



VI WORLD CONGRESS
OF DEER BREEDERS

VI ВСЕМИРНЫЙ КОНГРЕСС
МАРАЛОВОДОВ



PharmBiMed
Новое поколение качества

consumers in affluent urbanised export markets are increasingly vigilant about humane treatment of animals utilised for human benefit.

Deerwelfare legislation varies between and sometimes within countries. It ranges from detailed and prescriptive (e.g. New Zealand), actively or passively permissive (many countries e.g. Australia, Canada, Sth. Korea, Taiwan), to restrictive, allowing farming but prohibiting velvet antler removal (e.g. UK, Ireland, Europe). Some countries (and states within countries e.g. USA), even prohibit deer farming. Others as yet have no deer-specific legislation or broader legislation dedicated to animal welfare (e.g. Kazakhstan). There is, however, a growing awareness in the latter countries of the need for consideration of animal welfare legislation (e.g. China where legislation is being drafted). Some deer industries have developed specific deer welfare codes under animal welfare legislation e.g. New Zealand which has a comprehensive Deer Welfare Code and codes of practice for procedures such as deer transport, velvet antler removal and slaughter. Others, such as Australia and Canada have pro-actively developed industry-agreed welfare standards for deer farming and some specific practices in the absence of specific legislative requirements.

A large number of deer farming practices potentially affect deer wellbeing, some being specific to deer, given their unique biology, behaviour and product harvesting (velvet antler and trophy stags, and potentially musk). Deer welfare issues include confinement, feeding and nutrition, health, provision of shelter and shade, transport, slaughter, velvet antler removal, handling and restraint (including the use of drugs), design of facilities, reproductive technologies (artificial insemination and embryo transfer) and weaning. Experience shows that all of these potential concerns can be adequately addressed through appropriate environment, management and technical procedures. As demonstrated in other animal industries, producers who meet optimum standards for animal wellbeing reap the benefits of optimum animal and economic performance, since wellbeing and productivity are integrally linked.

This paper will briefly address the main issues surrounding deer welfare internationally. It will discuss, in more detail, means for achievement of animal wellbeing in the practical management areas above within the accepted welfare domains. It will also focus on the series of animal welfare initiatives within the New Zealand deer industry as an example of what is regarded in that country as best practice. These examples could assist others developing deer welfare initiatives at industry and/or legislative levels.

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Age and individuality in nasal and oral calls of mother and calf Iberian red deer

Acoustic communication channel is among most important for establishing and supporting the relationship between mother and offspring in ungulates. Individual-specific call features that are based on variations of their acoustic structure enable mother-young recognition in a herd. While vocal variation is thoroughly investigated in Iberian red deer stags *Cervus elaphus hispanicus*, the Iberian mother and young calls were studied only on a limited sample of individually unidentified calls. This study conducted at June of 2011-2012 at the experimental farm of University of Castilla-La Mancha (Albacete, Spain). Examines a sample of 1235 individually identified contact calls, recorded from 28 mother and 31 calf Iberian red deer. Both hinds and calves produced calls through the mouth and through the nose. No significant effect of sex was revealed on the acoustic variables. For calves, a comparison of variables of oral and nasal calls with repeated-measure ANOVA revealed that the maximum fundamental frequency, peak frequency and power quartiles of oral calls were significantly higher compared to those of nasal calls. Duration was longer in oral calls. For hinds, the maximum fundamental frequencies and durations were undistinguishable between oral and nasal calls. Earlier, we showed for mother and young saiga antelope (*Saiga tatarica*) and for calves of goitred gazelles (*Gazella subgutturosa*) that the fundamental frequency of the oral calls is higher than those for the nasal calls, what contrasts with obtained with the current data on hinds of Iberian red deer. Analysis of vocal individuality has been conducted with 5 to 10 oral and nasal calls per individual included into discriminant function analysis (DFA). In calves, individuality was moderately expressed in both oral and nasal calls. Contrastingly, 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 hind nasal and oral calls did differ by the degree of individualization, but not by their acoustic structure. Previously, we found 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 cross-validation 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 from mother-calf communication in Iberian red deer arise anew each year.

