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BEHAVIOUR PATTERN OF ROE DEER AT FEEDING PLACES REVEALED BY CAMERA-TRAPPING IN THE HUNGARIAN GREAT PLAIN

Gergely Tóth[1,2,3*], Natania Ferreira De Souza[3], Krisztián Katona[3]

[1]Doctoral School of Animal Biotechnology and Animal Science, Hungarian University of Agriculture and Life Sciences, Gödöllő, HUNGARY
[2]Ministry of Agriculture, Department of Game Management, Budapest, HUNGARY
[3]Hungarian University of Agriculture and Life Sciences, Institute for Wildlife Management and Nature Conservation, Gödöllő, HUNGARY

[*]corresponding author: tothgergely0148@gmail.com

Abstract: In the Hungarian Great Plain the roe deer (*Capreolus capreolus*) is one of the most important species for wildlife management. The supplementary feeding of roe deer in Hungary is a traditional habit, it can be beneficial for deer to survive and keep body condition during winter. In our study, we aimed to know the behavioural habits of roe deer at feeding places. The data were collected in two wildlife management units in Jász-Nagykun-Szolnok county in Hungary from the winter of 2019 until the spring of 2020. Roe deer followed a temporal trend, with higher numbers around feeders in colder months and lower numbers in warmer months. Their visits followed a bimodal activity pattern that was characterized by peaks of activity at dawn and dusk. We were able to link the presence of snow cover and precipitation to an increase in the feeding activity of roe deer. It is important to understand that the presence of deer at the feeder does not reflect the actual biological effect of the use of feeders on deer. Game managers should identify what the main goal of the feeding is and think of how to validate the effectiveness of this expensive intervention. We suggest at least measuring how much of the supplemented feed actually makes up the diet of roe deer individuals. However, it would be the most reliable approach to analyse the physiological and biological differences between fed and non-fed deer.

Keywords: Cervidae, daily activity, game management, supplementary feeding, remote sensing camera.

1. Introduction

Winter feeding of wild and free-ranging animals can be implemented for a range of reasons but overall is mostly associated with maintaining high densities of animals for hunting and improving trophy quality. The intensive feeding can also have negative effects e.g. transmission of diseases among animals, feed contamination in case of improper placement (on the ground), stress (Putman & Staines, 2004).

In most of Europe, roe deer (*Capreolus capreolus*) is a species with great economic and cultural value as they can be harvested for meat production and used for sport hunting, as well as an ecological value as they are part of European biodiversity (Burbaitė and Csányi, 2009). In the Great Plain, which includes the central and eastern part of Hungary, roe deer is the most important and numerous big game species (Csányi and Lehoczki, 2010).

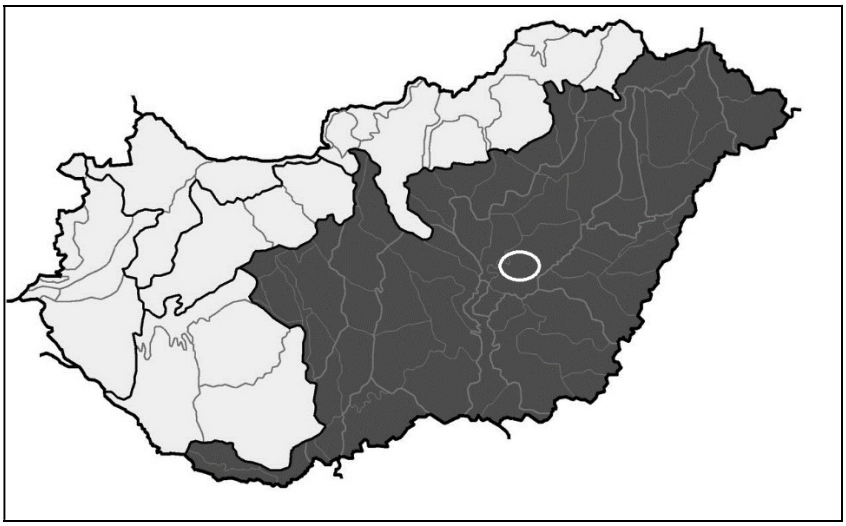
The supplementary feeding of roe deer in Hungary is a traditional habit, however, there are few evidences of its effectiveness. In our study, we were not able to determine the consequences of the feeding program on roe deer survival, reproduction or antler quality, either. But using camera traps, which is a reliable and minimally invasive technique to provide the visual opportunity of surveying wildlife with little effort (Caravaggi et al. 2017, Murray et al. 2021), we were able to describe the intensity of using feeding places by roe deer. We analysed their monthly and daily activity at the feeding places and the relationships between visits and snow conditions during the autumn-winter period.

