

Activity patterns of *Myosorex varius* and *M. cafer* in captivity

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The circadian rhythms of captive *Myosorex varius* and *M. cafer* (Insectivora: Soricidae) were investigated. Both were predominantly nocturnal, *M. varius* being active for 4% of the day and 34% of the night, while comparable figures for *M. cafer* were 11% and 37% respectively. The mean level of daily activity in both forms was similar to that which appears to be characteristic of their subfamily, the Crocidurinae.

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Die daaglikse ritme van *Myosorex varius* en *M. Cafer* (Insectivora: Soricidae) in gevangenskap is ondersoek. Beide is oorwegend naglewend; *M. varius* is 4% aktief gedurende die dag en 34% gedurende die nag, terwyl vergelykbare syfers vir *M. cafer* respektiewelik 11% en 37% is. Die gemiddelde daaglikse aktiwiteitsvlak in die twee spesies was soortgelyk aan dié wat blykbaar die betrokke subfamilie, die Crocidurinae, kenmerk.

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Within the crocidurines, the genus *Myosorex* exhibits soricine affinities in its primitive dentition and paired frontal foramina. Furthermore, it exhibits size reduction with a reduction in mean annual temperature (Baxter, Charlton, Davis & Meester in prep.) as is found in the soricine genus *Sorex* in the USSR (Mezhzherin 1964) in contrast to the crocidurine genus *Crocidura*, *C. flavescens* in particular, which appears to increase in size with a reduction in mean annual temperature (Meester 1963). However, *Myosorex* is grouped with the crocidurines on account of its unpigmented teeth and continuous articular facets on the mandibular condyle (Repenning 1967).

Baxter, Goulden & Meester (1979) have shown that subfamilial differences in metabolic rates of shrews, as suggested by Vogel (1976) are manifested in differences in total daily activity. Consequently, an investigation into the activity patterns of the two *Myosorex* forms *M. varius* (Smuts 1832) and *M. c. cafer* (Sundevall 1846), could assist in clarifying the systematic position of the genus.

Materials and Methods

The shrews were collected at Darvill Sewage Works, Pietermaritzburg. Activity patterns were automatically monitored in an activity cage (Baxter & Davis in press.), which is an extensively modified version of that described by Smit & Langman (1974). The cage was kept indoors under semi-controlled conditions with a 12 hour light dark regime. Temperature did not drop below 15° C or rise above 25° C. Humidity changes were not monitored.

Shrews placed in the activity cage were allowed 48 hours to acclimatize before monitoring began. The monitoring periods ranged from six to nearly 14 days and during these periods the shrews were fed a standard diet (Baxter 1977). Food and water were supplied *ad libitum* and feeding occurred daily between 16h00 and 17h00. Other disturbances that may have influenced the activity patterns were periodic checks to ensure that the apparatus was functioning normally. No checks were made during the dark period.

The data for *M. varius* were obtained from 33 days and one hour of monitoring using three single shrews (two males, one female) and one pair, while those for *M. cafer*

were obtained from 48 days and two hours of monitoring using four single shrews (two males, two females) and one pair.

Differences between the activity levels of single shrews and pairs were attributed to the cumulative effect of the additional animals. Seasonal variation in activity patterns was not readily apparent, possibly on account of the semi-controlled conditions under which activity was monitored. Consequently, all data were meaned in order to provide an activity profile which was characteristic of the particular species in captivity. All the meaned data are reported as a percentage of activity per hour. Szymanski coefficients of activity (Szymanski 1918) were calculated for each species by dividing the mean daily activity by the mean daily inactivity.

Results

M. varius

The one male showed a higher activity level than the remaining single shrews which were very similar in activity profile. The pair showed a slightly elevated activity level.

M. varius is a nocturnal shrew with little diurnal activity (34% vs. 4%). Overall daily activity was 19% and periods of inactivity seldom exceeded two hours (Fig. 1). Periods of activity were usually 20-40 minutes long at night but much shorter during the day.

