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Maternal Behavior of a Short-Tailed Shrew (*Blarina brevicauda*)

BEHAVIOR MACIERZYŃSKI U *BLARINA BREVICAUDA*

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The maternal behavior of a short-tailed shrew (*Blarina brevicauda*) in simulated natural conditions was described. The female shrew was seen to constrict the nest openings during lactation as well as reinforce the nesting material. Her activity, measured as time out of the nest, increased during pregnancy and increased greatly during lactation. The shrew retrieved her pups both by dragging and with a behavior similar to caravanning. Maternal behavior ceased completely on day 22, the time of weaning.

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I. INTRODUCTION

Descriptions of maternal behavior in shrews are rare. Maternal behavior has been described for captive *Suncus etruscus* (Fons, 1974), and pup retrieval has been detailed in *Crocidura bicolor* (Dippenaar, 1979). Pearson (1944) described parturition and care of neonatal *Blarina*. Caravanning, a line of shrew pups led by their mother, has been known in crocidurine species for some time (e.g., Herter, 1957; Zippelius, 1972). These species form a caravan in which shrews actually bite onto the rump of the shrew in front of them. Recently, caravanning has been described in two soricine species. Harper (1977) observed a caravan of *Sorex araneus* in the field and Goodwin (1979) noted caravanning in

a captive litter of *S. cinereus*. Goodwin saw only the nose of a shrew buried into the rump of the shrew in front of it; an actual bite was not seen.

This study reports on the behavior of a female *Blarina* which gave birth to a litter of five pups while maintained in simulated natural conditions. Simulated natural conditions were established in rooftop cages measuring 1 by 3 m. Open areas of these cages were constructed to simulate a forest floor and protected cage sections simulated underground and nesting conditions. Each nest area had two openings which connected via plastic tubing to a common tube to the open cage area (Martin, 1980).

II. RESULTS AND DISCUSSION

The female gave birth to a litter of five pups on 23 June 1979. The pups were seen to follow the development stages outlined by Hamilton (1929). All pups were successfully weaned and survived to adulthood.

While nursing the pups, the female removed all food from the open area of the cage soon after it was added. She was quick to respond to any disturbance and would immediately leave the nursing pups. Her activity, measured as time out of the nest and determined by microswitches placed at the open/protected cage interface (Martin, 1980), increased greatly (Fig. 1). The daily activity pattern for this shrew during the summer is shown as a function of reproductive state in Fig. 1. The mean total daily out of nest percent activity was significantly different for these reproductive states ($H=33.78$, $p < 0.001$, Kruskal-Wallis One-Way ANOVA by Ranks; Siegel, 1956). Both nursing ($U=23.5$, $p < 0.001$) and pregnancy ($U=204.5$, $p < 0.03$, Mann-Whitney U Test; Siegel, 1956) increased activity out of nest relative to the control, post-weaning state.

Pregnancy and lactation may have increased activity due to the increased nutritional needs of the female. She may therefore have increased her foraging, and presumably, increased her food intake. Lactation may additionally have increased activity levels due to a female's possible increased patrol of her territory to protect the pups against conspecifics or predators. Lactation may also be a very stressful time for a female. Shrews are easily stressed and the demands and activity of the pups may have caused the female to leave the nest at frequent intervals.

The overall daily patterns of activity during these reproductive states, while exaggerated, was similar to that of other shrews during the summer (Martin, 1980). The only major difference between the shape of the curves in Fig. 1 and a "normal" summer curve was the additional peak during period 3. This time period includes the time of the morning feeding. (Shrews were fed at the same approximate time of day throughout the year.) Apparently this female learned when feeding occurred. Her activity throughout the year consistently showed small peaks during period 3.