2. Materials and methods

2.1. Study area

The two areas involved, *Határvölgyi* and *Robinia* wildlife management units are located in the middle of the Hungarian Great Plain in Hungary (*Figure 1*). On the Határvölgyi study area the estimated roe deer population is 800 individuals, they harvested 93 individual. On the Robinia study area we estimated 600 individuals and they harvested 100 individuals. Corn and oats were placed in both feeders.

Figure 1: Location of Hungarian Great Plain (black) and study areas (white circle) in Hungary



2.2. Camera trap and data processing

The camera trap data were collected in the *Határvölgyi* unit from November 18, 2019, until March 13, 2020, generating 13008 pictures in total. In the *Robinia* location, data were collected from September 10, 2019, until March 25, 2020, for a total of 5550 pictures. One feeding place was under survey in both areas. The

camera model used was a high-quality UOVision Wireless Scouting Camera UM785-4G Cloud. The pictures were taken by motion detection and they were downloaded every 1 or 2 weeks. The pictures collected were imported and processed using the Timelapse software (Greenberg & Godin, 2012). The datasheet templates were created to count the individuals in different categories (adult: female (doe) or male (buck), separately, young (fawn), and unidentified roe deer) on the photos. Snowing and snow cover was also registered for each picture.

2.3. Data analysis

The exported CSV files containing the database of the analysed photos in Timelapse were processed using Microsoft Excel (2016). The number of photos on which the individuals of different roe deer categories were identified were summed for each hour and day and then compared within daily hours and between months. This kind of variable is a better indicator for the total time spent at the feeder by roe deer and describing the activity pattern than the number of individuals on the photos due to the repeated appearance of the same individuals on the pictures of the same visit.

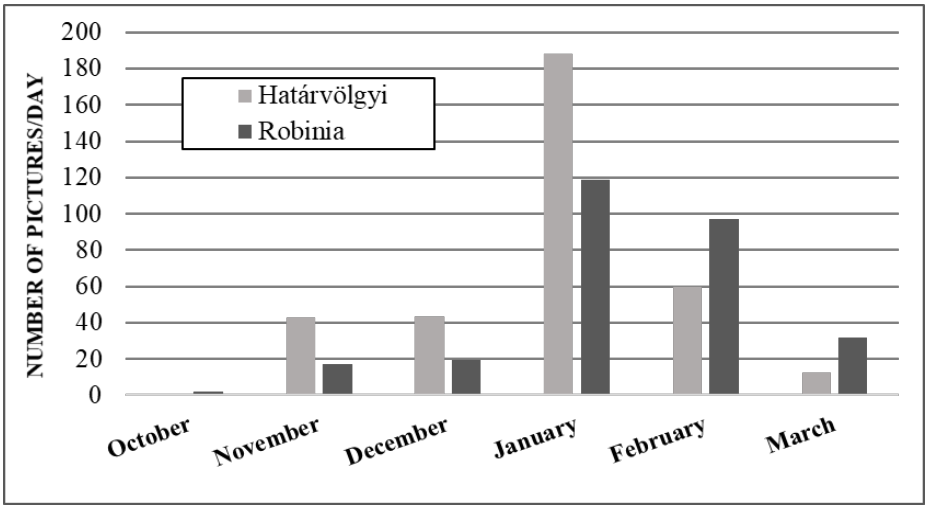
We performed a Spearman correlation analysis between the monthly proportion of snowy days and the number of daily pictures taken of roe deer at the feeder using Jamovi 2.3.21. software.

3. Results

3.1. Monthly activity pattern of roe deer

The roe deer activity in both study areas was the highest in January, which was the coldest month of the year (*Figure 2*).

Figure 2: Roe deer appearance at the feeding places by months in two study areas



3.2. Daily activity pattern of roe deer

It can be seen that there were two major peaks in the daily activity rhythm of the roe deer visits. In both study areas the first peak occurred between 6:00 and 8:00 a.m.; and the second one between 4:00 and 6:00 p.m. (*Figure 3 and 4*). During the day, there was an activity break between 10:00 a.m. and 14:00 p.m., meanwhile, the visits became more frequent during the dark periods. The activity pattern for both sexes was the same in both areas.

