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Preliminary data on the defensive behavior and vocalization of the Lesser blind mole rat, *Nannospalax leucodon* (Nordmann, 1840)

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Abstract. The defensive behavior of two individuals of the Lesser blind mole rat, *Nannospalax* (superspecies) *leucodon* (Nordmann, 1840), was investigated. A characteristic defensive posture and two types of vocalization were recorded: teeth grinding and grunting, expressed by consecutive series of complex harsh calls, consisting of sequences of single very short (1.7 – 2.6 ms) phases (with maximum energy at about 9.8 KHz), accompanied by strong noise component. More research is needed to reveal the full vocal repertoire and behavioral characteristics of the species.

Key words: *Nannospalax leucodon*, Lesser blind mole rat, vocalization, defensive behavior.

Introduction

The Lesser blind mole rat, *Nannospalax* (superspecies) *leucodon* (Nordmann, 1840) is a subterranean rodent species inhabiting open habitats (mostly grasslands and agricultural lands) in Southeast Europe. The species is threatened by habitat loss due to agricultural intensification and urbanization (Kryštufek & Amori 2017). In Bulgaria it is included in the National System for Environmental Monitoring.

Although the blind mole rats are known as strictly subterranean animals, a surface activity caused by a variety of factors, is reported also. However, their narrow specialization to underground lifestyle makes mole rats very vulnerable out of their tunnel systems. They are captured by predators most often during these emergences on the surface. Thus, being small sized and slow moving, mole rats need some kind of defensive strategy when encounter predators above ground. Warning postures and facial expression, as well as vocalizations that are meant to confuse the enemy, are among the most common behavioral responses in cases where the physical features of the animal do not allow escape.

While there are relatively many available data for the vocalization and behaviour of subterranean rodents, including some species of mole rats (mostly *Nannospalax ehrenbergi* (Nehring, 1898), *Fukomys mechowii* (Peters, 1881), *Cryptomys* sp.) (Heth *et al.* 1986; Rado *et al.* 1987; Credner *et al.* 1997; Hrouzková 2012; Bednářová *et al.* 2013; Bednov *et al.* 2013), no information is found about *Nannospalax leucodon*.

The vocalization in subterranean rodents is characterized by low frequencies which are better transmitted by the soil (Credner *et al.* 1997; Rickye *et al.* 1992; Heth *et al.* 1986). Seismic signals resulted from head thumping against the tunnel ceiling are also typical for the mole rats (Heth *et al.* 1987; Rado *et al.* 1987).

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Material and Methods

Two male Lesser blind mole rats (1 adult and 1 subadult) were captured in a sunflower field near Ravno pole village in the vicinity of Sofia, Bulgaria (42.6737 N 23.5221 E, 533 m a. s. l.) in May 2019. The animals were caught by opening the tunnels and blocking the way back after they appeared at the opening. The defensive behavior of the mole rats was observed in the field first and later in the laboratory. It was provoked by stressful situation - removing the animal from the cage and touching its back. Vocalization was recorded by M500 USB Ultrasound Microphone and laptop using BatSound Touch recording program that saves the recordings as 16 bit wav files. The microphone was held at approximately 20–30 cm from the animals. Totally 10 series of grunting sounds were analyzed. The computer analysis was performed using BatSound 3.1 software for Windows. The frequency components of the calls were measured from the Fast Fourie Transform (FFT) power spectrum, size 1024, Hamming window. The main call parameters are considered: total call duration (ms), frequency with the most energy (KHz) and shape of spectrograms.

Results

Both in the field and in the laboratory the disturbance by the observer made the mole rats to take a defensive posture. The animal raised head upward and widely opened its mouth demonstrating its long incisors (Fig. 1). At the same time, it produced warning calls and occasionally gnashed its teeth. All the time it tried to localize the threat and to remain faced with the intruder, but it did not try to escape. When the mole rat was given the opportunity to hide itself in a plastic tube imitating its natural tunnel, the animal preferred to go into it in reverse, remaining all the time facing the “enemy”.

Fig. 1. Defensive posture of the Lesser mole rat, *Nannospalax leucodon* (Nordmann, 1840).

Two types of sounds produced by the threatened mole rats were recorded: grunting and teeth grinding. The grunting was expressed by consecutive series of complex harsh calls, consisting of sequences of single very short (1.7 – 2.6 ms) phases (with maximum energy at about 9.8 KHz), accompanied by strong noise component (from 2 – 3 KHz and dying to 50 KHz). The number of separate phases of the calls varies between 18 and 25 (Fig. 2 and 3).

