

Quill-Marking, a Method to Identify Crested Porcupines Individually

INDYWIDUALNE ZNAKOWANIE JEŻOZWIERZY

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Crested porcupines were marked with strips of coloured plastic adhesive tape attached to the distal part of 20 quills of the lumbar region. Approximately 50% of the marked quills were still retained five months after marking but only 25% were retained two months later. No significant difference was found in the proportion of marked quills retained by males and females. An improvement in this method would be to mark modified hairs that are unlikely to be lost during defensive activities (e.g. crest, rattle-quills) and to double or treble their number. The ethics involved and the retention period of marked quills (regularly five to seven months) make quill-marking an interesting and reliable temporary marking method for short term field studies.

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1. INTRODUCTION

Several permanent, semipermanent and temporary methods may be used to mark animals (Ashton, 1978; Twigg, 1978; Day, Schemnitz & Taber, 1980) but few cause the minimum of disturbance to them or, more importantly, satisfy the principles of ethics and humanity.

Substantial practical problems are involved in marking as well as in identifying Old World porcupines (*Hystrix* spp.) individually. Their body is covered with different types of modified hairs (spines, quills, transitional quills, tactile bristles, rattle-quills and crest, *sensu* van Weers, 1983), which does not allow the use of a permanent marking technique, such as freeze branding. Their ear-pinnae are well-developed but extremely thin, thus affecting the retention of ear-tags and the permanence of holes and notches due to natural injuries. Furthermore, although adult females are larger than males (Gaigher & Currie, 1979; Alkon & Saltz, 1985; Pigozzi, in press), it is difficult to discriminate the sexes according to both their morphological features (Niethammer, 1978) and their behavioural repertoire (Mohr, 1965). Finally, no easily recognizable individual variation in the Old World porcupines' natural markings has been yet identified, unlike that of other vertebrate species (e.g. belly pattern of

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newts (Hagström, 1973), bill of Bewick's swans, nose of gorillas, ear of elephants, and whisker spots of lions (cf. Pennycuik, 1978).

Alkon & Saltz (1985) marked Indian crested porcupines (*Hystrix indica* Kerr, 1792) with a combination of numbered aluminium ear-tags and radio-collars, and Morris & van Aarde (1985) and van Aarde (1985) marked captive southern African porcupines (*Hystrix africaeaustralis* Peters, 1852) with a combination of holes clipped into the ear-pinnae and colour-coded Stercolite collars. Similarly, Filibeck *et al.* (1981) marked crested porcupines (*Hystrix cristata* Linnaeus, 1758) with a system of notches clipped into the ear-pinnae. In addition they marked 50 quills of the dorsal area with coloured adhesive tape, so that they could indirectly assess the individual movement of crested porcupines by plotting the locations of recovery of the marked quills.

According to Vincent & Owers (1986), the quills of crested porcupines have longitudinal stringers, sometimes with internal stringers not attached to the highly fibrous material components of the quill wall, and their mechanical properties (*e.g.* little bending when loaded axially, breaking of the tip when pushed in the assailant's body) suggest that their function is mainly of defensive nature. In this regard, Kleiman (1974) suggested that quills, bristles, and crest are erected and vibrated to communicate to conspecifics and predators the likelihood of an attack.

This paper describes a quill-marker that satisfies the following requirements: (i) to be ethically acceptable and harmless to crested porcupines, (ii) to be clearly visible to an observer approaching the trapped crested porcupine, in order to ensure its rapid release, (iii) to be quickly and easily applied, (iv) to be inexpensive.

2. MATERIALS AND METHODS

Crested porcupines were captured in the Maremma Natural Park, central Italy, (42°39' N, 11°05' E) between September 1983 and November 1985 using large cage traps (50×60×150 cm) of welded steel mesh (5×10 cm) with a single drop door. The traps had a monofilament nylon string as trigger mechanism (Cheeseman & Mallinson, 1980) and were baited with peanuts and occasionally with maize. Crested porcupines were immobilized with intramuscular injections of xylazine hydrochloride (20 mg/individual) and ketamine hydrochloride (11 mg/kg) (Pigozzi, 1987). Following immobilization, 20 quills of the lumbar region were thoroughly cleaned and marked with 6-cm long strips of plastic adhesive tape (of the type generally used to repair electrical cables). The marker was tightly taped around the distal part of the quill, taking care not to include any long sparse hair between the adhesive tape and the quill, since this might subsequently cause irritation to the crested porcupine while erecting its quills. The combination of tapes of different colours allowed the individual marking of crested porcupines.

