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EFFECTS OF OPEN MEADOW AND COMPLEX ANTHROPOGENIC HABITATS ON ALARM COMMUNICATION IN TWO POPULATIONS OF SPECKLED GROUND SQUIRRELS *SPERMOPHILUS SVSLICUS*

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The alarm call structure in ground squirrels is strongly affected by geographical (Nicol'skii, Rumyantsev 2004, Zool. Zhurnal, 83:1008-1017; Nicol'skii et al. 2007, Zool. Zhurnal, 86:1379-1388), and environmental factors (Rabin et al. 2006, Biol. Cons., 131:410-420). In hibernating ground squirrels, geographically separated populations may differ by dates of emergency from hibernation and durations of a breeding season, aboveground activity and hibernation. Additionally, environmental effects, such as complex relief, human disturbance and anthropogenic noise, may affect anti-predatory behaviour including alarm communication. We compared the alarm call structures between two populations of speckled ground squirrels, located 540 km apart on the axis north-south. The Zarajsk population is northernmost population in the border of the species area, inhabiting open meadow floodable grasslands in Moscow region. The Lipetsk population is located in steppe habitats near Lipetsk city, close to a highway, in strongly complicated anthropogenic landscape, very often visited by people. We analyzed alarm calls of 52 adult (26 male, 26 female) speckled ground squirrels from Zarajsk and 48 (27 male, 21 female) speckled ground squirrels from Lipetsk, 10 alarm call notes per animal. Recordings were made within a month after emergence from hibernation, from animals captured in live-traps and calling toward approach of surrogate predator (human). The maximum fundamental frequency of alarm calls of Zarajsk ground squirrels was much higher compared to those of Lipetsk ground squirrels, both in males (9.7 ± 0.6 vs 8.3 ± 0.5 kHz, $t=9.53$, $p<0.001$), and in females (9.4 ± 0.8 vs 8.4 ± 0.6 kHz). The alarm call duration did not differ in males (0.23 ± 0.06 vs 0.22 ± 0.03 s, $t=0.86$, $p=0.39$, $t=4.73$, $p<0.001$) and was significantly higher in females in Zarajsk than in Lipetsk (0.26 ± 0.05 vs 0.21 ± 0.04 s, $t=3.48$, $p=0.001$). However, encoding individual and sexual identity was very similar between the populations. Discriminant function analysis, conducted on the base of 8 acoustic variables showed 67.9% correct classification to sex for the Zarajsk population and 65.8% correct classification to sex for the Lipetsk population ($\chi^2=0.39$, $p=0.53$). Also, the values of correct classification to individual did not differ for the Zarajsk and Lipetsk populations, as separately for males (79.8% vs 84.8%, $\chi^2=1.97$, $p=0.16$) or females (89.1% vs 89.5%, $\chi^2=0$, $p=0.99$), and for the pooled sample of two sexes (79.2% vs 81.0%, $\chi^2=0.43$, $p=0.51$). Thus, in spite of substantial differences in the environmental conditions and strong differences in the values of fundamental frequency of alarm calls, the potential to encoding individual and sex identity was undistinguishable in the two geographically remote populations of speckled ground squirrels. At the same time, among different species of ground-dwelling sciurids, the ratios of individual and sex differences in the alarm call structure are well-expressed (Matrosova et al. in press). Probable, that the ratio of individual- and sex-related variation in alarm call structure represents sustainable species-specific characteristic at least for the given species of ground-dwelling sciurids, the speckled ground squirrel.

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