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Признаки возраста и индивидуальности в ротовых и носовых звуках самок и детенышей испанского благородного оленя

Канал акустической коммуникации - один из наиболее важных для установления и поддержания связи между матерью и детенышем у копытных. Индивидуальные особенности в звуках, основанные на изменчивости их акустической структуры обеспечивают распознавание мать-детеныш. В то время как изменчивость звуков у самцов испанского подвида благородного оленя *Cervuselaphushispanicus* хорошо исследована (Freuetal., 2012), крики самок и детенышей были изучены до настоящего времени только на небольшой выборке неизвестной индивидуальной принадлежности (Volodinetal., 2014a). Это исследование проведено в июне 2011 и 2012 гг на экспериментальной оленьей ферме университета Кастилья Ла-Манча в г. Альбасете (Испания). Было измерено 1235 криков с известной индивидуальной принадлежностью, записанных от 28 самок и 31 детеныша испанского благородного оленя. Как самки, так и детеныши издавали звуки как через рот, так и через нос. Пол детенышей не оказывал достоверного влияния на структуру звуков. Для детенышей сравнение параметров носовых и ротовых звуков с помощью дисперсионного анализа повторных измерений показало, что максимальная основная частота, пиковая частота и энергетические квартили ротовых звуков были достоверно выше по сравнению с этими параметрами в носовых звуках. Ротовые звуки были длиннее носовых. Для самок максимальные основные частоты и

длительности были неразличимыми между ротовыми и носовыми звуками. Ранее мы показали для самок и детенышей сайгака (*Saigatararica*) и для детенышей джейрана (*Gazellasubgutturosa*), что основная частота ротовых звуков выше, чем в носовых (Volodinetal., 2011, 2014b), что противоречит полученным в этом исследовании данным для самок благородного оленя. Анализ индивидуальности в звуках был проведен на выборке, включающей от 5 до 10 ротовых и носовых звуков на особь, включенных в дискриминантный анализ. У детенышей индивидуальность была умеренно выражена как ротовых, так и в носовых звуках. Напротив, у самок индивидуальность была достоверно выше в ротовых, чем в носовых звуках. Таким образом, у детенышей носовые и ротовые звуки различались по своей акустической структуре, но не по степени индивидуализации, в то время как у самок ротовые и носовые звуки различались по степени индивидуализации, но не по своей акустической структуре. Ранее мы обнаружили, что индивидуальность была более выражена в ротовых звуках по сравнению с носовыми также и у детенышей джейрана (Volodinetal., 2011). Для того чтобы оценить стабильность индивидуальных акустических различий между годами в контактных звуках одних и тех же взрослых самок, мы провели кроссвалидационный дискриминантный анализ звуков, записанных в июне 2012 г с помощью дискриминантных функций, рассчитанных по звукам, записанным в июне 2011 г. Величина корректной классификации к особи снизилась вдвое, что указывает на очень низкую стабильность индивидуальных характеристик носовых звуков самок между годами. Эти результаты свидетельствуют о том, что акустические ключи, обеспечивающие взаимное распознавание в коммуникации мать-детеныш у испанского благородного оленя, возникают каждый год заново.

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Список литературы

Frey R, Volodina I., Volodina E, Carranza J., Torres-Porras J., 2012. Vocal anatomy, tongue protrusion behaviour and the acoustics of rutting roars in free-ranging Iberian red deer stags (*Cervus elaphus hispanicus*) // *J. Anat.*, V. 220. P. 271-292

Volodina I. A., Lapshina E. N., Volodina E. V., Frey R., Soldatova N. V., 2011. Nasal and oral calls in juvenile goatred gazelles (*Gazella subgutturosa*) and their potential to encode sex and identity // *Biology*, V. 117. P. 294-308

Volodina I., Matrosova V., Volodina E., Garcia A.J., Gallego L., Márquez R., Lusia D., Beltrán J.F., Landete-Castillejos T., 2014a. Sex and age class differences in calls of Iberian red deer during rut: reversed sexual dimorphism of pitch and contrasting roars from farmed and wild stags // *Acta Ethol.*, DOI 10.1007/s10211-013-0179-8

Volodina I. A., Sibiryakova O. V., Kokshunova L. E., Frey R., Volodina E. V., 2014b. Nasal and oral calls in mother and young trunk-nosed saiga antelope, *Saiga tatarica* // *Bioacoustics*, V. 23. P. 79-98

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Evolution of calls in European and Asian red deer: from bass to soprano

The red deer *Cervus elaphus* is the species with broad distribution over Eurasia and North America, displaying a strong variation in the structure of stag rutting calls. The species *Cervus elaphus* 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 from 52 Hz to 223 Hz between subspecies. The Eastern stags produce high-frequency bugles, with the maximum fundamental frequency 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 fundamental frequency of contact calls of hinds matches the fundamental frequency 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 fundamental frequency of their roars and body size for most subspecies. Among Western subspecies, the lowest fundamental frequency 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 mtDNA. 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 *Cervus elaphus*, more data are necessary, primarily on the acoustic variation among sex and age classes of Asian subspecies of red deer.

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