LETTERS

Wolves' avoidance of flag barriers and management implications

Sir,

Leg-hold traps are the devices most commonly used by researchers to capture wolves. These traps can cause injury, as they cannot usually be monitored closely enough to prevent captured animals from struggling in them. In areas where guard dogs are not used, typical methods for controlling wolf predation on livestock are culling and building substantial or electric fences to exclude wolves. These methods have two major drawbacks – culling can threaten the population, and conventional fences are expensive and difficult to maintain.

Ironically, an ancient wolf-hunting technique may offer a cost-effective, reliable solution both for capturing wolves and to the problem of livestock predation. This technique, known as *fladry* and used to hunt wolves in Eastern Europe and Russia, consists of driving them into a bottleneck formed by 50x10 cm red flags hanging from ropes stretched above the ground. Okarma and Jedrzejewski (1997) employed an adaptation of this technique to livetrap wild wolves. One of us (MM) has worked with Okarma and Jedrzejewski, and has witnessed that the application of *fladry* allows for a sudden intervention and sedation of captured wolves, which were never injured (Jedrzejewski *et al* in press).

In 1997-1998, we conducted a pilot study to assess: i) whether captive wolves living in the Rome Zoo responded to *fladry*; and ii) which characteristics made such flag barriers effective. We found that avoidance was maximal when the flags (regardless of their colour) were 50cm apart with the bottom edge at ground level. When positioned across wolf pacing trails, *fladry* barriers were never crossed. No crossings occurred even when the daily food ration was placed on the opposite side of such barriers. In short, our results suggest that *fladry* is effective on captive wolves, at least for the time frame we tested (our tests lasted up to one hour).

Sutherland (1998) stressed the importance of adopting non-lethal means to reduce predation. He also mentioned creating habitat barriers that predators avoid crossing. Our experiments demonstrate *fladry*'s effectiveness at excluding wolves from food and confining wolves in limited spaces, at least temporarily. Therefore, we believe that the *fladry* technique has potential for wolf management. Further research may be needed to evaluate the use of *fladry* to protect livestock in areas where conflicts between wolves and shepherds exist (eg the Alps, the northwestern United States). In this respect, experimentation with semi-captive wolves may play an important role for the better understanding of the characteristics that make *fladry* effective.

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Sir,

I have read Prof Broom's article in *Animal Welfare 1999*, **8:** 205-228 in which he reviews the welfare of farmed mink.

I am somewhat surprised at his conclusion in which he writes '*xii) As summarized in conclusions..., there is considerable evidence of poor welfare in*

mink kept in the most widely used cages and under normal management procedures'.

A possible explanation could be the way in which he selected results from scientific publications on which he bases his conclusion.

My work has been cited several times in his article. I have chosen to take as a starting point his interpretation of especially my investigations concerning selection a fearful and confident temperament in farm mink (*Applied Animal Behaviour Science 1996, **49:** 137-148).*

He concludes '*ii) Mink have been kept in captivity for relatively few generations. No research effort has focused on long term selective breeding of mink for reducing fear in relation to farm conditions, and research which has been conducted has, thus far, indicated only that mink can be bred to be more fearful over a few generations*'.

My article was based on behavioural selection in mink over six generations. The mink had been selected in two lines for fearful and confident temperament, respectively, on the basis of a simple and practical test (the stick test). After three generations, a control line was established by cross-breeding the two lines which strengthened the possibility of relating temperament in the two selection lines to a common control line within each generation. It is correct that mink selected for confident temperament did not become more confident during the first six generations. This was due partly to the fact that 80 per cent of the mink in the confident line already reacted confidently, partly that the test favoured the characterisation of fearful rather than confident temperament, and partly due to a great variation in temperament between generations during the first years after selection had started.

However, for each generation the article documents that mink selected for confident temperament are more confident than mink selected for fearful temperament, and that unselected mink (control line) are less confident than mink selected for confident temperament and more confident than mink selected for fearful temperament.

It therefore seems possible, on the basis of a simple and practical test, to increase the percentage of confident mink and thus improve the welfare of mink under production conditions.

To this may be added an environmentally induced effect resulting in mink becoming more and more confident during the growth period regardless of their genetic potential which shows a positive habituation to farm conditions.

On the basis of this, I regard his conclusion(s) as somewhat biased and unreasonable considering the expressed objective of his article, namely to give a scientific review of the welfare of farmed mink.

There is a need for further research on the environment and management of mink, but it does not benefit the welfare of the mink to neglect the possibility of, through systematic selection, continuing and intensifying the domestication process of the last century.

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Sir,

Dr Hansen claims that our review paper *The Welfare of Farmed Mink in Relation to Housing and Management: A Review* selectively presents results from the scientific literature. He is correct, in writing our review we have been very selective about the results and conclusions we have included. This was necessary because many of the publications in this field do not give sufficient detail to enable the reader to judge how results were produced, and whether all of the conclusions reached are