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Pattern and rhythm of activity in Alpine chamois (*Rupicapra r. rupicapra*) during winter

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Changes in activity pattern and rhythm may be indicators for negative impacts on an organism, e. g. diseases or external influences (Aschoff 1981; MacArthur et al. 1982; Green and Baer 1990). For this reason we included activity patterns and rhythms in our ongoing research to determine the impact of leisure activities of man on the behaviour of alpine chamois. No studies have yet been performed on this topic. Whereas much information is available on the daily activity of chamois, we have only few evidence of their activity during the night (Boillot 1980).

If activity during the night is part of the behaviour usually shown by chamois, then animals which leave their preferred feeding grounds during daytime because of leisure activities (Schnidrig-Petrig 1994; Ingold et al. 1993) would have restricted possibilities to compensate for reduced feeding time. This could have negative consequences for the animals in winter, when there is a bottleneck in the availability of food.

The aim of this study was to investigate the activity pattern and rhythm of chamois during winter in a region without human leisure activities.

The present study was carried out in the region Augstmatthorn near Interlaken in the Bernese Alps (Switzerland). The area, about 4 km^2, is part of a game reserve. It covers mostly open pastures at an altitude between 1 400 and 2 100 m above sea level. In winter, the steep, sun-exposed slopes are snow free for most of the time. They are inhabited by up to 150 female chamois at this time of the year.

We recorded the activity of seven females and one male chamois in a total of twenty-nine periods of several days (median: 5 days, minimum: 3 days, maximum: 21 days), over a 24 h period from September 1995 to April 1996 and from January to February 1997. The animals were caught with snares and equipped with a radio tracking collar including motion and orientation sensitive sweeps (TXE, Televilt, Sweden). Signals were recorded with a datalogger (RX 900, Televilt), which was installed in the field in a solar-powered electricity station. Each individual was logged continuously for 1 min., then the logger switched to the next one. This resulted in 7 min. of recording time per hour and animal, when all 8 individuals were logged.

We analysed the data after the method worked out by Bächler (pers. comm.). Data were assigned to the categories "activity" (feeding, moving etc.) and "inactivity" (lying). We conducted a fast fourier transformation of the mean value transformed proportions of activity per hour. The results were depicted in periodograms, which plotted magnitudes vs. period lengths of the frequencies found. The magnitude is defined by the sum of the squared parts of the real and the imaginary part of the amplitude. To demonstrate the

daily distribution of activity, we combined the data for the period of 24 hours. Mean values and standard errors were calculated for every hour.

In figure 1 the mean activity over 24 hours and the rhythm of the chamois "Rita" in the period from 31. 1.–7. 2. 1997 are presented as an example. The mean activity shows three peaks, one in the morning, one in the afternoon/evening and a third around midnight. A minimum of activity is found in the early and in the late night. Furthermore, there is a well developed circadian and an eight-hour rhythm. In all observation periods we found rhythms with a period length of 8 hours and in 28 of 29 cases a circadian rhythm, in some cases also other ultradiane rhythms. In all cases, an activity-peak occurred during the night, almost always around midnight. The amplitude of these peaks was mostly lower than those of the two daily peaks. In all cases there were minima of activity in the early and late night.

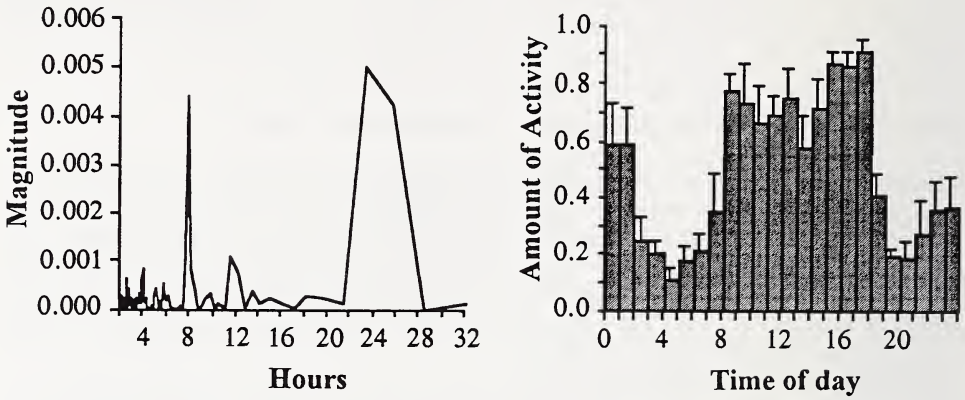

Fig. 1. Rhythm (left-hand side) and pattern of activity of the female chamois "Rita" from 31. 1. to 7. 2. 1997. Rhythms can be recognised as clear peaks. For further explanations, see text.

Although there was some evidence of nocturnal activity of alpine chamois, the regularity of this phenomenon, at least from autumn to spring, is surprising. Simultaneous observations showed that about 75% of activity is feeding. Therefore, we conclude that the results obtained by radio tracking are valid for feeding behaviour also, at least during daylight hours. Whether this proportion of feeding remains at a comparable level during the night remains to be evaluated.

Four of the investigated radio-tracked females were observed on eighteen days during winter 1996/97 from morning to late afternoon. At all times they remained in the open meadows above the treeline. After snowfall they stayed for one or two days at a lower altitude (but still above the treeline) until the snow had disappeared from some places. From morning to late afternoon they only moved over very short distances and remained in a very small area the entire time. The conditions for these animals appear to be ideal: they live in an advantageous winter habitat (open meadows without snow most of the time); they can choose the best places and the best time for feeding since they are not influenced by human activities. Therefore, the activity pattern and rhythm described above seem to represent optimal behaviour for energy balance.

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References

Aschoff, J. (1981): Biological Rhythms. In: Handbook of Behavioural Neurobiology. Vol. 4. Ed. by J. Aschoff. New York: Plenum Press.

Boillot, F. (1980): Différents types de marquages utilisés pour l'étude éco-ethologique du chamois vosgien. Bull. Mens. ONC. **35**, 13–18.

Green, R. A.; Baer, G. D. (1990): Seasonal cycles and daily activity patterns of Rocky Mountain Elk. J. Wildl. Manage. **54**, 272–279.

Ingold, P.; Huber, B.; Neuhaus, P.; Manini, B.; Marbacher, H.; Schnidrig-Petrig, R.; Zeller, R. (1993): Tourismus und Freizeitsport im Alpenraum – ein gravierendes Problem für Wildtiere? Rev. Suisse Zool. **100**, 529–545.

MacArthur, R. A.; Geist, V.; Johnston, R. H. (1982): Cardiac and behavioural responses of mountain sheep to human disturbances. J. Wildl. Manage. **46**, 351–358.

Schnidrig-Petrig, R. (1994): Modern icarus in wildlife habitat: Effects of paragliding on behaviour, habitat use, and body condition of chamois (*Rupicapra r. rupicapra*). Ph.D. Thesis, University of Berne/Switzerland.

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