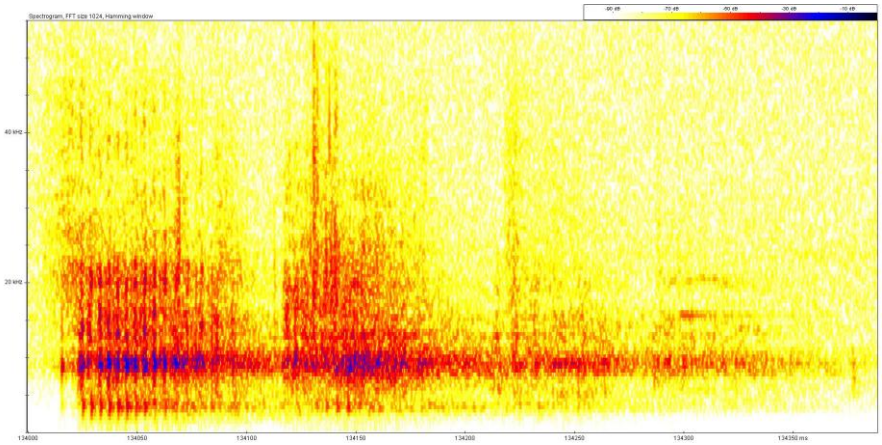

Fig 2. Harsh calls consisting of sequences of single very short phases.

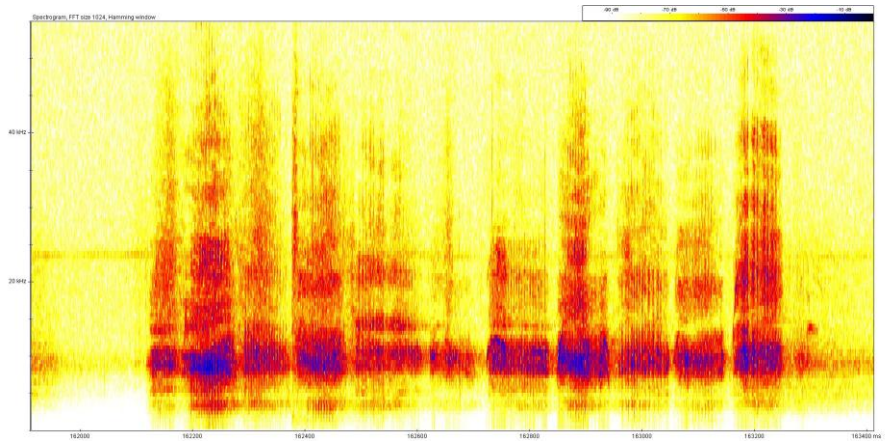

Fig 3. Consecutive series of 10 harsh calls.

Discussion

The observed posture in response to disturbance by the researcher may be associated with defensive anti-predator behavior. Perhaps it could be observed also during intraspecific agonistic interactions. The mole rat's refusal to enter the tube head-on could be explained by its vulnerability to such a situation - it can defend itself from attack only through its large incisors. So, returning to the tunnel backwards is probably inborn behavior in mole rats. When out of their burrows, escape is not a solution - the animal is too slow to have a chance to save itself.

Although previous studies show that teeth grinding is a typical mechanically produced sound in subterranean rodents, this sound hasn't been reported for *N. leucodon* so far. In mole rats' teeth grinding is associated with aggressive behaviour (as in the present study), but interestingly, this sound is more often produced while the animals are resting and sleeping (Credner *et al.* 1997; Bednářová *et al.* 2013).

Individual, age, sex, population, and geographical differences in the vocalization of *Nannospalax leucodon* could be expected in view of the fact that some kind of variability has been observed in other mole rat species. For example, different vocal dialects are reported for the chromosomal species of *Nannospalax ehrenbergi* superspecies (Nevo *et al.* 1987). Dvorakova *et al.* (2017) found individual differences in mating calls of Mashona mole rat - *Fukomys darlingi* (Thomas, 1895).

Some researches reveal comparatively rich repertoire of vocalisation in rodent species (Simeonovska-Nikolova & Dekov 2013; Credner *et al.* 1997; Bednářová *et al.* 2013).

In our study the individuals from *N. leucodon* superspecies demonstrated uniform and slightly variable sounds accompanying their defensive behavior. Recorded sounds certainly do not deplete the set of acoustic communication signals, produced by the Lesser blind mole rat. In-depth researches on a large number of individuals from different localities are needed to shed light on the complete repertoire of this species, its variability and the significance of individual sounds in the intra-species and between species communication.

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