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SHORT COMMUNICATION

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Assessing camera traps for surveying the European mink, *Mustela lutreola* (Linnaeus, 1761), distribution

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Abstract This study assesses the suitability of camera trapping as a method for detecting the European mink and determining its distribution in a region located in southwestern Europe. Using this technique, 98 river stretches were surveyed, resulting in the detection of 11 species of carnivores. A high photographic rate was obtained for the European mink, and we were able to get a picture of its distribution area in the year 2000. No seasonal differences were found in the efficiency of the method used. Camera trapping is an effective technique that provides quick updates of the distribution of the European mink and may be used in programs monitoring this species.

Keywords *Mustela lutreola* · Detection · Camera trapping

Introduction

The European mink *Mustela lutreola* (Linnaeus, 1761) is a mammal whose survival is seriously threatened. The current distribution of this species is estimated to be only 20% of the original population, and the decline of the species continues at an accelerating rate.

The change in the distribution of the European mink in southwestern Europe has been traced through monitoring programs conducted in France (Maizeret et al. 1998). In this study, an annual review (between 1991 and 1997) of the distribution of the species was carried out, using live trapping as the detection method. This method offers unequivocal observations of the species and makes it possible to compile additional information and samples of the animals captured. However, in order to conduct regular updates (every 1 or 2 years) on the distribution of this species by means of live trapping in a large area (several thousand km^2), the assistance of many people is required, which entails either ample funding or the collaboration of volunteers. Live trapping presents the same drawbacks as any capture method in that it is always associated with a mortality rate, which is a factor that must be taken into account when studying a threatened species. Moreover, it is not advisable to catch females during the reproductive season. Hence, live trapping cannot be carried out at any time of the year.

The last 20 years have witnessed the development of several systems that make use of photographic cameras to detect different carnivorous mammal species and monitor their populations (Jones and Raphael 1993; Kucera et al. 1995; Moruzzi et al. 2002). Camera trapping allows us to obtain information without interfering with the life cycle of the species, and the work itself is less demanding than live trapping, requiring the participation of fewer people, thus incurring less financial cost.

This study assesses the suitability of camera trapping as a method for the detection of the European mink and the possibility of its use in regional programs monitoring this species.

Materials and methods

The camera traps employed in this study consisted of an automatic, 35-mm camera connected to a bait by a fishing line (Fig. 1), following the design of Jones and Raphael (1993) and Kucera et al. (1995). The camera comes equipped with an auto-flash and auto-advance and costs between €20 and €30. The system was made up of the camera, two wooden stakes, and the shutter release button. The shutter release button was set so that the animal would release the button when it nibbled on the bait. This mechanism was set up by opening the camera and tying a fishing line to the inner shutter release lever. The line was threaded through a small hole made in the bottom of the camera to the exterior (Fig. 1a). The camera was

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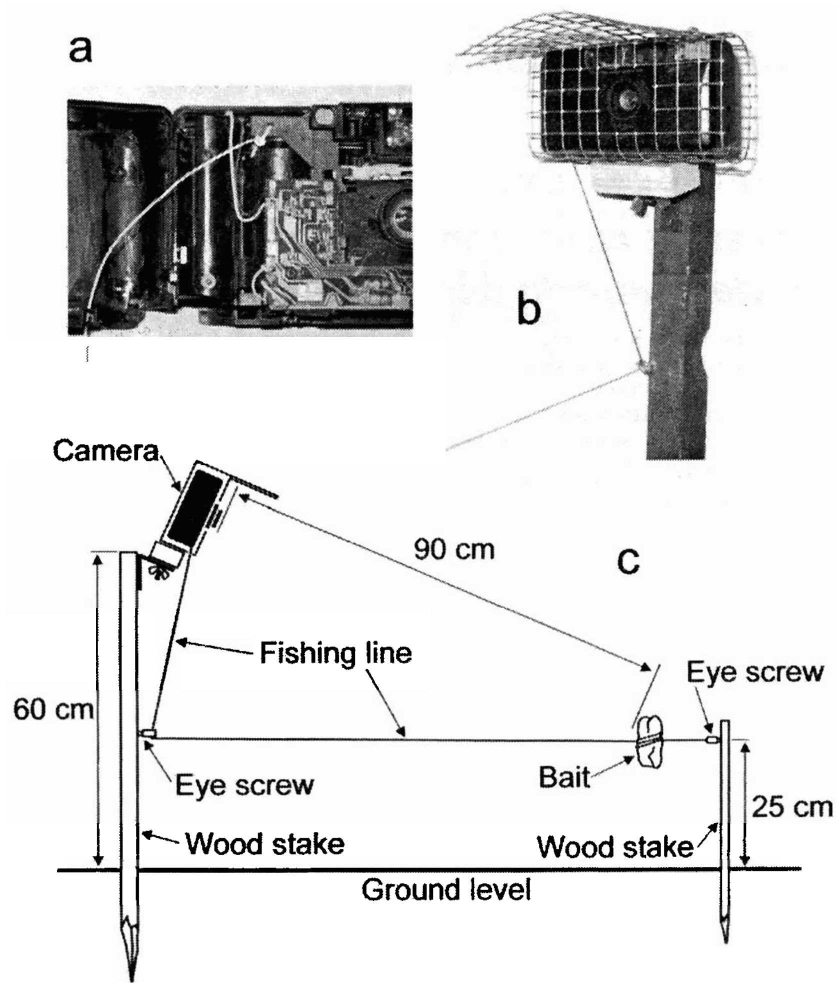
Fig. 1a–c Camera trap used in this study. **a** Detail of the modification made on the shutter release mechanism inside the camera. **b** Detail of the camera set up to take photographs. **c** Side-view diagram of the layout of all the elements



