Short communication

Arboreal behaviour of the wood mouse *Apodemus sylvaticus* (Rodentia: Muridae): a study in the Venetian plain

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Abstract - The arboreal activity of the wood mouse is known, but mostly based on anecdotal evidence or single records. This study reports on field observations carried out systematically during an indirect survey conducted in the Venetian plain using hair tubes positioned at different heights in the shrub layer. The research confirmed that in the study area the wood mouse moves not only at ground level, but at also a few meters above the ground reaching heights up to 2.30 m (1.54 m on average).

Keywords: Arboreal behaviour, hair tube, small mammals.

Riassunto - Comportamento arboricolo del topo selvatico *Apodemus sylvaticus* (Rodentia: Muridae): uno studio nella pianura veneta.

L'attività arboricola del topo selvatico è nota, ma basata soprattutto su testimonianze aneddotiche o singole osservazioni. Il presente studio riporta osservazioni di campo effettuate sistematicamente durante un'indagine indiretta condotta nella pianura veneta, mediante l'utilizzo di hair tube posizionati a varie altezze nello strato arbustivo. Lo studio ha confermato che il topo selvatico si muove non solo a livello del suolo, ma anche ad alcuni metri dal terreno, raggiungendo altezze fino a 2,30 m nell'area di studio (1,54 m in media).

Parole chiave: Comportamento arboricolo, hair tube, piccoli mammiferi.

INTRODUCTION

The wood mouse *Apodemus sylvaticus* (Linnaeus 1758) is a small rodent widely spread throughout Europe, from the Iberian Peninsula to Western Russia, reaching to the north Sweden, Norway and even Iceland (Amori *et al*., 2008). In Italy, the species populates most of the peninsula and some islands like Sicily, Sardinia, Elba, Giglio, Capri and Pantelleria (Amori, 1993; Capizzi & Santini, 2007), thanks to its broad capacity to adapt to different ecological conditions (Amori *et al*., 2008). The species is present throughout the Veneto region, from sea level up to quite high elevations, even beyond 2000 m (Bon, 2017). Although most of the species' activities are carried out at ground level (Jennings, 1975; Flowerded, 1991), the wood mouse also has a marked aptitude for climbing, reaching up to 3-4 meters in height on shrubs (Montgomery, 1980; Gurnell, 1985). Although this behaviour has been frequently reported, arboreality of the species has been little investigated and this information often remains anecdotal (Buesching *et al*., 2008). As a secondary result of a monitoring of small mammals carried out in a protected area of the Veneto plain, it was possible to collect quantitative data on this little-studied behaviour in a systematic way.

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MATERIALS AND METHODS

Study area

The present study was conducted in the Regional Natural Park of the River Sile, sited between the localities of Canizzano (TV) and Quinto di Treviso (TV) (45°38'47.8"N, 12°11'35.6"E). This is a riparian area adjacent to the River Sile and close to the Treviso airport, consisting of mixed-species hedges with *Rubus ulmifolius* Schott, *Cornus* sp. and to a lesser extent *Morus alba* L., *Corylus avellana* L. and other shrub and tree species, and woods with *Ulmus minor* Mill., *Alnus glutinosa* (L.) Gaertn., *Quercus robur* L., *Robinia pseudoacacia* L. Reedbeds are also present in some areas.

Data collection and analysis

Data were collected during a monitoring survey conducted with hair tubes (Pocock & Jennings, 2006; Chiron *et al*., 2018) and targeted at the hazel dormouse *Muscardinus avellanarius* (Linnaeus 1758). In this case, the choice fell on tubes 20 cm long and 3.5 cm in diameter, in order to facilitate entry only to target species and those of similar size, as has already been successfully experimented in other studies (Tioli & Zocca, 2010). In particular, 30 tubes arranged in two transects of 15 tubes each were tied at a distance of 5-10 m apart on the branches of trees and shrubs at a height ranging from 100 cm to about 250 cm, depending on the shrubs. Horizontal branches have been favoured to enhance the stability of the hair tubes. The placement height of each hair tube was then recorded rounding the measurement down to the nearest ten cen-

timetres. The hair tubes were left in place for about two and a half months, from 25 May to 2 August 2022, and were checked periodically (5 times) every two weeks to collect any samples, replace the double-sided tape and put the tubes back in place. The collected samples were first removed from the double-sided tape and then cleaned of impurities by immersion first in acetone and then in water. The hair was then identified under an optical microscope at 100× and 400× magnification through the diagnostic microstructures of the cuticle (outermost layer, formed by the overlapping of transparent keratin scales) and the medulla (inner part, formed by dead cells).

Identification was performed by visual comparison with figures in specialist texts (Debrot *et al*., 1982; Teerink, 1991; Paolucci & Bon, 2022).

In order to obtain a statistical description of the arboreal behaviour of the wood mouse in relation to the height attained in the shrub layer, a weighted average of the heights of the frequented hair tubes was calculated, taking into account the height of placement and the number of positive controls per hair tube (i.e. those in which hairs of the species are present). In addition, the range (minimum and maximum heights) of occurrence of the wood mouse in the arboreal environment is reported. The mean for each control and the confidence intervals were also calculated. The chi-square test was performed to check whether there were differences between the various sampling sessions. All statistical analyses were performed in the R environment (R Core Team, 2022).

