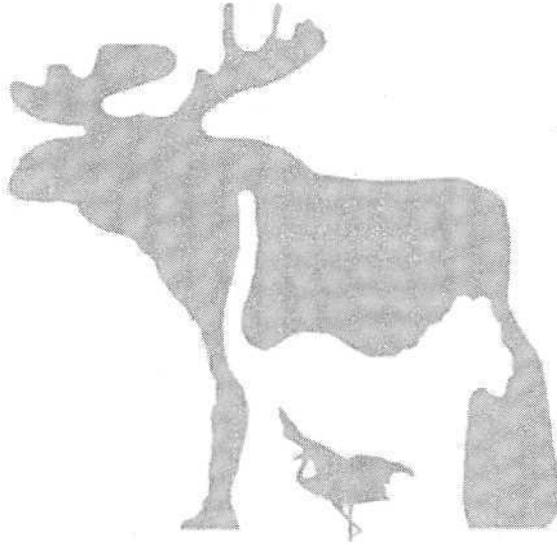


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individuality was moderately expressed in both oral and nasal calls. In contrast, in hinds individuality was significantly higher in the oral than in the nasal calls. Thus, in calves, the nasal and oral calls differed by their acoustic structure, but not by the degree of individualization; whereas, the hind nasal and oral calls did differ by the degree of individualization, but not by their acoustic structure. Previously, we reported more individualistic oral calls compared to nasal calls also in goitred gazelle calves. To estimate between-year stability of individual acoustic differences of June hind nasal calls, we made DFA crossvalidation of calls recorded in June 2012 with discriminant functions created with calls recorded in June 2011. The value of correct classification decreased twice, pointing to very poor between-year stability of individual characteristics of hind nasal calls. These results suggest that acoustic cues to communication to mother-calf communication in Iberian red deer arise anew each year.

Key words: call structure, farm deer, ontogenesis, social behaviour, vocalization

D54 Vocal variation from bass to soprano in red deer *Cervus elaphus*

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This talk integrates acoustic variation among subspecies of red deer, with involvement of own data on Iberian and Siberian subspecies. The red deer (*Cervuselaphus*) is the species with broad distribution over Eurasia and North America, displaying a strong variation in the structure of stag rutting calls. The species *Cervuselaphus* has originated from Tarim Basin in Middle Asia approximately 2 million years ago and then distributed in two opposite directions, to the East and to the West. The Eastern branch went over Tian-Shan and Altai to China, Siberia and North America. The Western branch went over Caucasus and Carpathes to Western Europe. The Western stags produce low-frequency roars, ranging in their maximum fundamental frequency (f₀) from 52 Hz to 223 Hz between subspecies. The Eastern stags produce high-frequency bugles, with the maximum f₀ ranging from 1230 to 2080 Hz between subspecies, what is



10 times higher than in Western stags. At the same time, the presumable ancestral pattern of rutting calls, found in modern Bactrian subspecies in Central Asia, contains the two frequencies, the high and the low, emitted simultaneously. The explaining evolutionary hypothesis suggests that the deer that migrated to the West lost their high frequency, whereas the deer that migrated to the East, lost their low frequency. We found that f_0 of contact calls of hinds matches the f_0 of rutting calls of their stags within subspecies. This is a challenge to the hypothesis, claiming that the acoustics of stag rutting calls are under strict sexual selection, as in this case, the acoustics of the opposite sex are also affected. In addition, we found that in the Iberian subspecies, hind calls were lower than stag calls, what is against to the common rule for mammals, declaring the lower-frequency calls for males, primarily due to their larger sizes and effects of testosterone on male vocal folds. Consistently, the positive relation was found between f_0 of their roars and body size for most subspecies. Among Western subspecies, the lowest f_0 is found in the smallest Corsican and Barbarian subspecies. In Western European red deer, roaring patterns differ even between subspecies belonging to the same haplotype of mDNK. Surprisingly, that these substantial differences in roar acoustics could evolve during very short evolutionary time of 12 thousand years, as all these subspecies radiated from the same refugium after the last European Ice Ages. Thus, red deer vocalizations represent a natural experiment on effects of geographical radiation and sexual selection on evolution of communicative behaviour. However, the driving forces of this great acoustic variation remain unclear to date. For revealing the factors and mechanisms, responsible for the prominent and rapid acoustic variation within *Cervuselaphus*, more data are necessary, primarily on the acoustic variation among sex and age classes of Asian subspecies of red deer.

Key words: acoustic communication, call patterns, rutting calls, stag and hind calls

D19 Daytime movements of red deer disturbed by human activity

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We compared the daytime activity patterns of red deer in two different areas. One