placed on a stake (3×3×80 cm) on top of a metal mesh support (Fig. 1b). The line was first threaded through an eye screw that had been nailed to the stake and then tied to the bait, which in turn was tied by a line to another stake and hung in the air at a minimum focal distance of approximately 90 cm (Fig. 1c). In case of rain, the camera stand could be covered with a plastic bag. Chicken wings were used as bait. The type of film was 24-exposure, 200-ASA color print film.

The suitability of this technique to study the distribution of the European mink was tested in the Basque Autonomous Community, a region in the north of Spain with a surface area of roughly 7,200 km^2. The distribution of the European mink in this region has been well documented in recent years (Castién and Mendiola 1985; Palazón and Ruiz-Olmo 1997; Marañ 1999). The home range of minks tends to revolve generally around riverbeds and riverbanks (Garin et al. 2002). For this reason, we chose a series of stretches of the river that would provide a uniform picture of the hydrographic network of the region. The only criteria used for selection required that these stretches carry water all year round and that their riverbanks have a substantial amount of shrub cover. In keeping with this, 98 stretches were selected (Fig. 2). Between five and seven cameras were set up along each stretch at distances ranging between 500 and 1,000 m, depending on river conditions. Size of home ranges of European mink vary from 0.6 to 17 km along watercourses (Garin et al. 2002); therefore, the positioning of the camera traps allows us to cover the range of one individual.

A total of 616 camera traps were set. The cameras were hidden among the bushes on the riverbank at a maximum distance from the water of 10 m. They were left to function 7 days in a row. During this interval of time, we did not visit the area. The work was carried out by a team of three people between December 1999 and December 2000.

The behavior of mustelids varies throughout the year, which causes seasonal variations in the efficiency of the detection methods commonly used (Erlinge and Sandell 1986; Buskirk and Lindstedt 1989; Tuyttens et al. 1999). For the purpose of proving whether or not the method used in this study was capable of detecting the European mink at different times of the year, we monitored the presence of this species in the Agauntza Stream (Gipuzkoa, Basque Autonomous Community, see location in Fig. 1) during the period June 2000–May 2001. Along a 5-km stretch of this river, six camera-trapping sessions were conducted (July 2000, October 2000, December 2000, February 2001, March 2001, May 2001). During each session, seven camera traps were set up with a distance between cameras of at least 500 m. Cameras were left to function for 7 days in a row. Along the same stretch of the river during the same period of time, four live-trapping sessions were carried out as well (June 2000, September 2000, January 2001, May 2001) in order to acquire additional information on the presence of this species that would help us evaluate the results obtained using camera trapping. Each live-trapping session consisted of laying 15 single-entry cage traps (20×20×60 cm) at a distance between traps of at least 250 m. The traps were active for 3 consecutive days. In both detection methods, chicken wings were used as bait.

Results

The technique used to survey the hydrographic network of the Basque Autonomous Community led to the detection of 13 species of mammals and 4 species of birds (Table 1). It is interesting to note that we were able

