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Records of mounds built by the Steppe Mouse (*Mus spicilegus*) (Mammalia: Rodentia) in Greece

Nálezy kurgančiků myši panonské (*Mus spicilegus*) (Mammalia: Rodentia) v Řecku

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Abstract. Two mounds made by the steppe mouse were found near Vlaherna, distr. Arta, Epeirus, Greece. They were hidden among dense and tall vegetation in balks along a small maize field. On October 18, mounds already contained store chambers full of spikes of Yellow bristle grass (*Setaria pumila*), Bermuda grass (*Cynodon dactylon*) and maize (*Zea mays*) seeds. This confirms that even in the lowlands of western Greece where winters are fairly mild, steppe mice retain their specific behaviour of making mounds containing winter food stores.

INTRODUCTION

The steppe mouse (*Mus spicilegus* Petényi, 1882) inhabits natural steppe grasslands and agrocenoses in lowlands of south-eastern Europe, from Austria and Serbia to Russia (Macholán 1999, Unterholzner et al. 2000). Isolated populations have also been found in the south-western Balkans: Montenegro (Petrov & Ružić 1983, Kryštufek & Macholán 1998), Albania and Epeirus, north-western Greece (Macholán & Vohralík 1997) and the Peloponnesus (Macholán et al. 2007). The steppe mouse is one of the so-called "aboriginal" species which avoid human dwellings and other buildings. It possesses the unique behaviour of making winter grain stores covered with a mound of soil, with a complex system of tunnels and nests underneath. Besides the use of molecular methods, this behaviour is commonly considered to be the most conclusive method for the identification of the steppe mouse species. These conspicuous mounds, inhabited by a group of mice (mostly 2–11 individuals), generally have diameters from 60 cm to 200 cm and attain heights from 10 cm to 70 cm (data from Vojvodina, Serbia – Mikeš 1971). In Moldova and Ukraine, even much bigger mounds have been found (see Sokolov et al. 1990 for a review). Although mounds built by a local subspecies *Mus spicilegus adriaticus* Kryštufek et Macholán, 1998 have been found in Montenegro (Petrov 1992, Kryštufek & Macholán 1998), none have yet been reported from Greece.

In August 1985, we collected three specimens of aboriginal mice near the village Vlaherna (Βλαχέρνα), 39° 09' N, 20° 59' E, Arta Dist., Epeirus, Greece, altitude 20 m, and identified them as *M. abbotti* Waterhouse, 1837 (Sofianidou & Vohralík 1991). Later, these mice were re-identified according to skull characters as *M. spicilegus* (Macholán & Vohralík 1997). From 16–18 October 2001, we returned to that locality. The aim of our visit was to check whether the

Greek *M. spicilegus* population also build mounds as do all other known populations of that species, and in addition, to collect tissue samples for molecular analyses.

RESULTS AND DISCUSSION

The area south of Vlaherna was considerably destroyed by a highway which had been recently built there. However, the small field where mice were collected in 1985, situated between a river and the highway, was preserved. The field had oblong shape with sides ca. 50 and 40 m long. On the north it was bordered by an orange orchard, on the east and south it was surrounded by completely bare plots from which the soil had been removed, and on the west was a disturbed ruderal plot covered with sparse tall vegetation. On the east, south and west the field was lined with ca. 2–3 m wide balks overgrown by tall grass, reeds, blackberries and bushes; there were also several solitary trees. Just a few days before our visit, maize (*Zea mays*) was harvested from the field.

Two mice mounds were found: the first (no. 1) in the eastern balk (Fig. 1), and the second (no. 2) in the southern balk (Fig. 2). Since no mounds made by steppe mouse populations isolated in the southern Balkans have ever been reported, we describe them here in more detail.

Mound no. 1 was situated ca. 30 cm from the field margin and was nearly completely hidden by dense vegetation (blackberry and very tall grass), and in addition had a cherry tree growing through its top (Fig. 3). The mound was 160 cm long, 120 cm wide and 60 cm high. Its surface was covered by fresh soil containing small limestone stones (up to 3 cm in diameter). On 17 October in the evening, we opened the mound surface near the top, on a plot ca. 20 cm in diameter. At a depth of ca. 10 cm we found the ceiling of a store chamber. The next morning, we found the mound surface perfectly repaired. Therefore, we opened the mound again at the same place and excavated a chamber containing ca. 4 litres of spikes from the Yellow bristle grass *Setaria pumila*. The majority of spikes (ca. 80%) were nearly decomposed, but the rest, stored in one corner of the chamber, were absolutely fresh. Another older chamber containing decomposed spikes was found further down. This suggests that the chambers and consequently also the mound had been in use for several years.

