Mastozoología Neotropical, 17(1):207-211, Mendoza, 2010

ISSN 0327-9383
Versión on-line ISSN 1666-0536
http://www.sarem.org.ar

NESTS OF *Oligoryzomys* sp. AND *Holochilus brasiliensis* (RODENTIA, CRICETIDAE) IN EASTERN ENTRE RÍOS PROVINCE, ARGENTINA

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ABSTRACT: We describe the structure and location of nests built by *Oligoryzomys* sp. and *Holochilus brasiliensis* in eastern Entre Ríos Province, Argentina. Nests were associated with water bodies. Nests of *Oligoryzomys* sp. averaged 18 cm length, 8 cm width, and 10 cm height and were found at elevated sites, while nests of *H. brasiliensis* were a few centimetres above water surface and had an ellipsoid shape with a mean size of 22.5 cm length, 13 cm width, and 18.7 cm height. A seasonal nest building pattern was observed that might indicate that these species construct their nests during spring and summer for breeding. Knowing the biology of these potential pest species of economic and public health importance in a natural environment will help defining an effective control program.

RESUMEN: Nidos de *Oligoryzomys* sp. y *Holochilus brasiliensis* (Rodentia, Cricetidae) en el este de la provincia de Entre Ríos, Argentina. Se describe la estructura y ubicación de los nidos de *Oligoryzomys* sp. y *Holochilus brasiliensis* en el este de la provincia de Entre Ríos, Argentina. Los nidos se hallaron asociados a cuerpos de agua. Los nidos de *Oligoryzomys* sp. se encontraron en sitios elevados, su tamaño medio fue de 18 cm de largo, 8 cm de ancho y 10 cm de alto. Los nidos de *H. brasiliensis* se localizaron a unos pocos centímetros sobre la superficie del agua, tenían una forma elipsoidal con medias de 22.5 cm de largo, 13 cm de ancho y 18.7 cm de alto. Se observó un patrón estacional en su construcción; esto podría indicar que estas especies construyen sus nidos durante la primavera y el verano para albergar sus crías. Estas especies tienen importancia sanitaria y económica por lo cual es importante conocer su biología en ambientes naturales para establecer un adecuado programa de control.

Key words. Ecology. Natural history. Nesting behaviour. Sigmodontinae.

Palabras clave. Comportamiento. Ecología. Historia de vida. Sigmodontinae.

The cricetid rodents *Oligoryzomys* spp. and *Holochilus brasiliensis* occupy a wide range of habitats in Argentina (Gurini, 1986; Redford and Eisenberg, 1992; Cirignoli et al., 2006). *Oligoryzomys* sp. inhabits mostly vegetated and bushy places, while *H. brasiliensis* prefers riparian habitats (Massoia, 1965). *Oligoryzomys* Bangs, 1900 have been identified as a natural reservoir for Hantaviruses and thus represent a serious public health problem

Recibido 8 septiembre 2008. Aceptado 20 mayo 2009. Editor asociado: M Díaz

(Enria, 1998). The knowledge of its nests may also help in studies of horizontal transmission of Hantavirus – do pups get infected from urine/faeces in the nest deposited by infecting individual – (see Delfraro et al., 2003; Padula et al., 2004). The genus *Holochilus* Brandt, 1835 is considered a pest in northern Argentina (Massoia, 1974, 1976), because it causes considerable damage to cane plantations by gnawing the cortex, interrupting nutrient circulation, and destroying the plants (Gurini, 1985).

The scarce knowledge on the nests of sigmodontinae rodents inhabiting the southern cone of South America is limited to occasional comments by some authors (Llanos, 1944; Massoia, 1965, 1971, 1976; Massoia and Fornes, 1965; Sierra de Soriano, 1969; Mann Fisher, 1978). Previous studies on the nesting behaviour of cricetid rodents in Argentina (e.g. Yunes et al., 1989; Laconi and Castro-Vázquez, 1999) have been carried out in laboratories, under controlled conditions and with nesting materials that are uncommon or do not exist at all in natural environments. These observations may therefore not be representative of the nesting behaviour of wild cricetids.

The goal of the present study was to contribute to the knowledge of some aspects of the ecology and natural history of *Oligoryzomys* sp. and *H. brasiliensis* in natural environments. More specifically, we analyzed the nesting behaviour and the structure of nests built by *Oligoryzomys* sp. and *H. brasiliensis* in natural habitats. The presented data will be useful to construct an adaptive profile for these species and will help delimiting an effective control program in areas where their populations are abundant.