Since no published data on the quill-shedding by crested porcupines were found,

both ears were marked with coloured plastic tags of different size (Mini-Rototags 21×5 mm and Rototags 37×10 mm, manufactured by Dalton Supplies Ltd., Henley-on-Thames, Oxfordshire, U. K.), which were numbered serially. The ear-tags served as a back-up to recognize crested porcupines that had lost all their marked quills. However, the simultaneous use of both types of marker allowed the investigation of the validity of quill-marking as a method to recognize crested porcupines individually.

3. RESULTS AND DISCUSSION

The use of quill-markers provided some advantages. Re-trapped crested porcupines were recognized and released without increasing their excitement and avoiding the need to handle them. Several independent observers correctly identified the colour of the quill-markers at a distance of 5 m with the naked eye and at about 30 m with 7×42 binoculars in good light condition. In addition, during a study on the presence of

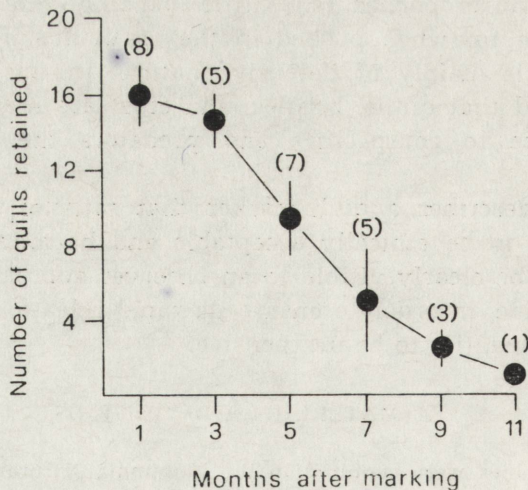


Fig. 1. Mean number of marked quills retained by crested porcupines at different times after marking. Pooled data from males and females. Vertical bars represent standard deviation whereas values in parenthesis represent the number of crested porcupines investigated at each time.

crested porcupines within badger setts (Pigozzi, 1986), quill-marked individuals leaving their dens at night were often identified when their body was flashed with a beam of light within a range of about 10 m.

Unlike most marking methods, the recognition of markers was easier when the trapped animal was excited. Of the 24 marked crested por-

cupines, 21 (87%) showed signs of excitement, stamping the hind foot and/or moving backwards and erecting their quills. The latter behaviour usually made the quill-markers more conspicuous to the observer and the ear-tags more difficult to read.

On three occasions a marked individual lost one ear-tag while moving within blackberry bushes after recovering from immobilization. Moreover, three months after being marked no crested porcupines retained both ear-tags, irrespective of their size. Hence, the reading of the number on the remaining ear-tag was essential to recognize individuals. However, dirt and abrasion often reduced the visibility of the number, and this required a closer approach to the animal which increased its excitement. In this respect the quill-markers proved superior to the ear-tags.

A disadvantage of quill-marking was the loss of the marked quills. Approximately 50% of the marked quills were lost in the five months after marking (Fig. 1). Males and females did not differ in the proportion of the marked quills lost (Fisher exact probability test $p > 0.40$). However, there were substantial differences in the proportion of marked quills lost by each individual. For example, one of the males lost 7 quills (35%) during the first month after marking whereas another lost only 2 quills (10%) during the same period. Similarly, one of the females lost 13 quills (65%) during the five months after marking whereas another lost only 7 quills (35%) during the same period. Yet, one crested porcupine had a marked quill eleven months after marking, the longest retention period recorded in this study.

Quills were probably lost as a result of a natural shedding process and during defensive activities. In this regard, a possible improvement in the quill-marking method would be to mark modified hairs that are unlikely to be lost during defensive activities (*e.g.* crest and rattle-quills) and to double or treble their number. These changes would probably increase the chance of finding any marked quill over a significantly longer period of time.

The ethics involved, together with the recorded retention period of the quill-markers (regularly five to seven months), make quill-marking an interesting and reliable temporary marking method for short term field studies. However, it might be also useful to employ them in combination with a permanent marker in long term field studies.

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