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Desert - Namib - Scorpions - behaviour.

## RESEARCH NOTES

### DIURNALISM IN *PARABUTHUS VILLOSUS* (PETERS) (SCORPIONES, BUTHIDAE)

It is well known most scorpions are strictly nocturnal in their activities although definite, restricted cases of diurnal behavior have been recorded. Williams (1971, 1980) described the phenomenon in the vaejovid *Vaejovis littoralis* Williams, and Roth and Brown (1976) found it in another species, probably *Vaejovis gertschi* Williams (Williams pers. comm.), both occurring in Baja California. Toye (1970) found the scorpionid *Pandinus imperator* Koch occasionally active by day in Nigerian forests. In Namibia, Lamoral (1979) has observed diurnalism in the buthids *Buthotus conspersus* (Thorell), *Parabuthus kraepelini* Werner, *Parabuthus stridulus* Hewitt, and in the scorpionid *Opisthophthalmus carinatus* (Peters). The diurnal behavior of some of these is probably fortuitous since they are predominantly nocturnal.

The present note describes in further detail the partly diurnal behavior (Newlands 1974) of *Parabuthus villosus* (Peters). This species is one of the largest buthid scorpions known and is widespread in Namibia. Its distribution stretches roughly from the northern Cape Province, South Africa, to northern Damaraland. From west to east it ranges from the coast to as far inland as longitude  $19^{\circ}30'$ . It is found in the extremely arid gravel plains of the Namib desert though is apparently absent in the sand dune systems of the Namib and Kalahari deserts.

Diurnal sightings of *P. villosus* (predominantly adult males and females) were made by various individuals, including the author, and are listed below. Most were made at Gobabeb in the central Namib where a permanent research station exists. The localities cover most of the range of the species. Gobabeb 0830 hrs; Valencia 42, Windhoek district 0910; Fish River Canyon 1000; Bethanie 1100; Gobabeb 1300; (1 July 1980, hot); Windhoek 1300-1400; Namuskluft 88, Lüderitz district 1400; Gobabeb 1445; (6 June 1980, feeding on beetle); Gobabeb 1400-1500; Gobabeb 1500 (warm); Gobabeb 1500 (April, very hot); Uis 1600; Hentiesbay 1600 (foggy); Gobabeb 1600 (December); Gobabeb 1630; Sandmund 270, Keetmanshoop district 1630 (cool); Obib mountains 1600-1700 (fairly hot); Omaruru river 1600-1700; Gai-As Fountain, Damaraland 1600-1700; Gobabeb 1715; Fish River Canyon 1745 (2 May 1979); Uis 1800 (twilight).

It is thus evident that *P. villosus* can be active throughout the day, mostly during cool, overcast or twilight conditions although definite observations to the contrary exist. In addition, the vaejovids already mentioned by Williams (1971, 1980) and Roth and Brown (1976), and to an extent *P. villosus*, are active during the hottest part of the day. Compared to that of some closely related scorpions in Namibia, diurnal behavior in *P. villosus* is distinctly atypical. Neither *Parabuthus granulatus* (Hemprich and Ehrenberg), a widespread burrower, *Parabuthus raudus* (Simon), also a burrower, in the Kalahari Sand System, nor the rarer *Parabuthus schlecteri* Purcell, occurring under stones in southern Namibia, have been seen to be active by day. In addition, and in spite of a

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higher population density of humans within its range, no daytime activity has been reported for the common *Parabuthus transvaalicus* Purcell. This species is closely related to *P. villosus* and also ecologically equivalent to it. *P. transvaalicus* is found under stones in arid areas of the northern Transvaal, eastern Zimbabwe and southwestern Botswana, all roughly similar in rainfall and vegetation to the Namibian habitat of *P. villosus*.

The reasons underlying diurnal activity in scorpions are poorly understood, though may be partly accounted for by being an adaptation for better exploitation of prey resources. Thus it is perhaps significant that both *P. villosus* and the vaejovids already mentioned have been reported to feed by day. The former has been seen catching beetles, at Gobabeb in the Namib desert (Marinaki, pers. comm.). Similarly, the vaejovids described by Williams (1971) and Roth and Brown (1976) were reported to stalk insects and eat isopods, respectively. Certainly in the case of *P. villosus*, on the gravel plains of the central Namib at Gobabeb, more beetles, a major food source for scorpions, are active by day than by night (Seely, pers. comm., Koch 1961). Thus, the diurnal activity seen in this scorpion may have evolved to take advantage of such daytime food supplies.

Some arachnids other than the scorpions described above show a similarly unexpected partial diurnal activity, hexisopodid solifugids of the genera *Chelypus* and *Hexisopus* (Lawrence, pers. comm., Lamoral 1973) being examples. These "mole" solifugids are highly specialized, adapted to a psammophile, fossorial way of life and when diurnal, are known to be active during the hottest part of the day (Lawrence, pers. comm.). In contrast to typical diurnal solifugids such as *Solpuga* sp., however, they lack the characteristically rapid locomotion and dense pubescence of the latter.

I thank Mr. G. Newlands and Dr. O. F. Francke for helpful comments and Dr. S. C. Williams and Mr. V. D. Roth for their interest in diurnalism in scorpions. The loan of the specimen of *Vaejovis littoralis* by Dr. D. Kavanaugh of the California Academy of Sciences is acknowledged, as is the interest of Dr. R. F. Lawrence and Dr. M. K. Seely.

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Manuscript received January 1981, revised April 1981.

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