Field work was carried out during the cold and warm seasons of 2000. Marshy environments associated to the Arroyo Perucho Verna (32º 10'S, 58º 18' W) and two small tributaries of the Río Gualeguaychú (32º 06' S, 58º 25' W), near Villa Elisa (32° 10'S, 58° 24' W), Entre Ríos Province, Argentina (**Fig. 1**), were searched for the presence of nests. The elevation of nests over the ground or water surface was registered, and the plant species near the nest locations were identified. Photographs of their position were taken (**Fig. 2**) and then nests were collected. In the laboratory, structure and nesting materials of nests were analysed, and their shape as well as their measurements were taken. The measurements registered were length, width and height and were obtained using a manual calliper.

Nests were attributed to *H. brasiliensis* whenever this species could be observed inside the constructions. Although *Oligoryzomys nigripes* and *O. flavescens* were captured using traps around nesting sites, presence of individuals inside nests was not observed directly. For this reason, hair was collected from the nests and the taxa identified based on the techniques described by Chehébar and Martín (1989). For this, hair were immersed in hydrogen peroxide during five minutes, then immersed in ether during the same lapse of time, dried under a lamp, and finally placed in glycerine on a slide. The structure of the hair medulla was then evaluated with an optic

Fig. 1. Sampling localities of sigmodontine nests in eastern Entre Ríos province, Argentina: 1- Río Gualeguaychú and 2- Arroyo Perucho Verna.

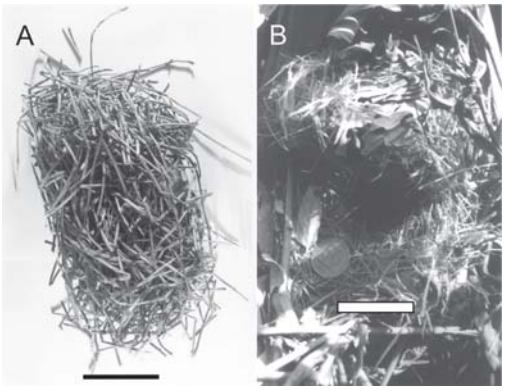

Fig. 2. Sigmodontine nests recorded in Entre Ríos province, Argentina: **A.** Nest of *Oligoryzomys* sp. **B.** Nest of *Holochilus brasiliensis*. Scale bar = 5 cm.

microscope. After removal of the hair from the glycerine, the mark of its scales remained and allowed to determine the cricetid species by comparing them with scales of specimens of the mammal collection at Museo de La Plata and specimen showed in Piantanida and Petriella (1976) and Gurini (1985).

Hair analysis confirmed that nests had been built by *Oligoryzomys* sp., but it did not allow us to determine the species because no significant differences can be observed in the hair structure of the two species present in the study area, *O. flavescens* and *O. nigripes* (see Gurini, 1985). However, only one pattern of nest building was observed, suggesting that only one species was responsible for its construction. The nests of *Oligoryzomys* sp. were found at the border of small channels of Arroyo Perucho Verna (**Fig. 1**). The predominant vegetation in this area consisted of *Equisetum giganteum* (horsetail, Equisetaceae), and *Cortaderia* sp. (Poaceae), while the arboreal stratum was mainly represented by *Erythrina crista-galli* (Leguminosae). Nests (N=9) were found at a height between 1-2 m above ground level; their entrances were not evident (**Fig. 2A**). Their mean size was 18 cm length, 8 cm width and 10 cm height. They were mainly found on horsetail (N=8), which makes compact shrubs with its secondary axis arranged in compact whorls. The rodent uses them as a base on which it builds its nests by adding other materials of the same plant species and different grasses. Nest structure is simple and consists of an external and an internal part. The former consists of thick materials, mainly small sticks in lax form. The smoother and more delicate inside material, usually grass and hair, is arranged in spirals and more densely than the external part. Nests were only found in spring and summer.

Nests of *H. brasiliensis* were found in the source areas of the tributaries of Río Gualeguaychú (**Fig. 1**), in open areas where *Pontederia cordata* (Pontederiaceae), *Echinodorus grandiflorus* (Alismataceae) and *Scirpus* sp. (Cyperaceae) were abundant and arboreal vegetation was absent. All nests studied (N=17) were found 20 to 50 cm above the water surface. Nests were found on *Pontederia cordata*, which was used by the rodents as a support for their constructions. Rodents gnaw material to build their nests, using the big leaves as an external cover while the smoother stem fibre and some grasses are used to line the inside in a helicoidal form. The ellipsoid nests have a mean size of 22.5 cm length, 13 cm width and 18.7 cm height. A circular entrance at one side was observed in four cases (**Fig. 2B**). Nests of *H. brasiliensis* were found in spring, summer and winter. Because of the exceptional rainfall in the region during the sampling year, plants of *P. cordata* were found in high density; although dry, they were upright supporting the nests.

