CAPTURE AND IDENTIFICATION TECHNIQUES OF MARMOT ON MOUNT CIMONE (NORTHERN APENNINES)

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Riassunto - Vengono illustrati i metodi di cattura e di identificazione individuale utilizzati nell'ambito di una ricerca pluriennale sulla eco-etologia della popolazione di *Marmota marmota* dell'Appennino tosco-emiliano. Come metodi di cattura sono state utilizzate trappole e lacci alla tana. Questi ultimi sono risultati essere più semplici da usare ed efficaci. Per il riconoscimento individuale delle marmotte si sono utilizzati: clips auricolari di plastica colorata, clips metalliche numerate, colorazione del pelo con tinture per capelli, depigmentazione del pelo tramite esposizione a basse temperature e tatuaggi ad inchiostro.
Nessun singolo tipo di marcatura ha permesso il riconoscimento a distanza degli individui per più di una stagione di attività, operazione resa possibile dall'utilizzo in contemporanea di diversi sistemi di identificazione. Le clips auricolari di plastica colorata risultano invece il metodo più efficace di riconoscimento a distanza per una stagione di attività.

IBEX J.M.E. 1:14-16

1. Introduction

The population of *Marmota marmota* introduced into the Northern Apennines (Tuscany and Emilia Romagna) between the 1950s and 1970s has recently been the subject of in-depth studies to describe distribution and identify the main environmental parameters which condition settlement (Ferri *et al*., 1988). In addition, ethological observations of the marmots living in a study area on the northern slope of Mount Cimone (Province of Modena) have been carried out each year since 1988 (Tongiorgi *et al.*, 1993).
For research purposes, the most common method of capture is with traps, of both the metal net kind (Armitage, 1982; Arnold, 1990; Davis, 1982; Lenti Boero *et al*., 1988) and the so-called "box" traps which are closed on the sides (Allainè, 1992; Zelenka, 1965). Snares and nooses, the traditional hunting methods, are now only used when capturing marmots to be transferred to new territories. A comparative study of the efficiency of the various methods of capture has recently been carried out by Cortot *et al.* (1992).
Marmots are marked with metal and/or coloured plastic ear tags (Armitage, 1982; Cortot *et al*., 1992; Perrin *et al*., 1992; Zelenka, 1965). Long range recognition is generally possible by dying the animals' fur (Armitage 1982; Arnold, 1982) often in addition to marking with the coloured tags (Perrin *et al*., 1992).
The present paper reports the capture and marking techniques used in the study area of Mount Cimone to record the residents, and identify individuals during ethological observations (*cf*. also Sala *et al*., 1992).

2. Methods of capture

Traps - On four occasions in four different years, June 1989, July 1990, May 1991 and July 1992, attempts were made to capture marmots using traps (Hawahart with two entrances, mod. 1050 3A, dimensions: 107x28x33 cm). A total of 10 days, using 6-8 traps per day, was spent trapping. The traps were baited with peanut butter or with oat flakes mixed into a porridge with water and salt (following the indications supplied directly by Kenneth Armitage), and placed at the entrances to the most used burrows or along the connecting paths.
Results were completely negative as not a single marmot was captured. The marmots did not show any signs of suspicion towards the traps, but nor did they show any particular interest when these were installed across the territory with the bait inside or nearby.
The use of the traps has therefore been definitively abandoned, both because of their inefficiency and because their weight and bulk made them difficult to transport and position.

Snares - The snares used were formed of a noose of flexible steel wire, approximately 80 cm in length. They were installed at the entrances to the burrows or just inside, and the loose end was tethered to a peg. Snares were set in the morning before the animals left their burrows, kept under constant observation and, as a precaution, released at sunset. Consequently only a limited number of snares could be used, and these were therefore installed only at the entrances of the burrows shown by preliminary observation to be the most used and above all, those in which the marmots

slept. The most simple and efficient method of capture, the snare, sufficiently guaranteed the safety of the animals. Altogether, a dozen snares were installed for a total of 20 days, and the overall efficiency of the operation was 0,16 captures/snare/day.

3. Methods of marking

The weight, sex and age class (young, 2-3 year-olds or adult) were recorded for each individual captured. In the first capturing operation, animals were given sedatives (Ketavet or Ketalar, Ketamine hydrochloride, and Rompun, ylazine hydrochloride) to reduce the stress caused by handling; later, however, this was abandoned as felt to be superfluous.

