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II. MITTEILUNGEN – SHORT COMMUNICATIONS

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Activity pattern of European mink *(Mustela lutreola)* in Southwestern Europe

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1 Introduction

Little is known about the ethology of the endangered European mink *(Mustela lutreola)*. Captive individuals are mainly nocturnal (MARAN et al. 1998), although some degree of diurnal activity has also been observed. (PALAZÓN and RUIZ-OLMO, 1997; SIDOROVICH, 1997). So far, the activity pattern of European mink has not been specifically investigated.

The rapid colonisation of the American mink *(M. vison)* is thought to be playing a significant role in the dramatic decrease of the European mink populations (MARAN et al., 1998). As a result, chances of studying the biology of the native species in the absence of American minks are steadily decreasing.

The purpose of this study has been to determine the activity budget and the activity pattern of European mink in an area of their western range in the absence of American minks.

2 Materials and Methods

This study was conducted in the Urdaibai Biosphere Reserve (UBR), Basque Country, Southwestern Europe, a hilly area of 230 km² that encompasses the catchment of the river Oka. The altitude range is 0–900 m, and the climate is oceanic. January and July mean temperatures are 6 °C and 18 °C respectively, and average annual rainfall is 1400 mm. Major landscape units are forests and woodlands [54% of the land surface, mainly plantations of exotic species (*Pinus radiata* and *Eucalyptus globulus*) and holm oak *(Quercus ilex)*], meadows and cultivated fields (29%), estuarine mudflats and saltmarshes (5%), and urban areas (5%) (ARRIETA et al., 1993; ALDAI and ORMAETXEA, 1998). The human population of ca. 44,000 is mainly clustered in the towns of Gernika and Bermeo, each having a population of 18,000.

Animals were live-trapped in single entry cage traps (25 × 25 × 45 cm) placed in stream banks. The distribution of trapping effort was: 877 trap-nights from February to March 1999, 621 trap-nights in September 1999 and 111 trap-nights in January 2000. After immobilisation with Zooletil (Virbac. Carros, France), we collared the trapped minks with radiotransmitters (Biotrack. Dorset, UK).

Hand-held 3-element Yagi antennas and TRX-1000S receivers (Wildlife Materials Inc. Carbondale, USA) were usually deployed on foot. Radiolocations were gathered weekly. Each tracking session lasted from twilight to dawn (12–14 hrs), recording at least one fix per hour. Sporadically, daytime locations were also recorded. Animals were classed as either active or inactive according to the level of variation in strength of the radio signal (KENWARD, 1987). Activity was defined as the proportion of active radiofixes per hour. We considered the mating season to last from February to April (YOUNGMAN, 1982; PALAZÓN and RUIZ-OLMO, 1997).

3 Results

We surveyed 5 males and two females during different periods of variable duration, totalling an entire year of survey and 1211 activity fixes (Table 1).

Overall, animals were active during a significantly larger proportion of the night ($\bar{X}$ = 0.44 ± SD = 0.28, n = 62) than of the day (0.11 + 0.17, n = 38) (Mann-Whitney U = 368, p < 0.001). Such differences where consistent through the mating and non-mating seasons (Table 2, M-W U_{mating} = 39, $U_{non\text{-}mating}$ = 151, p < 0.001). Nocturnal activity of males was higher during the mating than during the non-mating season (M-W U = 113, p < 0.01), while their diurnal activity was not different between seasons (M-W U = 115, p = 0.84).

During the mating season, much of the mink night activity concentrated around midnight although crepuscular activity was also noticeable (Fig. 1). Out of the mating season,

Table 1. **Survey data of radiotracked European mink.**

	Sex	Survey Period	Tracked days	Activity fixes
M1	M	March–May 99	19	45
M2	M	February–April 99	20	45
M3	M	February–October 99	56	360
M5	M	March–August 99	32	225
M6	M	September 99–February 2000	48	433
F1	F	March–May 99	21	45
F3	F	January–March 2000	19	58

Table 2. **Proportion of time European mink was active (mean ± SD). Between brackets the number of individuals surveyed is indicated.**

	Diurnal activity		Nocturnal activity	
	Males	Females*	Males	Females*
Mating	0.13 ± 0.21 (n = 5)	0.27 ± 0.21 (n = 2)	0.62 ± 0.19 (n = 5)	0.44 ± 0.32 (n = 2)
Non mating	0.08 ± 0.13 (n = 4)		0.38 ± 0.26 (n = 4)	

* No data or small sample size out of mating season

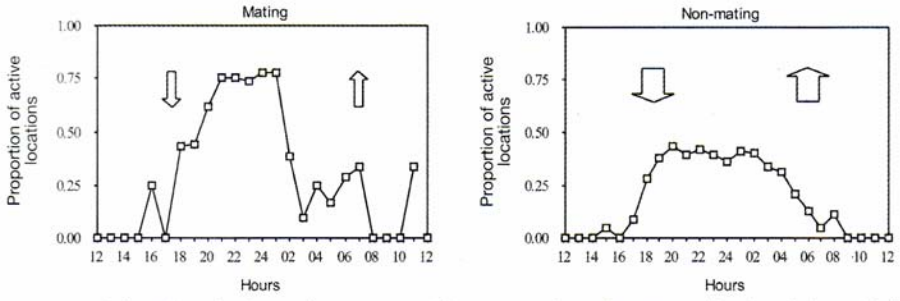

Figure 1. Diel activity rhythms of European mink. Arrows show the onset of dusk and the end of dawn

crepuscular activity was at its lowest and there were no distinct activity peaks during the night either.

