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Short Reports

Can shooting be an effective management tool for foxes? Preliminary insights from a management programme

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Summary

Historically, shooting has been a popular method for controlling foxes in Australia, but past research has shown it to be an ineffective method for significantly reducing fox population numbers. These past studies investigated shooting when conducted in isolated, one-off programmes. In more recent years large, coordinated group fox management programmes has become popular in both agricultural and conservation areas. These landscape scale programmes give more chance of long-term respite from predation damage by slowing down the immigration rates of foxes into the culled area. Studies have been conducted investigating the effectiveness of large-scale group fox management programmes that primarily used 1080 baiting as the method of control to protect vulnerable livestock and small animal. This study investigated the potential of a large-scale group programme that used shooting as the main form of control to reduce the impact of fox predation.

Introduction

Over the last two decades, the approach to managing pest animals such as the fox (Red Fox, *Vulpes vulpes*) has changed in Australia. The focus has moved from the short-term mindset of killing as many animals as possible in the immediate area to a more carefully planned and coordinated landscape approach with the long-term priority of reducing the impacts of pest animals, not just their population (Braysher 1993, Saunders & McLeod 2007).

Historically, shooting has been a popular method for culling foxes; however, with the decline in the fox fur trade and the gain in popularity of 1080 baiting and group baiting programmes, this popularity has waned over the past two decades (West & Saunders 2003; Saunders & McLeod 2007). Despite shooting being a very selective and humane method of control (Beasom 1974; Sharp & Saunders 2005), many Australian studies have described it as ineffective method for long-term fox management (Coman 1988; Newsome *et al.* 1989; Fleming 1997; Fairbridge & Marks 2005). One reason for this ineffectiveness was the biasing towards younger, less wary individuals which, although altering the age structure of the population, did not necessarily lead to a decline in the population or to the impacts they caused (Coman 1988). The compensatory potential of the remaining population allowed the remaining animals' survival and breeding to be enhanced, immigration rates to increase, and dispersal rates to decrease (Caughley 1977; Newsome *et al.* 1989; Hone 1999; Harding *et al.* 2001; Gentle *et al.* 2007).

All of these Australian studies investigated shooting when conducted in an isolated, uncoordinated manner. Despite the fact that a seemingly large number of foxes were culled across the state during the Victorian Fox Bounty Trial, there was no planning or coordination at a landscape or regional level, and the scheme only achieved a temporary and insignificant reduction in some local fox populations (Fairbridge & Marks 2005). Recent research has shown that, to be effective, fox management must be a persistent, coordinated landscape scale, group effort to give any chance of long-term respite from predation (Thomson *et al.* 2000; Gentle *et al.* 2007; McLeod *et al.* 2010). Studies investigating the effectiveness of large-scale group fox management programmes have concentrated on 1080 baiting as the method of control to protect vulnerable livestock and small animal populations (e.g. Linton 2002; Dexter & Murray 2009; McLeod *et al.* 2010). But might there be potential for a large-scale coordinated group programme that used shooting as the main form of control to reduce the impact of fox predation?

This short report describes a management programme that undertook a coordinated fox shooting programme on private properties over 5 years in a rural/peri-urban region in southern New South Wales, Australia. While some monitoring of foxes was undertaken before and after shooting, this programme was not designed as a research experiment. It is hoped, however, that the programme may

provide some insights into the potential of fox shooting to contribute to fox control in rural and peri-urban areas.

The Fox Control Programme

The Milton group programme was a joint project between seven bodies: the South East Livestock Health and Pest Authority (LHPA); Southern Region Catchment Management Authority; Milton Rural Landcare; Shoalhaven Council; Shoalhaven Landcare; Office of Environment and Heritage (NSW National Parks and Wildlife Service); and the RSPCA. The programme commenced in September 2004 and was conducted each year until April 2009. It was initiated when members of the community in the Milton/Ulladulla region of NSW raised concerns about the number of foxes in the area. A community meeting was held with all stakeholders and community members invited, leading to the formation of a steering committee to develop and oversee the operation of the programme.

Shooting was the main method of culling as a group 1080 baiting programme was not feasible because of the small nature of many holdings; the proximity of dwellings in the area; and, the anti-baiting sentiment of many of the locals. A professional shooter was hired for the entire programme, and so he could cover the entire area it was divided into two: the first area operating during the spring of each year covering approximately 2500 ha around Lake Conjola/Croogyar Creek, north of Milton; and the second area operating during the autumn of each year, covering approximately 6000 ha in a region south of the first area down to Burrill Lake (just south of Ulladulla).