There were no conspicuous peaks of activity but the period 20h00-24h00 showed a prolonged high level of activity and to a lesser extent the periods 01h00-03h00 and 04h00-05h00. However, the overall pattern indicated a constant low level of diurnal activity with a sharp rise at nightfall, a fairly constant level of nocturnal activity and a sharp decline at daybreak. The Szymanski coefficient of activity was 0,23.

M. cafer

There were only marginal differences in the activity levels of the four single shrews tested. The pair showed a slightly elevated level of activity with a very similar activity profile to those of single animals.

M. cafer is predominantly nocturnal but exhibited a considerable amount of diurnal activity (37% vs. 11%) (Fig. 2). The overall daily activity level was 24%, therefore

higher than that of *M. varius*. Inactive periods rarely exceeded 90 minutes and active periods at night usually lasted for 30-40 minutes. Daytime activity level was somewhat lower.

There were no conspicuous peaks of activity but minor peaks were found from 19h00-20h00 and from 03h00-06h00. However, the overall activity pattern indicated a constant level of diurnal activity with a sharp rise at nightfall, fairly constant nocturnal activity and a sharp decline at daybreak. This pattern was very similar to that of *M. varius* but the level of activity was somewhat higher. The Szymanski coefficient of activity was 0,32.

Discussion

The two *Myosorex* species had similar activity profiles ($r = 0,9665$) with *M. cafer* having a slightly higher level of nocturnal activity and a considerably higher diurnal activity than *M. varius*. A possible reason for this may be that both have similar food sources and therefore the larger *M. cafer* (12-14 g) will have a higher food requirement and consequently be more active than *M. varius* (10-12 g). Although the food preference of the two are not known, Rautenbach (1979) has supplied evidence of competitive exclusion between the two in some areas where they are sympatric.

The short-term rhythms in the activity patterns of the two species were very similar with both having seven to eight active periods alternating with inactive periods per night. This pattern remained constant when there was a reduction in activity during the day. This was most probably due to the semi-controlled conditions under which activity was monitored, but these data do imply that short-term rhythm is subject to metabolic demands which will remain constant under reasonably constant temperature. This suggestion is consistent with that of Lehmann (1976) on voles. However, Lehmann (*op. cit.*) has found that an endogenous oscillation, synchronized to light intensity, controlled circadian rhythms during summer but was an integral part of short-term rhythm during spring and autumn. In the present study seasonal variation was not apparent on account of the semi-controlled conditions under which monitoring occurred. However, seasonal variation could well occur, as has been

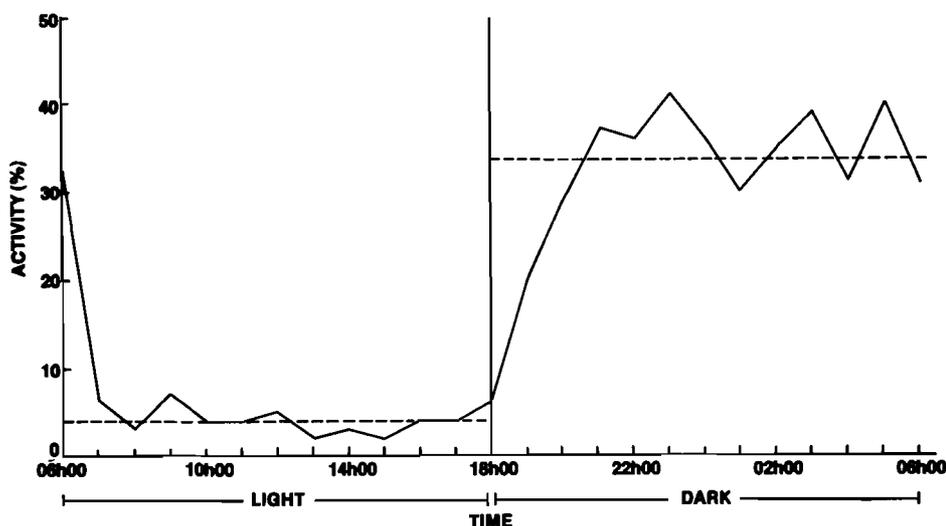


Fig. 1 The mean activity profile of *M. varius*. Broken lines indicate mean diurnal and mean nocturnal levels of activity.

