

## Influence of tourism activities on mountain hares (*Lepus timidus*) and their consequences

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### Abstract

Winter human outdoor recreational activities are increasing in the European Alps and have a significant impact on wildlife. Wildlife is often disturbed by these activities as they mostly occur in an unpredictable manner, and animals may only have limited possibilities for adaptation. However, the physiological and behavioural reaction to tourism activities in Mountain hares (*Lepus timidus*) is still unknown. In this study, we measured levels of faecal glucocorticoid metabolites (GCM) in Mountain hares in areas that had either no, low, or high tourism activities during winter 2011. Also we compared changes in food intake and behaviour in six captive Mountain hares between experimental stress and non-stress periods. Our results showed that GCM secretion was positively correlated with increased tourism. In order to protect Mountain hares populations, we recommend that managers keep forests inhabited by Mountain hares free from tourism infrastructure and retain undisturbed forest patches within skiing areas.

### Keywords

Faeces, cortisol, non-invasive, stress, touristic

### References to the guiding theme and to protected areas

Wildlife management, Swiss National Parc

### Introduction

In this study, we measured levels of faecal glucocorticoid metabolites (GCM) in free-ranging Mountain hares (*Lepus timidus*) in areas that had either no, low, or high tourism activities during winter 2011 in order to evaluate potential responses to such activities.

### Methods

A non-invasive method was utilized, which enabled an easy sampling in the field (REHNUS et al. 2009). Faecal samples were collected on transects with a total length of 42.9 km along ways of tourist activities (if available) in areas with no, low and high tourist activities. After field collection, all samples were frozen immediately at -22°C until further analysis with an 11-oxoetiocholanolone enzyme immunoassay.

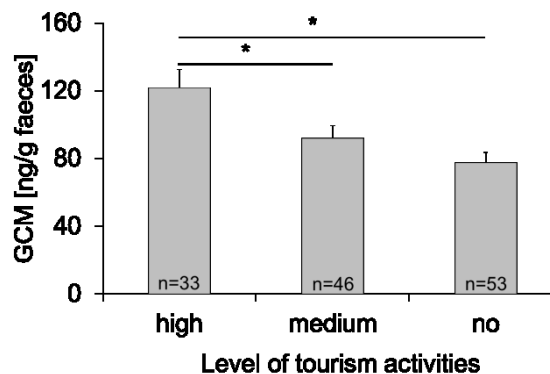


Figure 1: GCM concentration (mean  $\pm$  SE;  $n=132$ ) in areas with different level of tourism activities. The Tukey test showed significantly differences between the area with highest activities to the areas with low ( $t= 2.2364$ ,  $P<0.05$ ) and no tourist activity ( $t= 2.6901$ ,  $P<0.05$ ) on GCM-concentration.

## Results

GCM secretion was positively correlated with increased touristic activities. Highest concentrations of GCM were found in areas with highest tourist activities, followed by those with low and no activities (Fig. 1).

## Conclusion

In our study we investigated the physiological stress reaction of Mountain hares in the Alps on tourist activities for the first time. Therefore, a non-invasive method was applied which delivered reliable information in free-ranging Mountain hares in the wild by measuring GCM. The results indicate that Mountain hares are influenced by such activities. To protect their populations, we recommend that managers keep forests inhabited by Mountain hares free from tourism infrastructure and retain undisturbed forest patches within skiing areas.

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## References

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