METHODS OF CAPTURING AND MARKING ALPINE MARMOTS

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Riassunto - In una colonia di marmotte (*Marmota marmota*, L.), situata all'interno del Parco Naturale Orsiera-Rocciavrè, Alpi occidentali italiane, sono state effettuate 15 catture a scopo di marcatura, con l'uso di due diversi tipi di laccio, sistemati sull'apertura di tana: lacci ordinari e lacci a scatto. Questi ultimi sono dotati di filo di inciampo e di elastico, che facilita e rende più efficace la chiusura del cavo. L'efficacia dei due sistemi viene confrontata sia in termini di frequenza di cattura (numero di catture per giorno e per numero di lacci impiegati), che in quelli di probabilità cattura. I migliori risultati si sono ottenuti con i lacci a scatto, che consentono frequenze di cattura tra le più alte rilevate in bibliografia, senza rischio di traumatismi e senza distinzione di sesso e di età. Si sono registrate anche due ricatture.
Tra i sistemi di marcatura utilizzati (collari elastici colorati, marchi auricolari metallici, pastelli colorati per uso zootecnico) viene sottolineata la validità dei collari elastici, sia per quanto riguarda il riconoscimento a distanza dei soggetti, sia per la loro persistenza.

IBEX J.M.E. 1:11-13

1. Introduction

Within the context of a research programme regarding the eco-ethology of the Alpine marmot (*Marmota marmota*) capturing operations have been carried out for marking purposes.
Various methods can be employed for the capture of marmots: wooden or metal traps located on obligatory runs or at the burrows (Armitage, 1974; Perrin *et al.*, 1991; Lenti, 1988), cylindrical traps (Lattmann, 1973), modified spring traps (Mann and Janeau, 1988) or snares set at the entrances to the burrow (Grimod *et al.*, 1991).
Equally various are the systems of marking employed for long- range identification of the marmots: ear marking (Zelenka, 1965; Armitage, 1974; Mann and Janeau, 1988; Perrin *et al.*, 1991, Sala *et al.*, 1992), depigmentation of the fur through exposure to low temperature (Lenti, 1988), coat marking with various types of dye (Armitage, 1974; Sala *et al.*, 1992).
This paper describes a method of capture using spring snares and compares its efficiency with that of normal snares located at the entrances to the burrow, and a method of marking using elastic collars of various colours.

2. Study area and methods

The capturing operations were carried out in a colony of marmots, composed of four different families, located in alpine pasture at approximately 1.900 m. a.s.l. in the Orsiera-Rocciavré Natural Park (Eastern Italian Alps).
Two different types of snare were used, located at the burrows, both composed of thin, flexible steel cables: common snares and spring snares (Fig. 1) fitted with trip wire and elastic lines favouring the closure of the cable around the animal. Both systems were fitted with a safety locking mechanism with a minimum closure of 8-9 cm in diameter. The trip is formed by one or two lengths of nylon line stretched across the opening to the burrow.

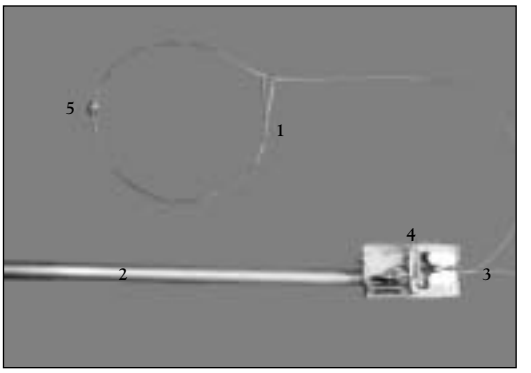

Fig. 1 - Spring snare:
1 = Steel cable
2 = Elastic line (inside)
3 = Trip
4 = Spring mechanism (rat-trap)
5 = Safety locking mechanism (minimum closure = 8-9 cm)

The snares were set at the same time on the highest possible number of burrows mostly during the early morning or late evening and were checked two or three times a day. A small coloured flag attached to the spring traps ser-

ved as an alarm signal when the mechanism was tripped. This device made it possible to check the snares from a distance without further disturbing the animals.
An overall total of 17 spring snares and 49 ordinary snares were set.
The capturing operations were carried out during May, July and August. The marmots, once captured, were handled without the use of sedatives or tranquilizers.
Three different systems of marking were applied to each captured animal: coloured elastic collars, ear tags and pastels.
The elastic collars are composed of a tape of the type used for mountaineering with a piece of elastic material attached to one end. They are 1.5 cm wide by 10 cm long, excluding the elastic part. Tapes of different colours were used and sometimes different combinations of colours on the same collar.
Metal tags used for surgical suturing were employed as ear marks approximately 8 mm in length once bent over. As it was not possible to distinguish the various marks, the tags being made of stainless steel and all of the same colour, they were applied in various positions and in varying numbers on the pinnae of the animals (right ear only, left ear only, 2 on the right, 2 on the left and so on).
The pastels were those normally used for the temporary marking of livestock (ovine and bovine) at pasture. The three colours used (blue, red and green) were applied to the animals in different combinations of colour and location.

