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MONITORING OF UNGULATE IMPACT IN HUNGARIAN FORESTED NATURA 2000 SITES

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ABSTRACT
Ungulates have both, advantageous and disadvantageous effects in forest ecosystems. But predominantly, there is a one-sided negative opinion about their role and impact mainly based on economic damage caused by these game species. However, we should also always consider their ecological role in forested habitats as ecosystem engineers. We, therefore, aimed to establish a nationwide monitoring of ungulate impact assessing forest-ungulate interactions based on a reliable unified methodology. This monitoring includes measurements of understory woody plant supply and tree-trunk availability to and their utilisation by ungulates; moreover the estimation of forest regeneration and intensity of area use by ungulates. First field studies take place on special areas of conservation (SAC) in Mátra Mountains belonging to the Natura 2000 network and covering about 5000 hectares. Various forest stands will be examined along transects with 100 sample points in each SAC area to ensure the representativity of sampling. The collected data will characterize the relationships between the relative ungulate density and food availability to herbivores. In this way, the forest-game interactions can be also described. A new monitoring system based on our elaborated methodology will provide regular data from many parts of the Hungarian forests. The spatial and temporal comparisons of those values help us to understand how different ungulate species contribute to the maintenance of natural processes of our forest ecosystems.

Keywords: forest-game interactions, wild boar rooting, red deer, browsing effect, Hungary

INTRODUCTION

Ungulate species play an essential role in the forest ecosystems. They have effects on other animal and plant species and vegetation dynamics by their presence, activity, different behaviours; mainly by their feeding. Ungulates can regulate the interspecific competition among plants by their selective browsing (KATONA ET AL., 2009). They can spread various type of seeds shaping the forest vegetation structure and composition (GILL AND BEARDALL, 2001). But generally the negative impacts of ungulates (especially deer and wild boar) are emphasised, meanwhile the 'ecosystem engineer' function (SMIT AND PUTMAN, 2011) of these species remains neglected. Game damage as a universal term for negative effects of ungulate game species has a significant prejudicial, emotional content. The forest-game conflict reflects conflicting human interests (REIMOSER, 2001). A more holistic ecological approach on ungulate impact would be necessary to reveal the real role of ungulates in forest ecosystems, their benefits and the causes of the damage (REIMOSER AND PUTMAN, 2011).

In a recent ongoing project financed by Swiss-Hungarian Contribution our task, therefore, is to establish an ungulate impact monitoring system, to elaborate an appropriate and efficient methodology, and collect useful datasets related to forest-ungulate interactions in Hungary (KATONA ET AL., 2013A). First, we always need to identify unequivocally the signs of ungulate presence (tracks, faeces, bed-sites, etc.), and to make a clear statement whether the impact is caused by game or not (KATONA ET AL., 2013B). In most cases it is

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not possible to determine the beneficial or disadvantageous consequences of these impacts by a momentary assessment. Thus, the long-term aim of this monitoring is to separate and evaluate the real negative effects (damage) and unoffending ones; and reveal essential regulatory impacts. Our applied methodology bypasses the economic approach; therefore it is not a game damage assessment. Our collected data not merely represent the extent of game damage, but also give answers how the ungulate species contribute to the long-term conservation of the forest ecosystems. Deeper understanding of the selection of large herbivores from forest supplies leads to better evaluation of the consequences of forest- and wildlife management practices on forest-game interactions.

MATERIAL AND METHOD

The most suitable monitoring method should be standard, repeatable, reliable, cost- and time effective and surveyable. Similar ungulate impact assessment systems (e. g. FRERKER ET AL., 2013; DAYTON AND O'HANRAHAN, 2011) must be studied to synthetize a well-based, comparable, widespread monitoring system of ungulate impact. Sufficient number of reliably measured data should be always collected instead of 'guesstimates'. Nevertheless, measuring the whole study area is uneconomical and often unreal to implement. The best solution is an estimation using only a minimum sample size needed. Accordingly, we can represent one or more attribution of the entire forest area by sampling areas typical to the whole described unit. Spatial diversity, heterogeneity of ungulate impact within the forest area is also very important question, and should be also expressed by mean values and standard deviations of different measured elements of ungulate impact. The accuracy of the estimation method should be adequate to the level of this heterogeneity and should also be tested.

Study areas of monitoring

After the successful methodological tests and elaboration of the sampling procedure in 2013 the field studies will be performed during summer in 2014 and 2015. For the first field application of ungulate impact monitoring method the mountain range of Mátra was designated. This region belongs to the North Hungarian Mountains as a part of the Carpathians. There the following 6 forested Natura 2000 sites (SAC, special areas of conservation) were selected for further investigations:

- Hegyes-hill of Recsk (HUBN20044; 161,5 ha);
- Mátra-North (HUBN20047; 780 ha);
- Világos-hill and Rossz-meadows of Gyöngyöstarján (HUBN20048; 326 ha);
- Mátrabérc – Fallóskút meadows (HUBN20049; 1506 ha);
- Gyöngyöspatai Havasok (HUBN20050; 324 ha);
- Mátra-West (HUBN20051; 1498 ha);
- Additionally the Sár-hill of Gyöngyös nature conservation area (189 ha) is also surveyed.