The female also greatly changed the physical environment of the nest area. During the first week after the birth of the pups, she

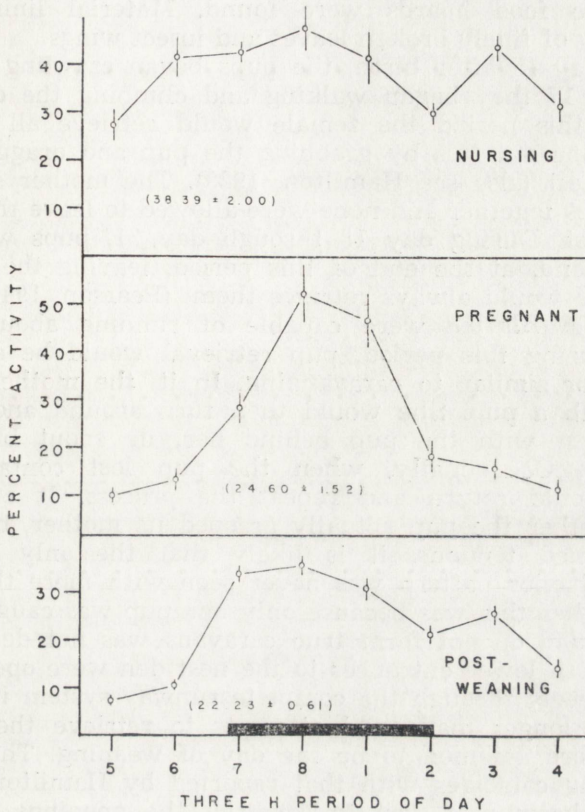


Fig. 1. Daily activity patterns during three reproductive states of a female *Blarina brevicauda*. Nursing (lactation) excludes days when pups were running out of the nest; pregnancy excludes days when the shrew was still with her mate. Post-weaning represents normal summer activity for this shrew. The day is divided into eight 3-hour periods; period 1 is 0000—0300 h, period 2 is 0300—0600 h, etc. The curves begin with noon for aesthetic reasons only. Mean percent activity \pm S.E. is shown for each 3-hour period. The mean period between sunset and sunrise is indicated by the band on the X-axis. Data are based on 16 days during lactation, 14 days during pregnancy, and 45 days post-weaning. The number in parentheses is the mean total daily percent activity \pm S.E. per reproductive state.

partially closed the opening to the nest area. The opening was just large enough for a shrew to squeeze through. During the second week of lactation the opening to the outside remained nearly closed and the nesting material around the pups increased. During the third week, the first week during which the pups were able to move about readily, the female blocked one of two lower entrances to the nest area completely. She also partially closed the remaining tube leading to the outside tube by filling it with peat moss, soil, and leaves. The outer opening remained partially closed. The nest was examined after the pups were weaned. The nesting area was generally free of urine and feces, but the tubes leading to the nest did contain a considerable amount of

fresh feces. No food hoards were found. Material lining the nest consisted mostly of finely broken leaves and insect wings.

On 8 July, day 15 after birth, the pups began crawling and moving about. On day 17 they began walking and climbing the den entrance tubes. During this period the female would retrieve all pups which left the nest. She did this by grabbing the pup and dragging it backwards to the nest (also see Hamilton, 1929). The mother shrew would keep all the pups together and none were allowed to leave the immediate area of the nest. During day 18 through day 21, pups were running up the tubing and, at the end of this period, leaving the area of the nest; the female would always retrieve them. (Pearson, 1944, also noted that 20 day old *Blarina* were capable of running about the cage). Occasionally during this period, pup retrieval would be accomplished using a behavior similar to caravanning. In it, the mother would approach and grab a pup. She would then turn around and walk back towards the nest with the pup behind her, its snout buried in its mother's rump. Occasionally, when the pup lost contact with its mother, she would return and repeat the process. It could not be ascertained whether the pup actually grasped its mother, but since the connection seemed tenuous, it is likely that the only contact was tactile. This behavior pattern was never seen with more than one pup at a time. Whether this was because only one pup was caught at a time or because *Blarina* do not form true caravans was not determined.

On day 22, both lower entrances to the nest den were open. The pups were running freely through the complete runway system in their cage. The female no longer made attempts to retrieve the pups. This day was therefore assumed to be the day of weaning. The time from birth to weaning coincides with that reported by Hamilton (1929).

The female shrew was seen to constrict the openings to the nest, probably both to prevent the entry of intruders and to hinder the pups' escapes from the nesting area. A behavior similar to the caravanning described by Goodwin (1979) was seen. Further investigations into this behavior in *Blarina* and other shrews may aid in the understanding of the evolution of this behavior through the *Soricidae*.

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