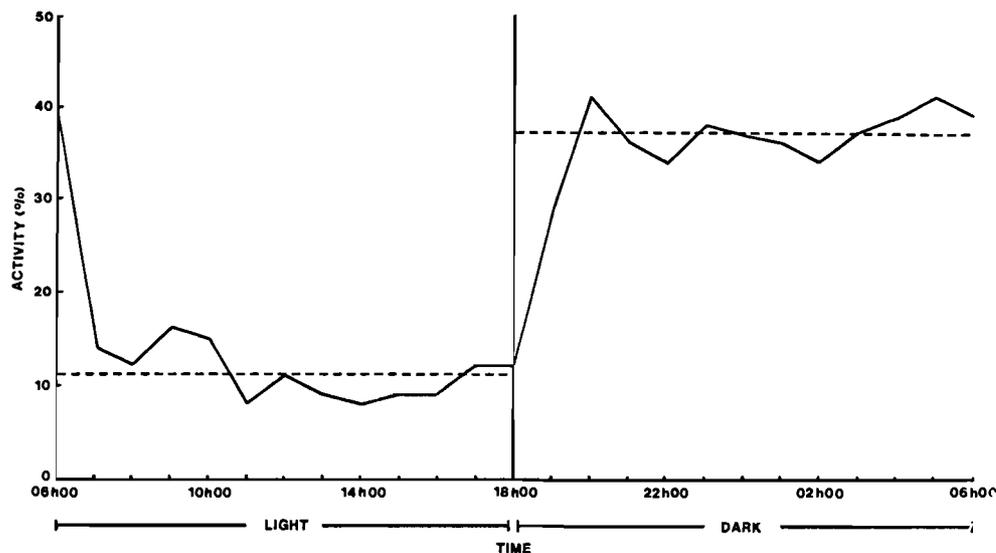


Fig. 2 The mean activity profile of *M. cafer*. Broken lines indicate mean diurnal and mean nocturnal levels of activity.

found in some Eurasian shrews by Gebczynska & Gebczynski (1965), Gebczynski (1965), Buchalczyk (1972) and Fons (1975).

The Szymanski coefficients of activity (Szymanski 1918) of *M. varius* and *M. cafer* were 0,23 and 0,32 respectively. Those of other crocidurine shrews were 0,23 for *C. flavescens*, 0,12 for *C. hirta* and 0,30 for *C. mariquensis* (Baxter *et al.* 1979); 0,13 to 0,24 for *C. suaveolens cassiteridum* (Rood 1965); and Saint-Girons (1959) obtained results similar to the above for *C. russula*. Soricine coefficients of activity were reported as 0,70 for *Neomys fodiens*, 1,46 for *Sorex araneus*, 1,36 for *S. minutus* (Crowcroft 1954) and 1,18 for *S. vagrans obscurus* (Ingles 1960). Martinsen (1969) found that *Blarina brevicauda* was active for 16% of the day which gives it a coefficient of 0,19.

Different temperature regimes and diets could potentially affect the activity patterns of shrews. In the above studies these conditions were not identical although in most the temperature range was within that followed in the present study and the diets were fairly similar. However, Ingles (1960) found that activity patterns remained stable under greatly varied conditions and Martinsen (1969) found the patterns remaining very similar on varied diets including starvation. Consequently, it appears that valid comparisons can be made using the Szymanski coefficients above. These coefficients, with the exception of that for *B. brevicauda*, suggest that subfamilial differences exist in the levels of activity and these are most probably the expression of the subfamilial differences in metabolic rates reported by Vogel (1976). The coefficients for the two *Myosorex* species definitely indicate crocidurine affinities and consequently it may be expected that *Myosorex* will have metabolic rates similar to those of other crocidurines.

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