RESULTS

During the survey, only wood mouse samples were collected. The average placement height of the hair tubes frequented by the wood mouse is 1.54 m ± 0.36 (S.D.). The hair tube positioned at the height of 2.30 m was frequented 4 times, the highest recorded height. Instead, the lowest tube used was located at 1.10 m. With the exception of the first sampling session, in which no hair samples of the species were found, in the subsequent ones the average height of the frequented tubes is around 1.50 m in height, not showing significant differences between one sampling session and another ($\chi 2$= 2.1204, p=0.9992).

DISCUSSION

The information reported in this work testifies and confirms the arboreal habits of the wood mouse (Buesching *et al*., 2008). Although the arrangement of the tubes may have probably influenced the results obtained, it can be said that the species appears to move skilfully from the ground level up to the height of 2.30 m. The findings are consistent with the observations reported in other European contexts (Gurnell, 1985), even if they do not reach the record height of 23.37 m exceptionally recorded in Poland for *A. flavicollis* (Melchior 1834), a species that shows similar arboreal behaviour (Borowski, 1962; Montgomery, 1980). The reason for this behaviour seems to be attributable to a combination of factors such as the

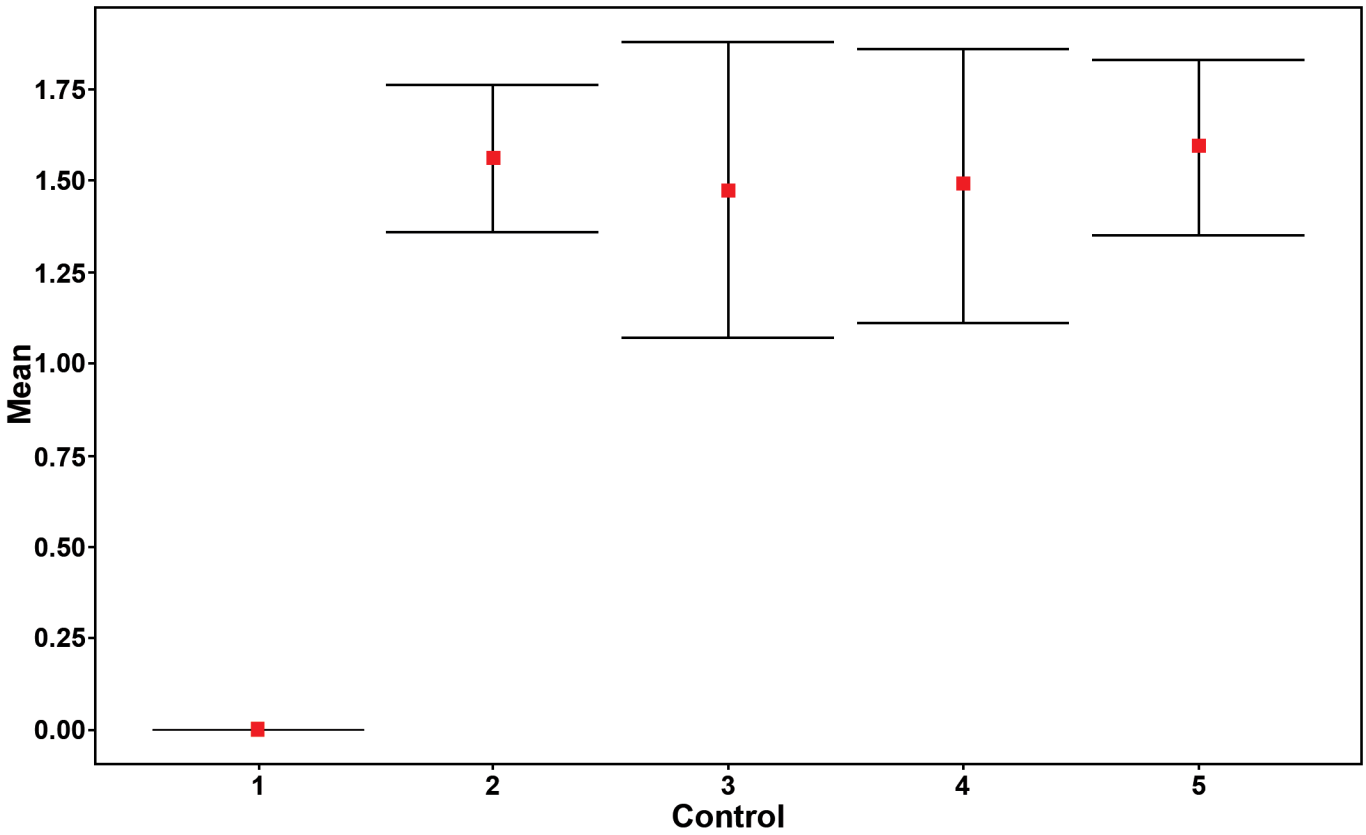

Fig. 1 - Averages and confidence intervals of the heights of the hair tubes used by the wood mouse during the sampling sessions. / Valori medi e relativi intervalli di confidenza delle altezze degli *hair tube* utilizzati dal topo selvatico durante le sessioni di campionamento.