The monitoring will cover about 5000 hectares in the project. Any monitoring system can only be reliable at nationwide scale if the collected data are representative and reliable at lower scales, as well. The crucial point of this monitoring, therefore, is the optimization of sampling size (SZEMETHY ET AL., 2013). Based on our earlier calculations on minimum sample sizes each designated transect will include at least 100 sampling points; and will represent together the Natura 2000 sites in the proportion of different forest stands available.

Applied methods of ungulate impact monitoring

Since ungulates take effects on the forest ecosystems in many ways, our methodology includes investigations from several different aspects. The monitoring consists of surveys on five greater components:

1. Woody plant food supply to and its utilization by ungulates in the understory
2. Tree sapling density and their utilization by ungulates
3. Tree trunk-availability and utilization by ungulates
4. Wild boar rooting
5. Intensity of area use of ungulates

WHAT AND WHY SHOULD BE MEASURED?

Understory supply and utilization by ungulates

If the available woody food supply in the understory contains diverse range of plants in case of relatively low game density, then ungulates can browse selectively. In this case the preferred plant species will be more intensively browsed; meanwhile several species will be avoided. If the game density becomes higher, less preferred plant species should also be consumed. Consequently, the vegetation will show the clear signs of overutilization. Similarly, when the diverse understory forage is lacking in the area (e.g. because of shrub removal by forest manager), ungulates will have no chance to follow selective feeding strategy. Therefore, game damage in homogeneous forests can raise high, even despite a low ungulate density.

Conducting vegetation surveys we can evaluate the relationship between ungulate pressure and plant food supply. We can decide whether the habitat offers a suitable place to ungulates, and ungulates actually maintain or destroy the habitat. To investigate the actual status of the vegetation, we use a special wooden frame of 50x50x30 cm (height x width x depth). This tool helps us to count the number of all and browsed woody shoots (as “food units” for large herbivores) up to 2m height at all sampling points. Differences in the browsing ratio among different woody species will reflect the selective browsing impact of ungulates. Finally, regulatory or threatening browsing effects on understory species can be evaluated in the light of food diversity.

Additionally, selective browsing impact will be also measured on the main tree species of the habitat. In every sampling point we investigate the browsing on individual saplings. Intensity and predicted importance of ungulate effect on individual tree growth will be described by different categories such as: “unbrowsed”, “only leaders browsed’”, “only the suckers browsed”, “both leaders and suckers browsed”, or ‘deformed’.

Tree trunk-availability and utilization by ungulates

Although ungulates primarily consume the shoots of understory woody plants, occasionally they can peel the bark from the tree trunks, as well. This behaviour is often related to starvation or unsatisfactory food quality. Trunks can also be injured from deer antler rubbing. It can be related to antler cleaning to remove velvet or even to antler casting. But tree trunks can also be injured during rutting season by aggressive attacks against the trunks. The seriousness of debarking can vary widely depending on the extension and the depth of the stripped surface. Injuries coming full circle around the trunk

usually represent the most serious damage, preventing the transport processes in the plant, and giving opportunities to secondary harmful organisms (fungi, insects) to attack the tree.
However, in most cases deciduous and coniferous trees are able to survive such type of ungulate effects. The signs of debarking remain as scars on the bark for a long time. Ungulates select among the trunks of different tree species and they also show various utilization intensities according to the diameter of trunks. Selective debarking, therefore, might be a significant modifying impact both on tree individuals and forest structure.
We will describe the trunk availability and utilization by counting the accessible trunks of all woody species in every sampling point and measuring their trunk diameter. Debarking will be always registered and the causes will be determined (peeling or rubbing). Vertical and horizontal extensions of stripped bark surface will be measured to evaluate the seriousness of the injury. The obtained results will promote the identification of the real effects of debarking to plant growth and forest succession.

Wild boar rooting and intensity of area use of ungulates

The rooting behaviour of wild boar takes many regulatory effects in the forest ecosystems. It alters e.g. the properties of soil and the activity of soil organisms; or it affects directly the growth and survival of seedlings or saplings. The negative economic consequences of rooting are also widely described (e.g. grubbing of gardens and roads). These various effects make the fact clear: rooting has both negative and positive effects on the environment. Presumably wild boar rooting is as substantial function in shaping vegetation structure and dynamics as e.g. the individual growth of plants or the competition between them. We will estimate wild boar rooting (depth and extension), and we will also count the other signs of ungulates (e.g. beds, faeces) at sampling circles to characterize the intensity of their area use and their local impact within the habitat.

CONCLUSIONS

Collected data will be a good basis to characterize the forest-ungulate interactions in Hungarian forests. We will have better insight into the ecological consequences of ungulate effects of different types and intensities on structural and compositional diversity of the different forest habitats. Not only the actual forest conditions will be surveyed, but some simple ungulate regulatory effects will also be revealed; moreover some potential negative game effects can also be forecasted.
Our field guides on the identification of ungulate signs and effects and on ungulate impact monitoring are available to download from the website of our Institute (http://www.vmi.info.hu) or can be requested by e-mail from the authors.

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