

How do Alpine ibex survive winter?

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INTRODUCTION & HYPOTHESIS

Recent studies on red deer (*Cervus elaphus*; Arnold et al. 2004) and Przewalski horses (*Equus ferus przewalskii*; Arnold et al. 2006) identified mechanisms previously unknown to exist in large mammals – nocturnal and seasonal hypometabolism associated with peripheral cooling. These mechanisms contributed significantly to reduced energy expenditure, mainly during winter and spring when ambient temperatures as well as the availability and quality of plant forage are low.

However, these studies were conducted with enclosed individuals in semi-natural environments. To fully reveal the importance and possible magnitude of seasonal changes in energy expenditure, it is therefore necessary to perform long-term studies with free-ranging animals living in extreme habitats. Since seasonal changes and harsh climatic conditions are strongly pronounced in high alpine zones, the Alpine ibex (*Capra ibex ibex*) is an ideal study species. Herewith we are expecting most pronounced physiological acclimatisation in order to cope with the prevailing circumstances.

MATERIAL & METHODS

We are using a self-constructed telemetry system consisting of two units, an internal transmitter to be swallowed by the animal and a repeater system located in a collar. After oral application, transmitters remain in the reticulum and measure heart rate and body temperature. These data are sent to the repeater system where data storage occurs. The collar further contains activity sensors, VHF beacon and GPS receiver. Therefore, we can also generate data on activity budget and habitat use.

The study is conducted in the Alpine ibex colony of Albris, situated in the border region of south-eastern Switzerland and northern Italy. The colony extends over the Engadin, the Spöl, the Bernina and the Veltlin Valleys, covers a total area of 1'100 km² and consists of over 1'000 individuals.

FIRST RESULTS

To test the field performance of the telemetry system and to obtain first data, a seven year old male and a five year old female Alpine ibex were fitted with the devices during winter 2006/2007. We received complete data sets for the whole measurement period for all parameters registered. This confirms the suitability of the telemetry system for the present study. The data demonstrate remarkable changes of the daily activity budget during the preliminary study period in the male with a peak during the (pre-)rutting season in November and December (Fig. 1) and, as expected, enormous fluctuation of body temperature with a corresponding change of heart rate. However, fluctuation of daily activity budget, body temperature and heart rate is less pronounced in the female.

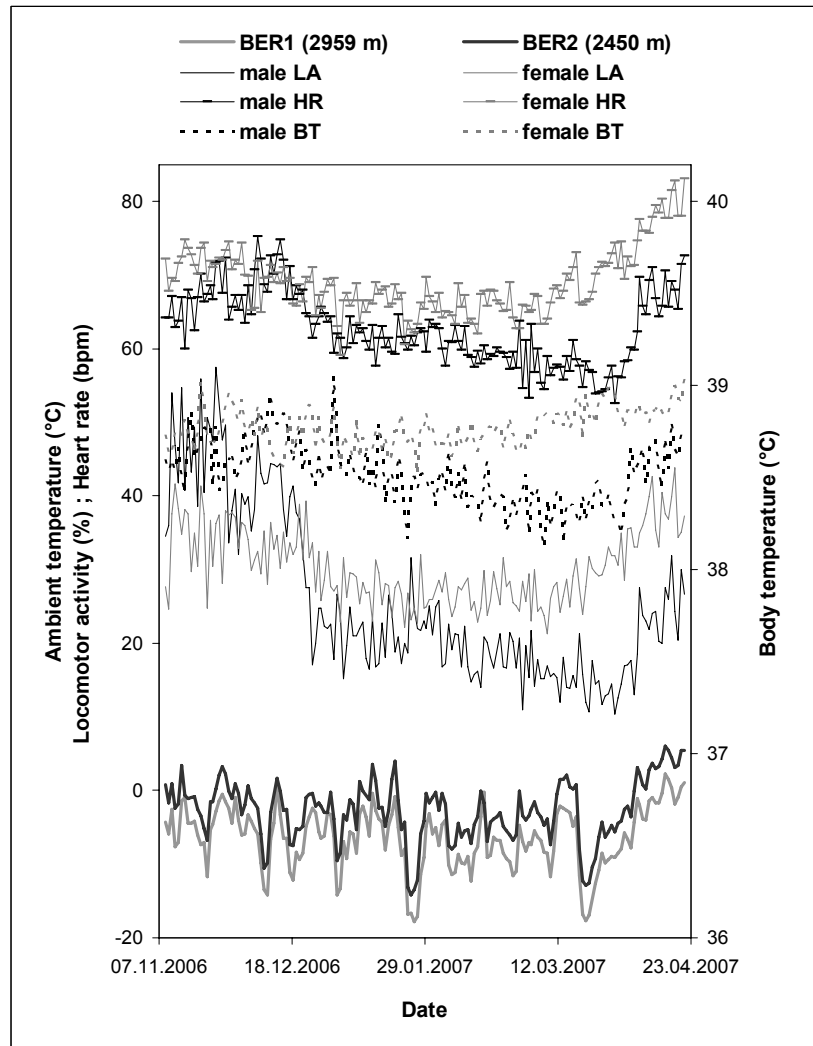


Fig. 1: Mean daily locomotor activity (LA), heart rate (HR) and body temperature (BT) of the two preliminary study animals in relation to the mean daily ambient temperature measured at the weather stations BER1 and BER2. Note the remarkable coincidence of BT peaks and troughs with ambient temperature.

CONCLUSIONS & OUTLOOK

The results from the preliminary study are in line with previous reports of hypometabolism and hypothermia in red deer (Arnold et al. 2004). While equipping further 20 adult ibex of both sexes for two consecutive years, these results let us expect to find such reactions even more pronounced and possibly to the largest extent ever reported for ungulates. Furthermore, analyses according to different groups of animals allow comparisons of different sexes, life history stages and age classes.

REFERENCES

- Arnold, W, et al. (2004), 'Nocturnal hypometabolism as an overwintering strategy', *American Journal of Physiology: Regulatory, Integrative and Comparative Physiology*, 286, R174 -181.
- Arnold, W, et al. (2006), 'Seasonal adjustment of energy budget in a large wild mammal, the Przewalski horse (*Equus ferus przewalskii*): II. Energy expenditure', *Journal of Experimental Biology*, 209, 4566-4573.