Each autumn and spring programme ran for 6 weeks each year, with shooting conducted over 20–30 nights (8 h/night) at each site. Spotlight counts were conducted over three consecutive nights a week before and after each programme to monitor fox abundance. The spotlight counts were conducted along the same route by the LHPA ranger using a white spotlight and 4WD vehicle. Additional monitoring was conducted in 2005 and 2006 with questionnaires being distributed all landholders in the area to collect data on changes in fox impact that may have occurred (e.g. livestock data, observations on native animal abundance).

Results

The number of foxes destroyed in each programme and the results from the population counts are shown in Figure 1. There was a significant effect of the fox shooting programme between pre and post counts (df = 1, $F = 42.24$, $P < 0.001$) and a significant difference across years (df = 4, $F = 19.93$, $P < 0.001$).

Of the 105 landholders that responded to the questionnaire (49% response rate), 67 had observed a reduction in the occurrence of foxes (sightings and sign), with 20 commenting that it only lasted up to 3–6 months after the programme. Thirty-five landholders observed no change

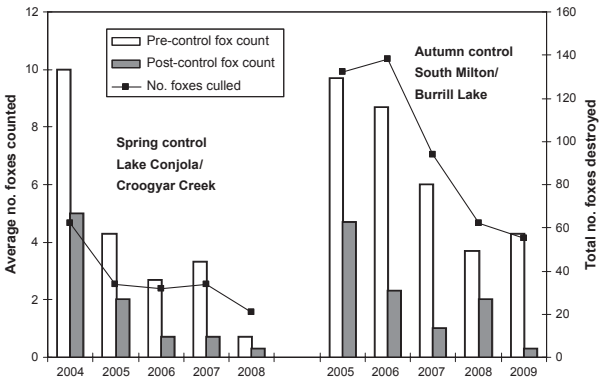

Figure 1. Results from the fox population counts pre- and post-control (average no. of foxes over three nights) and total number of foxes destroyed during fox control programs in the two areas covered by the program.

and three observed an increase in fox presence. Twenty-six landholders reported a beneficial reduction in predation after the programme (mainly a reduction in poultry predation and increase in native birds), while three landholders reported increased rabbit numbers.

Comments from programme participants were positive (e.g. 'pleased with current efforts', 'excellent program'). Reasons given for non-participation included a preference to conduct shooting themselves, no poultry or livestock present, perception that foxes controlled rabbits, no fox sightings on their land, and reliance on neighbours or government to conduct control programmes. One respondent felt that dog safety was an issue. One non-participator suggested that foxes should be tolerated.

Discussion

The population counts and landholders' observations suggest that the programme's objective of reducing fox numbers in the area appears to have been achieved, at least over the short term. However, the extent and duration of fox reduction cannot be ascertained because the spotlight monitoring method was not totally independent from the shooting itself. Both used spotlights to search for foxes and foxes can become spotlight shy, particularly after a shooting campaign. In addition, we did not monitor foxes that might have persisted in parts of the sites not covered by the transects.

In addition, as there has been no predictable relationship found between abundance and damage (Saunders & McLeod 2007), the effectiveness of fox control programmes cannot be measured reliably by the numbers of foxes shot. Ideally, the effectiveness of fox control programmes should be measured in terms of the response of the threatened population or in the increased agricultural production. Quantifying such changes was beyond the resources of this management project. However, we did find some positive feedback from landholders through the survey and anecdotal reports.

This programme demonstrated the importance of collaborative fox control programmes and the community ownership of the fox damage issue. The project was initiated by community members and was overseen by a committee made up of members from many stakeholder groups including local and state agencies, and the general public. As an alternative fox control programme for small holdings, the organisers as well as most of the participants believed this type of group programme was effective. Many more landholders were able to participate than one based on 1080 baiting, so a larger, more continuous area could be covered.

Unfortunately, however, this programme may have suffered from the same problem as those group baiting programmes that only occur once a year, with some respondents reporting that reduced sightings and impacts only lasted for 3–6 months, after which time the fox population began increasing again. The effectiveness of baiting programmes has been shown to increase when control is applied twice a year (McLeod *et al.* 2010) to cause maximum disruption to both the breeding and migration stages of the fox's life cycle. Funding and labour limitations prevented conducting this programme across the whole area twice a year. However, this should be considered to improve the programme's effectiveness over the longer term.

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Testing target-specific bait delivery for controlling feral pigs in a tropical rainforest

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Summary

Mitigation of feral pig (*Sus scrofa*) impacts in Australia's Wet Tropics World Heritage Area has been impeded by the lack of a target-specific method for delivering toxic baits in the region. This study evaluated methods to reduce bait-take by susceptible nontarget species without inhibiting bait-take by pigs, to enable more effective pig management. We predicted that dingoes would not select an unprocessed corn bait and that other potential nontarget bait consumers would be unable to access the same bait presented under a lightweight cover. Neither of these methods was expected to reduce bait selection or access by pigs. We tested these predictions by monitoring animal interactions with covered