total number caught
<b>Daesiidae</b>				
<i>Biton</i> sp.	—	100,0	—	7 (0,8 %)
<i>Biton</i> (females & juveniles)	—	50,0	50,0	2 (0,2 %)
<i>Blossia falcifera</i> Kraepelin	2,4	2,4	95,2	79 (9,9 %)
<i>Blossia planicursor</i> Wharton	9,1	90,9	—	11 (1,2 %)
<i>Blossia</i> sp. (A)	6,7	6,7	86,6	15 (1,7 %)
<i>Blossia</i> sp. (B)	100	—	—	3 (0,3 %)
<i>Blossia</i> (females & juveniles)	0,9	7,5	91,5	106 (11,9 %)
<i>Hemiblossia etosha</i> Lawrence	33,3	27,1	39,6	48 (5,4 %)
<i>Namibesia pallida</i> Lawrence	—	6,3	93,7	16 (1,8 %)
<b>Gylippidae</b>				
<i>Trichotoma michaelsoni</i> Kraepelin	6,5	93,5	—	46 (5,2 %)
<b>Hexisopodidae</b>				
<i>Hexisopus</i> sp.	100	—	—	1 (0,1 %)
<b>Melanoblossidae</b>				
<i>Lawrencega longitarsis</i> Lawrence	—	100,0	—	13 (1,5 %)
<i>Lawrencega minuta</i> Wharton	20,8	79,2	—	24 (2,7 %)
<i>Lawrencega solaris</i> Wharton	—	100,0	—	19 (2,1 %)
<i>Lawrencega</i> sp.	6,3	3,1	90,6	69 (7,8 %)
<i>Lawrencega</i> (females & juveniles)	9,0	17,3	73,6	110 (12,4 %)
<b>Solpugidae</b>				
<i>Solpugiba lineata</i> (Koch)	61,1	38,9	—	185 (20,8 %)
<i>Solpugista bicolor</i> (Lawrence)	17,4	82,6	—	69 (7,8 %)
<i>Zeria lawrencei</i> (Roewer)	32,3	67,7	—	62 (7,0 %)
Solpugidae unidentified juveniles	25,0	75,0	—	4 (0,4 %)

richness of trapped solifuges occurred at sites on the desert floor, and the highest solifuge captures occurred in March 1985. The Daesiidae had the greatest species richness with an especially high number of species and individuals trapped on rocky hillsides. The present data do not allow an obvious explanation of these trends in seasonality and habitat preference. Nonetheless, in the Namib, solipuges represent a group

of organisms very suitable for further research in a number of areas. Wharton (1987) found aspects of the behaviour and reproduction of the diurnal *Metasolpuga picta* to differ markedly from previously studied nocturnal species from North Africa, North America and the south-west Asian deserts. Biological investigations of other common Namib species should prove equally rewarding.

#### ACKNOWLEDGEMENTS

The support of the Department of National Education and the Rössing Uranium Mine during the survey is gratefully appreciated. I wish to thank P. Croeser, B. Curtis, M. Griffin, J. Mendelsohn and especially M. Seely for supplying helpful

advice and constructive criticisms of earlier drafts of the manuscript. The Department of National Education is thanked for granting permission for the publication of this paper.

#### REFERENCES

- CLOUDSLEY-THOMPSON, J. L., 1977. Adaptational biology of the Solifugae (Solpugida). *Bulletin of the British Arachnological Society* 4: 61-71.
- CRAVEN, P., 1986. Survey of vegetation in specific areas around Rössing. Unpublished manuscript, 16 pp. Rössing Uranium Ltd., Windhoek.
- KAESTNER, A., 1980. *Invertebrate zoology*, Vol. 2. Robert E. Krieger, New York.
- LAWRENCE, R. F., 1963. The Solifugae of South West Africa. *Cimbebasia* 8: 1-28.
- LOGAN, R. F., 1960. The central Namib Desert - South West Africa. *National Academy of Sciences Report* No. 9, Publication 758: 1-162.
- MUMA, M. H., 1974. Solpugid populations in southwestern New



- Mexico. *The Florida Entomologist* 57(4): 358-392.
- MUMA, M. H., 1975. Long term trapping for population analyses of ground-surface, arid-land arachnids. *The Florida Entomologist* 58(4): 257-270.
- MUMA, M. H., 1980. Comparison of three methods for estimating solpugid (Arachnida) populations. *Journal of Arachnology* 8: 267-270.
- NEWLANDS, G., 1978. Arachnida. In: WERGER, J. A., ed., *Biogeography and ecology of southern Africa*, pp. 658-702. W. Junk, The Hague
- WARD, J. D. SEELY, M. K. and LANCASTER, N., 1983. On the antiquity of the Namib. *South African Journal of Science* 79(5): 175-183.
- WHARTON, R. A., 1981. Namibian Solifugae (Arachnida). *Cimbebasia*, Memoir 5: 1-87.
- WHARTON, R. A., 1987. Biology of the diurnal *Metasolpuga picta* (Kraepelin) (Solifugae, Solpugidae) compared with that of the nocturnal species. *Journal of Arachnology* 14: 363-383.