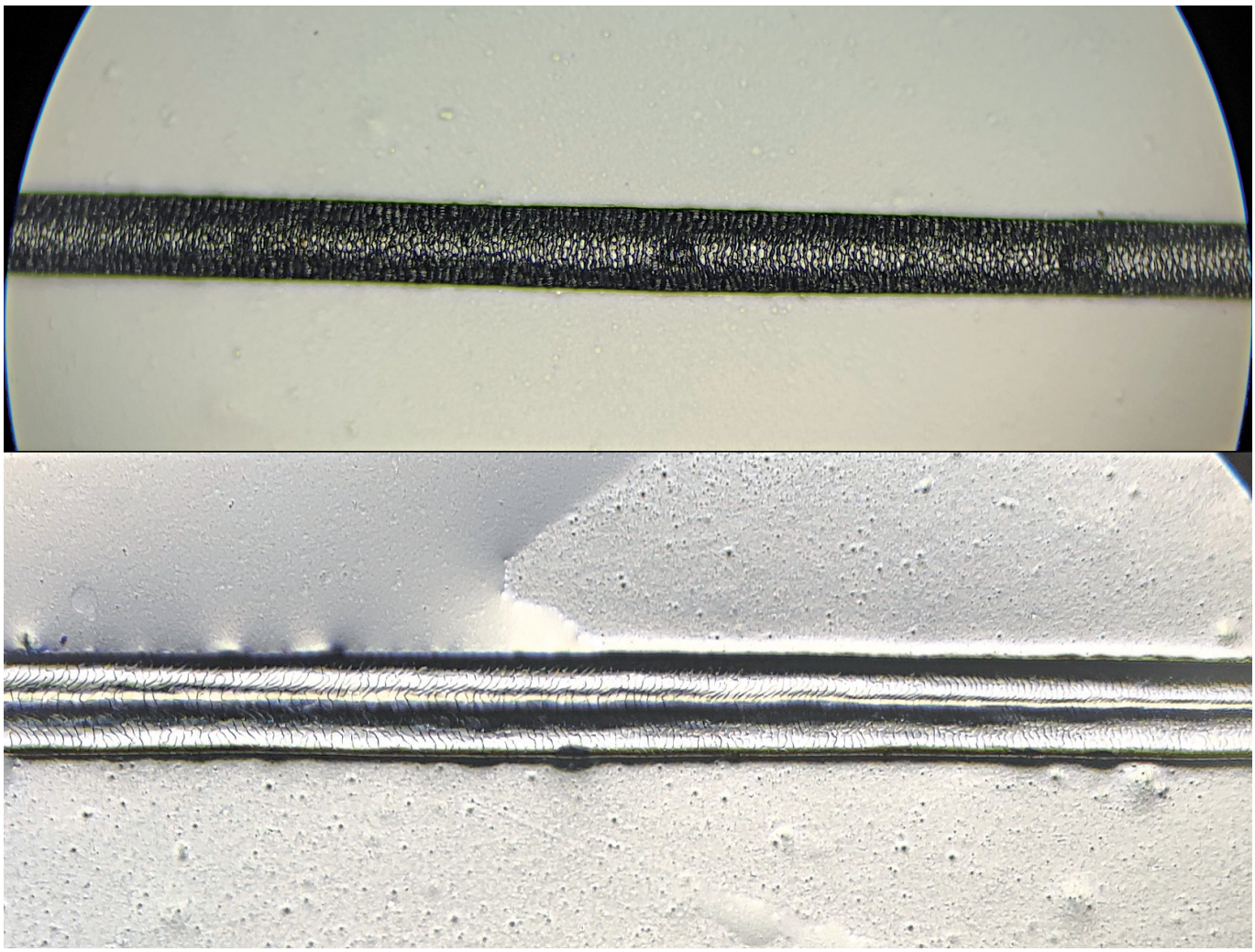

Fig. 2 - Medulla (above) and cuticle (below) of wood mouse hair seen under an optical microscope. / Midollo (sopra) e cuticola (sotto) di peli di topo selvatico visti al microscopio ottico.

search for additional food sources and the possibility of escaping predators (Buesching *et al*., 2008). Furthermore, the presence of the species also in the shrub layer can represent a disturbing factor for the hazel dormouse, as the two species can potentially compete for resources. In Germany, for example, it was observed that the absence (or the presence at low densities) of *A. sylvaticus* and *A. flavicollis* has a positive effect on the abundance of the hazel dormouse (Villing & Horst, 2021). Given the Community interest of the hazel dormouse (Habitats Directive 92/43/CEE), in-depth investigations into the ecological implications of the coexistence of this two rodent species in this study area are recommended.

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