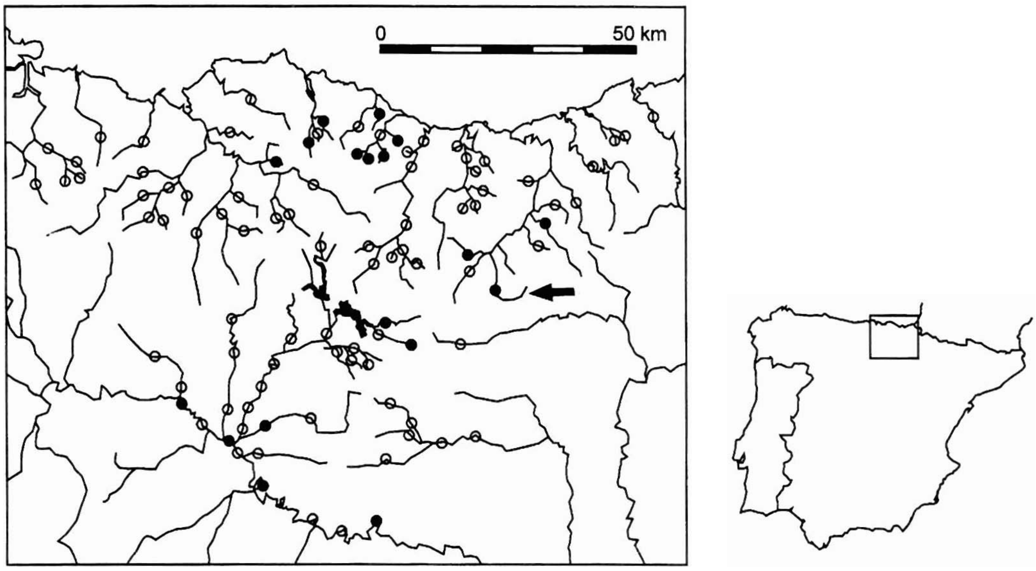


Fig. 2 Distribution of the river stretches sampled (*circles*) ($n = 98$) using camera trapping in the Basque Autonomous Community (Spain). *Black circles* show the stretches of the river where the European mink was photographed. The *arrow* indicates the location of the Agauntza Stream, where the year-round survey was conducted to determine the presence of the European mink using camera trapping and live trapping. The *figure on the right* presents a square of the area of the Iberian Peninsula sampled

to photograph both small species (weasels and rats, weighing less than 200 g) as well as large species (domestic dog, weighing over 20 kg). Carnivores were photographed along 73 river stretches (74%) and in 224 camera traps (36%). The species were identified unequivocally in 220 camera traps (98%). The European mink was found among the species photographed in the largest number of river stretches (Table 1, Fig. 2). Photographs of the European mink were taken in 46 camera traps, and the average number of photographs taken of this species per camera trap was 12.9 (SD = 6.8, range = 3–24, $n = 46$). The high position of the bait and the large mean number of photographs per camera made it easy to identify the European mink.

The operation of the cameras was not affected by the rain or low temperatures (minimum of −5 °C). The swelling that occurred in some of the rivers made five camera traps inoperative.

Of the carnivorous mammal species known to be present in the zone, the only ones that were not detected were the otter (*Lutra lutra*) and the wildcat (*Felis silvestris*).

Both camera trapping and live trapping detected the European mink regardless of the season of the year during which the surveys were carried out (Table 2).

Table 1 Photographic rates (proportion of river stretches where a photograph was taken) of different species of birds and mammals obtained by camera trapping in the Basque Autonomous Community (Spain)

Species	*n*	Rate
Mammals		
Common genet, *Genetta genetta*	37	0.38
Beech marten, *Martes foina*	33	0.34
European mink, *Mustela lutreola*	18	0.18
Domestic cat, *Felis catus*	16	0.16
Brown rat, *Rattus norvegicus*	12	0.12
Domestic dog, *Canis familiaris*	10	0.10
American mink, *Mustela vison*	3	0.03
Weasel, *Mustela nivalis*	2	0.02
Red fox, *Vulpes vulpes*	2	0.02
Pine marten, *Martes martes*	1	0.01
Western polecat, *Mustela putorius*	1	0.01
Badger, *Meles meles*	1	0.01
Sheep, *Ovis aries*	1	0.01
Birds		
Carrion crow, *Corvus corone*	2	0.02
Buzzard, *Buteo buteo*	1	0.01
Grey heron, *Ardea cinerea*	1	0.01
Moorhen, *Gallinula chloropus*	1	0.01

Discussion

Our findings show that camera traps are able to detect the European mink, with photographic rates similar to species that are probably more abundant along the river (rats, cats, dogs). The fact that the home range of the European mink is restricted to the riverbed and riverbanks may enhance its detectability.

The overall picture obtained of the distribution of the European mink in the Basque Autonomous Community is generally in keeping with what has been reported in the most recent reviews of the region (Castién and

Table 2 Results of year-round monitoring of the presence of the European mink in the Agauntza Stream (Gipuzkoa, Spain) using two detection methods. + Camera-trapping sessions during which the European mink was photographed

Live trapping		Camera trapping	
Date	No. of European minks caught (males/females)	Date	Photographs of European minks
June 2000	0/2	July 2000	+
September 2000	2/2	October 2000	+
January 2001	2/1	December 2000	+
May 2001	1/1	February 2001	+
		March 2001	+
		May 2001	+

Mendiola 1985; Palazón and Ruiz-Olmo 1997; Maran 1999). It is therefore likely that this picture shows the distribution of the species at the time the study was conducted.

Camera trapping has been employed in several different studies to monitor rare or elusive species (Karanth and Nichols 1998; Cutler and Swann 1999; Carbone et al. 2001; Moruzzi 2002). It may prove to be a useful method for monitoring the distribution of the European mink for the following reasons: (1) since the ability to detect the species is not subject to seasonal differences, there is no question as to the identification of the animals; (2) the animals do not suffer any harm; (3) not a lot of time is needed to train the sampling staff; (4) the material is not costly; (5) a good photographic rate is obtained; (6) it is not necessary to put in long hours checking the trapping stations, as is the case in live-trapping; and (7) a small team of people are able to survey large areas.

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