4 Discussion

The activity level and the bimodal activity pattern shown by European mink at the UBR were similar to that found in other native mink populations (SIDOROVICH, 1997; PALAZÓN and RUIZ-OLMO, 1998), and in other semi-aquatic mustelids such as the American mink (GERELL, 1969; BIRKS and LINN, 1982; DUNSTONE, 1993) and Eurasian river otters (*L. lutra*, KRUUK, 1995). At the UBR, all the active male locations during daytime were close to the resting sites, which are concealed beneath bramble (*Rubus* sp.) patches (GARIN et al., 2002). PALAZÓN and RUIZ-OLMO (1997) also observed that diurnal activity of European mink was restricted to the immediate vicinity of dens. European mink may hunt safely inside those dense shrub patches at daytime, although their extension would limit the time allocated to that activity. LODÉ (1995) explained the higher diurnal activity of polecats during spring as a strategy to increase the probability of finding anurans. Diurnal amphibians that start mating early in spring, such as *Rana perezi*, are present at the UBR (ÁLVAREZ et al., 1989), but whether anurans use bramble patches remains unknown. Possible links between the diurnal activity of minks and the activity pattern of potential prey could not be accounted for, as the diet of our mink study population was unknown.

Males at the UBR were more active during the mating season. Male American mink and polecats also show longer activity periods and higher mobility during this season (GERELL, 1970; WEBER, 1989; DUNSTONE, 1993; LODÉ, 1999). This is probably related to the search for females and the investigation of their reproductive status. During the mating season the activity decreased after midnight and recovered at dawn as in other European mink populations (PALAZÓN and RUIZ-OLMO, 1997; SIDOROVICH, 1997). Climate, prey availability, risk of predation or photoperiod are known to affect the activity pattern of small carnivores (ZIELINSKI, 1988; LODÉ, 1999) and they probably also promote the contrasting pattern observed between the mating season and the rest of the year in the UBR.

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Summary

We studied the activity budget and the circadian activity rhythm of European minks *(Mustela lutreola)* in an area of its western range in which American mink *(M. vison)* didn't occur. 5 males and 2 females were radiotracked for different time intervals over a year. Activity was determined by the variation of radio-signal strength. Mink were active primarily at night. The low activity of males during the daytime concentrated around the resting sites and within dense shrub patches. Males showed higher overall and crepuscular activity during the mating season.

Key words: Mustela lutreola, activity budget, activity rhythm, season

Zusammenfassung

Aktivitätsmuster des Nerzes (Mustela lutreola) in Südwest-Europa

Untersucht wurden das Aktivitätsbudget und der circadiane Aktivitätsrhythmus von Nerzen *(Mustela lutreola)* in einer Region im Westen ihres Verbreitungsgebietes, in welcher der Mink *(Mustela vison)* nicht vorkommt. Während eines Jahres wurden 5 Männchen und 2 Weibchen über unterschiedliche Zeiträume hinweg telemetriert. Die Aktivität wurde anhand der Veränderungen in der Stärke des Radiosignals bestimmt. Die Nerze waren hauptsächlich nachtaktiv. Männchen wiesen eine geringe Tagesaktivität auf, die sich auf die Umgebung der Ruheplätze und dichte Gebüschinseln konzentrierte. Während der Fortpflanzungsperiode waren die allgemeine Aktivität und die Dämmerungsaktivität der Männchen erhöht.

Schlüsselwörter: Mustela lutreola, Aktivitätsbudget, Aktivitätsrhythmus, Jahreszeit

Résumé

Actogramme du Vison européen (Mustela lutreola) dans le Sud-Ouest de l'Europe

Le budget d'activité et le rythme circadien de visons d'Europe *(Mustela lutreola)* ont été étudiés dans un site de la partie orientale de son aire de dispersion et non colonisé par le Vison d'Amérique *(M. vison).* 5 mâles et 2 femelles ont été suivis par radio-télémétrie à différentes périodes au cours d'une année. L'activité a été déterminée par la variation de l'intensité du signal-radio. Les visons se montrèrent actifs principalement au cours de la nuit. La faible activité des mâles au cours de la phase diurne s'est concentrée autour des lieux de repos et au cœur de fourrés denses. Les mâles ont présenté une activité générale plus intense et plus crépusculaire au cours de la période de rut.

Mots clefs: Mustela lutreola, budget d'activité, rythme d'activité, activité saisonnière.

Trad. : S. A. DE CROMBRUGGHE

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