Figure 3: Daily activity at the feeding places in the *Határvölgyi* area

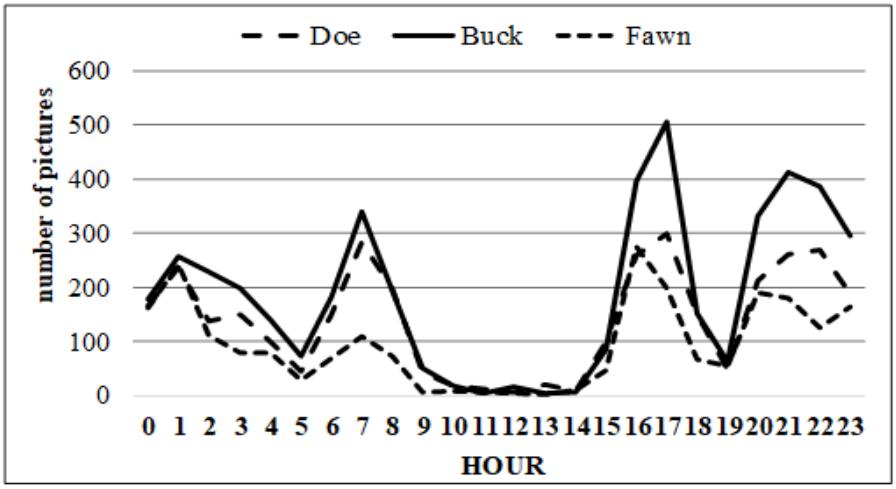
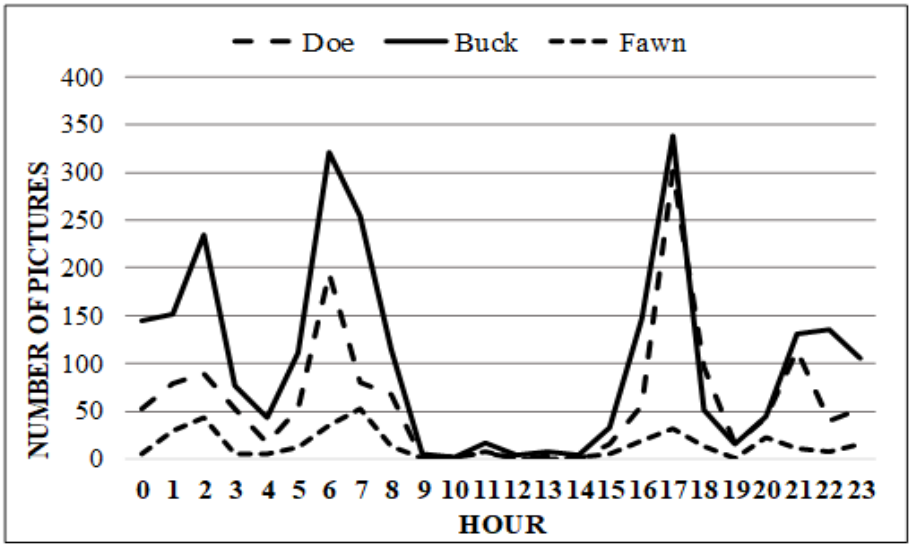


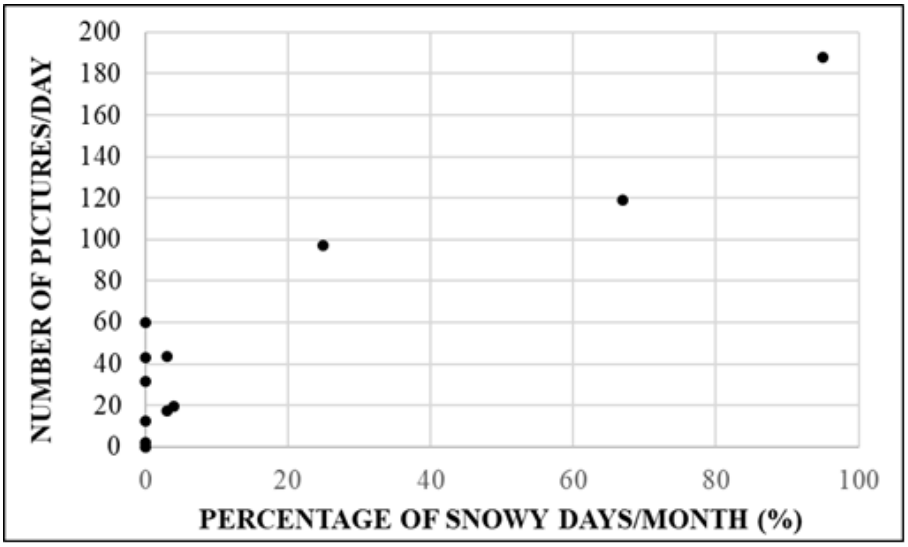
Figure 4: Daily activity at the feeding places in the *Robinia* area



3.3. Impact of snowy days on roe deer visits

The relationship between the monthly proportion of snowy days in a month and the daily appearance (number of pictures) of roe deer at the feeder was strong (Spearman correlation combining the data of the two areas: N=12; r=0.68; p=0.015) (*Figure 5*).

