

## **Radio tracking of one *Metachirus nudicaudatus* (Desmarest, 1817) individual in Atlantic Forest of Southeastern Brazil**

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**ABSTRACT:** The brown four-eyed opossum *Metachirus nudicaudatus*, is a medium-sized terrestrial marsupial, with nocturnal habitats and an insectivorous-omnivorous diet. In November 2001, radio telemetry was used to follow a female for three whole nights in the União Biological Reserve, Rio de Janeiro, in order to investigate its home range, movement patterns and activity. A total of 18 localizations were recorded. The area covered, calculated using the Minimum Convex Polygon method (MCP), was 8.4 ha. The animal travelled an average distance of  $549.9 \pm 49.5$  meters per night and was exclusively nocturnal, presenting activity peaks between 20:00 and 23:00 h. The results presented here are probably an underestimate of the true home range of the species, but the scarcity of radio tracking studies, makes the results relevant for future studies of this small Neotropical marsupial.

**Keywords:** radio tracking, *Metachirus nudicaudatus*, home range, movement, activity, small mammals, Atlantic Forest.

**RESUMO: Rádio-telemetria de um indivíduo *Metachirus nudicaudatus* (Desmarest, 1817) na Floresta Atlântica do Sudeste do Brasil.** A cuíca-marrom-de-quatro-olhos, *Metachirus nudicaudatus*, é um marsupial de porte médio, de hábito noturno, terrestre e dieta insetívora-onívora. Em novembro de 2001, uma fêmea foi acompanhada por três noites inteiras, através de rádio-telemetria, na Reserva Biológica União, RJ, para a investigação de sua área de uso, deslocamento e atividade. Obtivemos um total de 18 localizações. Calculou-se a sua área de uso através do método polígono mínimo convexo (PMC). O resultado encontrado foi 8,4 ha e o animal apresentou um deslocamento médio de  $549,9 \pm 49,5$  m/noite e aparentou ser exclusivamente noturno, com picos de atividade entre 20:00 e 23:00 h. Os resultados aqui apresentados provavelmente subestimam a real área de uso dessa espécie, mas a escassez de estudos de rádio-rastreamento tornam esses resultados relevantes para futuros estudos com esse pequeno marsupial Neotropical.

**Palavras-chave:** rádio-rastreamento, *Metachirus nudicaudatus*, área de uso, deslocamento, atividade, pequenos mamíferos, Mata Atlântica.

The Atlantic Forest is one of the most threatened ecosystems in the world. Due to its location in the most developed and densely populated region of Brazil, and due to frequent deforestation and forest fires, only around 8% of the original cover remains, distributed in small remnants (Mittermeier, 1986; Myers *et al.*, 2000). In the state of Rio de Janeiro, only 19.19% of the forest remains (Fundação SOS Mata Atlântica & INPE, 2002). The Atlantic Forest harbours around 250 species of mammals, of which 55 are endemic (Conservation International *et al.*, 2000). In Brazil there are 483 species of mammals, of which 44 are marsupials (Fonseca *et al.*, 1996).

The Didelphidae family is one of the most ancient mammalian families, and one of the richest marsupial families. However, little is known about the home range and spatial patterns of habitat use of species in this family – some species possess very large ranges that include a variety of habitats (Nowak, 1991). *Metachirus nudicaudatus* is a medium-sized marsupial that can reach weights of over 300 grams. It is terrestrial, nocturnal and solitary, with an insectivorous-omnivorous diet (Emmons & Feer, 1997).

Burt (1943) defined the term ‘home range’ as that area traversed by the individual in its normal activities of food gathering, mating, and caring for young. Apart from one study by Stallings *et al.*, (1994) there are few published studies of small mammals using radio telemetry in the Atlantic Forest. The present study used radio telemetry to investigate aspects of the ecology of *Metachirus nudicaudatus*, such as the size of its home range, its movement patterns and activity that may help in the conservation of the species.