3. Results

Over a period of 14 days 15 marmots were captured: 7 females and 8 males (1 female and 1 male were recaptured). In total 13 marmots were marked.
Table 1 shows the efficiency of the systems used giving the number of animals captured in relation to the total number of snares used and the number of days employed for the capture. The same table shows the trends regarding capture during the Summer.
All 13 animals were observed again and recognized due to the colour of the collar. Of the 13 marmots marked, only two, for different reasons lost their collar until the end of hibernation (May, 1993). Ear marks were used on 10 of the 13 subjects captured and were not lost during the course of one active season and one hibernation. The pastel colours, for livestock use, applied to all subjects, disappeared from the coats of the animals within four or five days.

4. Conclusions

The results obtained from a season's work enable us to draw some conclusions in relation to the systems of capturing and marking used. The study regarding the probabilities of capture using the two systems and the analysis of the confidence interval (Table 1) enable us to demonstrate that the spring traps are more efficient than the normal type.
If we consider that other authors (Le Berre, these proceedings) have estimated the efficiency of the snares to be higher than those of

Table 1 - Efficiency of the capture systems (A= Snares; B= Spring snares)

Days	N° Snares A	Total snares*days	N° captures	Efficiency	N° Snares B	Total snares*days	N° captures	Efficiency
14 -16/V	10	30	1	0.03	2	6	1	0.16
13 - 14/VII	14	28	0	0	2	4	2	0.5
03 - 07/VIII	22	110	3	0.03	8	40	4	0.1
18 - 21/VIII	30	120	2	0.02	5	20	2	0.1
Tot.		288	6	0.02		70	9	0.12

To analyse the confidence interval (confidence coefficient = 0.95), we assumed that the sample had a normal distribution: if $\hat{P}A$ = probability of capture per day for snares "A" and $\hat{P}B$ = probability of capture per day for snares "B" we have:

$P(0.004 < \hat{P}A < 0.037) > 95$ and $P(0.05 < \hat{P}B < 0.207) > 95$

the spring traps, then spring snares can be ranked among the best methods of capturing Alpine marmots, especially regarding the probability of capture. The advantages of this method then are the efficiency of the traps over the entire active season of the marmots, reduced costs and the involvement of less personnel.
The disadvantages arise from the fact that the animals have to be handled directly.
The almost equal ratio between the sexes of the marmots captured enables us to affirm that this does not constitute a system of selective capture.
The two examples of recapture show that snares which are correctly set, particularly those employing a triggering mechanism, are useful for recapturing operations.
None of the marmots captured experienced wounding during the capturing or marking operations.
The efficiency of the marking systems used, evaluated in terms of their persistence and the ease with which they can be recognized, shows that the coloured elastic collars clearly stand above the other methods.
The coloured pastels enable the animal to be recognized for only a few days after capture. Their use is therefore to be recommended, also in consideration of the ease with which they can be applied, to enable a rapid identification of the marmots just after release when the observer is still not used to distinguishing the colour of the collar from a distance.
The ear tags which were used by us are valid in terms of their persistence but of little use for the purpose of recognition if they are the only system employed.
Even though they do not permit recognition of the animal when used alone they are however a valid instrument to dispel any doubt regarding the identity of the subject, especially in situations where the posture of the animal is such that the collar cannot be seen. Their importance is increased by the fact that they may be the only system of recognition remaining if the collar is lost.
The coloured elastic collars made it possible to recognize all the subjects remaining in the colony under examination for the duration of the active season and after hibernation. The only point of any note is that they should be made of non-woven synthetic material in gaudy colours coupled with soft, good-quality elastic fabric.
The tolerability of these methods has been shown to be reasonably good and none of the marmots showed signs of irritation or annoyance caused by the collars, apart from a single instance of a subject whose collar was too tight obliging us to forcefully and "fortunately" recapture the animal.
To conclude we would like to stress the opportunity of using different system of marking at the same time; one systems easily seen from a distance but generally weaker (for example the coloured collar) and the other, less evident but more persistent (for example particular types of ear tags). The use of two different methods ensures recognition of the subject at a distance and reduces to a minimum the damage caused by the loss of one of the two systems.

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