Figure 5: Relationship between the monthly proportion of snowy days and roe deer visits at the feeders.



4. Discussion

The survey of roe deer activity at the feeding stations showed that the use of supplemental feeding is driven by a combination of physiological and environmental constraints. We found the most active period around the feeder to be in the harshest winter period, i.e. in January, and we revealed an impact of snow on increasing intensity of visits, which is according to the general expectations due to natural food scarcity. Previous studies (Ossi et al., 2017; Morellet et al., 2013) have also highlighted the opportunistic use of food by roe deer and their behavioural and ecological plasticity (Ossi et al., 2017), as they move depending on the availability of resources and physiological needs.

In relation to the daily activity pattern of roe deer, the data showed that roe deer made use of the provided resources following their circadian clock. The typical activity pattern expected of roe deer is characterized by peaks of activity at dawn (before sunrise) and dusk (after sunset and just before night). An important characteristic of endogenous circadian rhythms is their capacity to use environmental cues such as light, temperature and food availability (Pagon et al., 2013). In roe deer specifically, the peak of activity during dark hours has been previously associated with avoidance of human activity (Bonnot et al., 2013),

which can also be a reason at the feeding area, where occasional encounters with humans (while adjusting the camera or filling up the feeder) can also happen.

It is important to consider that intensity of deer visits at the feeder does not clearly reflect the biological effects of supplementary feeding. Although for this the most reliable approach would be to analyse the physiological and biological differences between fed and non-fed deer, it is hard to perform. We recommend establishing measurable goals for this intervention and monitoring some related variables aimed to improve this traditional management practice.

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References

Bonnot, N., Morellet, N., Verheyden, H., Cargnelutti, B., Lourtet, B., Klein, F., Hewison, A. M. (2013). Habitat use under predation risk: hunting, roads and human dwellings influence the spatial behaviour of roe deer. European Journal of Wildlife Research, 59(2), 185-193.

Burbaitė, L., & Csányi, S. (2009). Roe deer population and harvest changes in Europe. Estonian Journal of Ecology, 58(3), 169-180.

Caravaggi, A., Banks, P. B., Burton, A. C., Finlay, C. M. V., Haswell, P. M., Hayward, M. W., Rowcliffe, M. J., Wood, M. D. (2017). A review of camera trapping for conservation behaviour research. Remote Sensing in Ecology and Conservation, 3(3), 109-122.

Csányi, S. & Lehoczki, R. (2010). Ungulates and their management in Hungary. Cambridge Univ. Press, pp. 291–318. (chapter in book: European ungulates and their management in the 21st century)

Greenberg, S., & Godin, T. (2012). Timelapse image analysis manual. University of Calgary.

Morellet, N., Bonenfant, C., Börger, L., Ossi, F., Cagnacci, F., Heurich, M., Kjellander, P., Linnell, J.D.C., Nicoloso, S., Sustr, P., Urbano, F., Mysterud, A. (2013). Seasonality, weather and climate affect home range size in roe deer across a wide latitudinal gradient within Europe. Journal of Animal Ecology, 82(6), 1326-1339.

Murray, M.H., Fidino, M., Lehrer, E.W., Simonis, J.L., Magle, S.B.. 2021. A multi-state occupancy model to non-invasively monitor visible signs of wildlife health with camera traps that accounts for image quality. Journal of Animal Ecology, 90(8), 1973-1984.

Ossi, F., Gaillard, J.-M., Hebblewhite, M., Morellet, N., Ranc, N., Sandfort, R., Kroeschel, M., Kjellander, P., Mysterud, A., Linnell, J. D. C., Heurich, M., Soennichsen, L., Sustr, P., Berger, A., Rocca, M., Urbano, F., Cagnacci, F. (2017). Plastic response by a small cervid to supplemental feeding in winter across a wide environmental gradient. Ecosphere, 8(1), e01629.

Pagon, N., Grignolio, S., Pipia, A., Bongi, P., Bertolucci, C., Apollonio, M. (2013). Seasonal variation of activity patterns in roe deer in a temperate forested area. Chronobiology International, 30(6), 772-785.

Putman, R. J., & Staines, B. W. (2004). Supplementary winter feeding of wild red deer *Cervus elaphus* in Europe and North America: justifications, feeding practice and effectiveness. Mammal Review, 34(4), 285-306.