Our results are consistent with the scarce available literature on nests of *H. brasiliensis*. In one of the first descriptions of nests of *H. brasiliensis,* Burmeister (1879) mentions similar aspects to those described in the present study, while Yepes (1941) makes reference to observations of nests on trunks and shrubs. According to Massoia (1965), *H. brasiliensis* inhabiting the Delta del Parana make their nests with different intermixed plants attached to the aerial part of plants of less than 1 m height, above the ground, or over the water surface. It is interesting to note that *H. chacarius* builds nests of similar shape and size as those of *H. brasiliensis*, but in subterranean galleries in-

stead of aboveground (Massoia, 1971). These caves were found between the vegetation and had several (up to 3) entrances. This difference in nest construction between *H. brasiliensis* and *H. chacarius* is noteworthy because these species are sympatric in northeastern Argentina. Furthermore, it represents an additional evidence of the ecological differences between *H. brasiliensis* and *H. chacarius,* as was noted by Massoia (1971). Nevertheless, Massoia (1976) observed that in banana plantations in northern Argentina, *H. chacarius* used grass and banana leaves to make their nests about 1.40 m above ground, and that several nests were grouped together. This author also mentioned nests in rice fields and scrublands in northeastern Argentina located 50 cm above the water surface. Llanos (1944) studied a demographic explosion of rodents in northern Argentina and also mentioned nests of *H. chacarius balnearum* in sugar cane plantations. They were located in the highest portion of canes that had been gnawed to form a platform. This author registered a mean nest weight of 50 g and 17.5 cm diameter and also observed a lateral entrance that was slightly elevated when compared to the base of the nest. These observations clearly show the great flexibility of *Holochilus* for the construction of nests.

Even less is known about *Oligoryzomys* nests. Previous scientific information is limited to Massoia (1961, 1965) and Massoia and Fornes (1965), who mentioned briefly that the nests of *O. flavescens* and *O. nigripes* were found not only at a considerable height (up to 1 m) in trees but also on the ground surface, inside holes in trunks, and under creeping vegetation. In future works, the application of the spool-and-line device technique (Briani et al., 2001) would provide helpful information for determining the species of *Oligoryzomys* associated with the type of nests.

Oligoryzomys sp. and *H. brasiliensi*s are both associated with bodies of water, but being an active user of the aquatic habitat, the latter seems to be better adapted to aquatic life than the former (Sierra de Soriano, 1969). The materials they use to build their nests and their typical nest location a few centimetres above the water surface are additional indicators of their adaptations to living in the water. On the other hand, our results suggest that *Oligoryzomys* sp. is a scansorial species that prefers elevated sites away from water. Massoia (1961, 1965) and Massoia and Fornes (1965), though, mention that *O. flavescens* and *O. nigripes* can swim and dive.

The adaptative significance of these nesting behaviours may be related to the construction of shelters for thermoregulatory purposes (Yunes et al., 1989). The seasonal nest building pattern observed near Villa Elisa suggests that, at least in this area, thermoregulation may not be the primary reason for nest construction. The fact that no nests of *Oligoryzomys* sp. were found in the cold season might indicate that these species build their nests during spring and summer for breeding. This hypothesis is supported by the presence of a litter of newborn mice in one of the studied nests.

The same might be true for *H. brasiliensis*, although the exceptionally high precipitation rate registered in our study area during 2000 may have led to the nests of this species remaining intact for a prolonged time, which consequently allowed us to observe them in winter. During the cold season, *Equisetum* and *Pontederia,* two annual plants, usually dry out and drop their foliage. As a consequence, nests built on these plants fall apart and, because the shrubs no longer offer enough protection, rodents are forced to use the creeping vegetation as shelter from the cold and from predators. Massoia (1971) proposed that in the Delta del Parana islands, rodents die after prolonged exposure to intense solar radiation. The construction of nests by captive *H. chacarius* during the day may therefore be explained by their need for shelter. We cannot exclude the possibility that *H. brasiliensis* builds nests during the warm periods for similar reasons.

Acknowledgements. We thank Guillermo Udrizar Sauthier and Andrea Salazar for their help in fieldwork. To Ilse Friedmann de Casse for the English revision, and special thanks go to Mariella Superina, Ulyses F.J. Pardiñas, Pablo Teta, Analía Andrade, and Mariano Merino. Our deepest gratitude to Mónica Díaz, Christopher Yahnke, and an anonymous reviewer.

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