The study was conducted in the União Biological Reserve, administered by IBAMA and located at the border of the regions of Casimiro de Abreu and Rio das Ostras, in the state of Rio de Janeiro (22°27'36" S and 42°02'15"W). This reserve is one of the last remnants of Atlantic Forest on the coastal lowlands of the state (Kierulff, 1993). The reserve contains an area of approximately 2,400 ha of forest. The vegetation in the region is characterised as dense ombrophilous forest (IBGE, 1993). In the reserve area, a warm tropical and humid climate is prevalent, with average annual temperatures of  $24.3 \pm 2.5$  °C. Average annual rainfall is  $1,690.9 \pm 481.4$  mm, with rainfall concentrated in the period from November to April representing 71% of total rainfall (Kierulff, 2000).

The study was carried out from November 2-7, 2001. An adult female of *M. nudicaudatus*, weighting 243 grams, was captured in a wire trap that was placed on the ground and baited with banana and cotton soaked in cod liver oil.

Next, the animal was anaesthetized and fit with a radio-collar (Wildlife Materials Inc., model SOM-2190) weighting 3.5 grams [representing less than 5% of the total weight of the individual and, therefore, not hindering her natural movement or behaviour (Cochran, 1969)]. The female was followed for three nights (1800h-0600h) using radio-telemetry with a TR-2 receiver (Telonics Inc., Mesa, Arizona 85204), frequency 164-165 MHz, a “Yagi” antenna with three elements and one headphone.

Localizations of the individual were collected by triangulation, in which a minimum of three compass bearings were recorded location. These directions were used to calculate the position of the individual using the computer program “Locate II version 1.6” (Nams, 2000). If there was variation in the signal emitted by the radio collar in a period of 30 seconds, the percentage of the signal in which the individual was active was also noted. This variation occurs when the animal moves its head or its body and shifts the position of the antenna, causing the signal to change intensity or disappear. This technique was successfully used by Valenzuela & Ceballos (2000). Next, the number of active signals was used to calculate the percentage in relation to the total number of signals obtained each night and at hourly intervals. When possible, the sleeping locations of the animal were also located.

The locations of the animal and its shelters in the UTM system (Universal Transverse Mercator) were plotted on a map of the area, scale 1:10,000. The collected data were analysed using the program “Animal Movement Analyst Extension (AMAE) version 2.0” (Hooge, *et al.*, 1999) for Arcview 3.2 (Environmental Systems Research Institute, ESRI, Redlands, California, USA). All localizations of the animal were analysed by the Minimum Convex Polygon method (MCP) (Mohr, 1947). The area was calculated using 100% of the localizations, to permit future comparisons with other studies using conventional methods. The animal’s nightly travelled distance was calculated by summing the straight line distances between each location point, from the first to the last register each night.

A total of 18 localizations were obtained and the monitored animal displayed a home range of 8.4 ha (Fig. 1). The average travel distance was  $549.9 \pm 49.5$  metres [530 m on the first night, 475.8 m on the second, and 643.9 m on the third night (Fig. 2)]. During the study four sleeping locations were identified as burrows in fallen tree-trunks (n=2) and nests under foliage on the forest floor (n=2). When some leaves were slowly lifted from one of the foliage nests, the animal displayed defensive behaviour, with the characteristic sounds of “gnashing teeth” and “grunting”.

The animal was active only during the night, with only one activity peak in each of the three nights of monitoring. This occurred in the period from

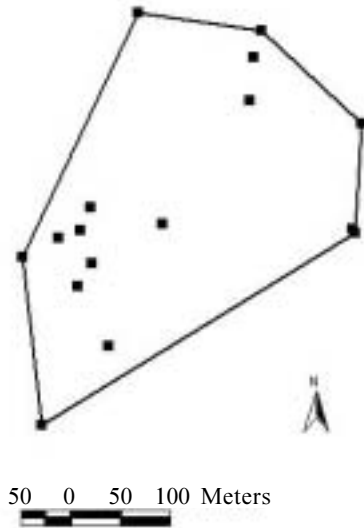


Figure 1. Home range of *Metachirus nudicaudatus* calculated using the Minimum Convex Polygon (MCP) in the União Biological Reserve, Brazil.