Mound no. 2 was situated on a low slope overgrown by bushes and trees (Fig. 2), at a distance of ca. 50 m (by line) from mound no. 1. This mound was 90 cm long, 100 cm wide and had a maximum depth of 30 cm. Its surface was also covered by soil containing small limestone stones (up to 2.5 cm in diameter). On 17 October in the evening, we opened the mound surface on a plot ca. 15 cm in diameter, and at a depth of 7 cm found the ceiling of store chamber. Again, the next morning we found the mound surface perfectly repaired. We then excavated the entire mound profile (Fig. 4). Under the ca. 7 cm thick layer of soil, the whole mound was composed of small dry twigs (between ca. 2 and 8 cm long), undoubtely originating from neighbouring trees and bushes. There were also numerous limestone stones (up to 4 cm in diameter). There was a single store chamber containing ca. 3 litres of maize seeds and pieces of maize cobs, and ca. 1 litre of spikes of Bermuda grass *Cynodon dactylon*. Bits of maize cobs and individual seeds were plentiful in the freshly harvested field and mice were even able to transport 4 cm long cob pieces.

We do not know how many mice inhabited the mounds. We captured only one young female (weight 11 g) and one adult female (19 g, reproduced) in mound nos. 1 and 2, respectively. However, as the surfaces of the mounds which we destroyed in the evening were excellently repaired during the night, we suppose that there were several other individuals. It is of interest

Fig. 1. The harvested maize field. On the right side is the eastern balk where mound no. 1 was found. The arrow indicates location of the mound.
Obr. 1. Sklizené kukuřičné pole, vpravo je východní mez kde byl nalezen kurgančik č. 1, jeho umístění je označeno šipkou.

Fig. 2. The southern field balk. The live-trap was placed on the upper margin of mound no. 2.
Obr. 2. Jižní mez, živochytná past je umístěna na horní hraně kurgančiku č. 2.

Fig. 3. Mound no. 1 was well hidden in the vegetation. The closer live-trap is located at the proximal margin, while the more distant live-trap is on the surface; a tree is growing through its top.
Obr. 3. Kurgančik č. 1 byl zcela ukryt ve vegetaci. Bližší živochytka označuje jeho bližší okraj, vzdálenější leží na jeho povrchu, vrcholem kurgančiku prorůstá strom.

Fig. 4. A cross-section through mound no 2. The chamber in the central part contains mostly seeds and pieces of maize cobs. The live-trap placed on the upper margin of the mound is 21 cm long.
Obr. 4. Detail průřezu kurgančikem č. 2. Uprostřed je zásobárna obsahující hlavně semena a kusy palic kukuřice. Živochytka umístěná na horní hraně kurgančiku je dlouhá 21 cm.

that mice were able transport pieces of limestone ca. 3 cm in diameter to the top of mound no. 1 during that night.

The species identification of both mice was verified by molecular analysis (Macholán et al. 2007), the specimens are deposited in collections of the Department of Zoology, Charles University, Prague (Nos BG-4653, 4657).

These observations document that even in lowlands of western Greece where winters are fairly mild, steppe mice retain their specific behaviour of making mounds containing winter food stores. Therefore, the presence of such mounds could be very helpful in mapping the distributional area of the steppe mouse in Greece, where it is most probably parapatric with another aboriginal mouse, *Mus macedonicus*. However, it is necessary to consider that in contrast to Central and Eastern Europe, where mounds are found in open fields and therefore easily visible (e.g., Sokolov et al. 1990, Unterholzner et al. 2000, Krištofík & Danko 2003), in Greece they can be well hidden in vegetation.

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SOUHRN

Myš panonská (*Mus spicilegus* Petényi, 1882), která obývá především agrocenozy a zbytky původních stepí jihovýchodní Evropy (od Rakouska a Srbska až po jihozápad Ruska) byla v poslední době zjištěna také na jihozápadě Balkánského poloostrova. Zatím zde byla nalezena jen na několika lokalitách v přímořských nížinách Černé Hory, Albánie a Řecka (Petrov 1992, Macholán & Vohralík 1997, Kryštufek & Macholán 1998, Macholán et al. 2007). Je zřejmé, že tyto populace jsou geograficky isolovány od hlavního areálu rozšíření druhu. Charakteristickým projevem myši panonské je budování nápadných nadzemních zásobáren semen, tzv. kurgančiků, které mohou dosahovat až průměru 2 m a výšky 70 cm a staví je většinou skupina 2–11 myší (Mikeš 1971). Předložená práce dokumentuje první nález dvou takových kurgančiků na území Řecka. Byly nalezeny 18. října 2001 u obce Vlaherna, distr. Arta, nadm. výška 20 m, ukryté v husté vegetaci na mezích malého políčka s kukuřicí. V zásobárnách uvnitř kurgančiků byly nalezeny klasy béru sivého (*Setaria pumila*), trskutu prstnatého (*Cynodon dactylon*) a semena a kusy palic kukuřice (*Zea mays*). Tyto nálezy dokumentují, že i v podmínkách nížin západního Řecka, kde jsou zimy velmi mírné, si myš panonská uchovala svůj charakteristický etologický projev – stavbu kurgančiků obsahujících zimní zásoby.

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