Identification techniques - Different combinations of coloured plastic ear tags (Mod. Minirototag from the company Dalton, 1.5 cm in length) were applied to both pinnae, allowing specific individuals to be recognized.
The tags proved to be reasonably successful. However, in certain light conditions, especially around midday, it was difficult to distinguish the colours, primarily because the tags were relatively small and sometimes stained with earth.
The plastic clips were, however, relatively useless for long term marking, as they normally lasted only for a single active season and were easily lost.
Colouring the fur with hair dye is the simplest and most efficient means of ensuring long range identification, but due to moulting, the marking is maintained for even less time than with the plastic tags. Some common livestock colour marking products (animal marking crayon) were tried, but despite the ease with which they can be acquired and applied, their efficiency was almost nil, probably because of the marmots' long fur.
Freeze marking was performed by applying dry-ice (CO_2, -60°C) or a refrigerant spray ("Check-Spoilt", Bieffe Chemical, -40°C) onto a previously shaved area of skin for 1-1.30 minutes. Generally, the region between the shoulder blades, on the back or on the sides was used, as these can be easily seen from a distance.
Freeze marking should enable long range identification for a number of consecutive years, because the fur of the treated area grows back in a lighter colour. Data in literature suggest that best results are obtained with one-year old individuals (Lenti Boero *et al*., 1988).
In 1988 our experience in marking adult individuals with dry-ice produced no better response than was obtained in 1989 where four individuals just over a month old were marked with refrigerant spray. Results remained below expectations and were not sufficient to allow individual recognition. This lack of success can probably be attributed to the excessively reduced application time (< 1.30 min) which we preferred not to exceed, to avoid pain or damage to the captured animals.
Numbered metal clips (Auptner company, length: 1 cm), normally used by American researchers for permanent marking of *M. flaviventris*, were applied to one pinna in some cases. However, these only resisted as long as and no less than the plastic tags.

Results - At the beginning of the research period (1988) six adult individuals and one sub-adult were present (captured and marked as individuals A-F) in the study area.
The following year, about fifteen days after emerging from winter hibernation (May 1989), five marmots were observed above ground at the same time. However, in June, only four adults were present, three of which were captured and marked: individual A, a female captured in 1988 and now designated 01, and the individuals 02 (a male) and 03 (a female), both captured for the first time. The individual which had been designated B the previous year could not be re-captured. These four individuals formed two pairs (B-01 and 02-03) each of which occupied its own family territory. In July, five young born to the pair B-01 were observed, four of which, three females and one male, were later captured and marked (05, 06, 07, 08).
On 15 May 1990, five adults and five young born the previous year were observed in the study area. On this occasion, only three of the adults were recaptured and marked (01, 02, and 03). It was not possible to recapture either B or any of the young. In the same period, male 02 was expelled from his territory by an extraneous male denominated Z, following two days of cruel combat. The pair formed by individual B (never captured but distinguished by a mark on its left cheek) and female 01 also reproduced in 1990 and four females and one male were born, all of whom were captured and marked (individuals 10, 11, 12, 13 and 14).
During the spring of 1991 just as the marmots were emerging from hibernation (around 20th April in the study area), there were heavy

snowfalls which completely covered the entire area for about a month, making it impossible for the animals to reach pasture. The captures made between 25 and 30 May showed that the pair 03-Z had survived, while, of the twelve individuals which at the end of the previous active season had formed the other family group, only four of the two years old animals (all of the 1989 litter), remained. Also in this year, the pair 03-Z produced four young, the first litter in this family territory for at least five years (in 1988 during the first trapping operations all the individuals caught were over two years old).

In 1992, no animals were caught but it was possible to count the members of the two family groups. At the beginning of the active season, the family of the pair 03-Z was unchanged, comprising two adults and the four young born the previous year. During the course of the season, the two young moved to an outlying area of the family territory so that by the end of July, with the birth of a new litter of four, the family appeared to be composed of between six and eight individuals. The other family territory was occupied throughout the 1992 active season by only two individuals of adult size.

Over the five years of observation, the population, surveyed during the Summer and including the year's births, increased from 7 individuals in 1988 to 9 in 1989 and 14 in 1990, but decreased to 10 in 1991 and 9-10 in 1992.

4. Discussion and conclusions

The methods of capture and identification used allowed us to observe various behavioural traits of the marmots in the study area, and follow the development of the population from 1988 to 1992.

The use of snares permitted a satisfactory number of captures of both adults and young in any given year, but proved less efficient in recapturing, not only during the same season, but also in following years.

If used singularly, none of the marking techniques can ensure recognition of the marmots for more than one active season. For recognition over a longer period, a combination of techniques must be used. Nevertheless, and although not always easy and immediate, it was possible to recognize at a distance each individual animal in an active season.

The need for a reliable method a marking, which became evident during the present study, as also been highlighted by Cortot *et al.* (1992) and Allainè *et al.* (1992). It would probably be preferable to refine these techniques on animals in semi-captivity rather than on those still living in wild.

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