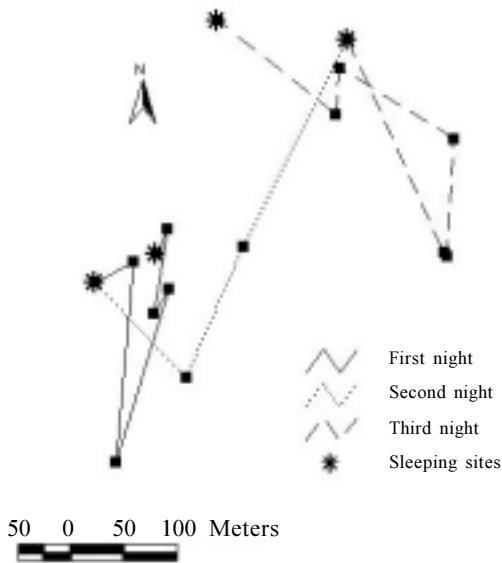


Figure 2. Movements and sleeping sites of *Metachirus nudicaudatus* in União Biological Reserve, Brazil.

20:00 to 23:00 h, when all localizations indicated activity. In the time following this peak, activity decreased until no active signals were recorded after 02:00 h. The absence of signal variation and lack of change in position of their nests/resting places during daytime (0700 - 1700 h) indicated absence of daytime activity during the three occasions (days) in which these information could be recorded. In the following month the individual was found dead, probably killed by an unknown predator. Only the radio-collar was found, covered with many hairs.

The study animal demonstrated an activity pattern with only one peak of activity throughout the night. This supports the findings for other didelphids, such as *Didelphis marsupialis* (Sunquist *et al.*, 1987), *Thylamys velutinus* in the Brazilian cerrado (Vieira & Baumgartem, 1995), *Didelphis aurita* (Cáceres & Monteiro-Filho, 2001) and *Micoureus demerarae* in the same study area (Moraes Jr., 2003). All those species showed only one peak of activity, which decreases after 02:00 h. This may be a general pattern for Neotropical marsupials.

The average distance travelled by the individual in the present study (549.9 m) is similar to the average value (505.6m) found by Milles *et al.*, (1981) for 11 individuals monitored using spool-and-line devices. Gentile & Cerqueira (1995) found that 78% of *M. nudicaudatus* movements were within 41-200 meters. However these authors used a four hectare grid with traps to calculate the movements, thus underestimating the values by covering a much smaller area than the daily movements encountered in the present study. The individual in the present study was not limited by an area covered by traps, therefore the movements encountered here are believed to better represent the real movements of the animal. The use of foliage nests and defensive behaviour, was also observed by Loretto *et al.*, (2003) in Serra dos Órgãos National Park, using spool and line method. The authors found thirteen nests. Nevertheless, these authors observed only two females, one with and another without nestlings, both presenting this behaviour. Here the study the animal, wich was without nestling, presented the same display.

Regarding habitat use, the União region contains five principal habitat types, including marshy woodland (“mata brejosa”), lowland woods (“mata de baixada”) and hillside woodland (“mata de encosta”), as characterised by Kierulff (2000). The study animal was observed using lowland and hillside woodland. Being an exclusively terrestrial animal (Emmons & Feer, 1997) it perhaps avoided the more marshy areas in the reserve.

In conclusion, the results presented here are probably an underestimate of the true home range of the species, as only one individual was monitored and only a small number of localizations was obtained. But the absence of published

results of home range, activity and movement studies of this species makes the results of this study relevant for future studies of this small Neotropical marsupial.

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