Corvid interference with Canid Pest Ejectors in the southern rangelands of Western Australia

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Summary

Canid Pest Ejectors (CPE) are a method of population management that has recently been approved for the control of wild dogs and foxes in Australia. A pilot trial of CPEs (n = 10) targeting wild dogs was conducted in the southern rangelands of Western Australia in the winter of 2017. CPEs were deployed for 81 days, which included periods of significant rainfall. CPEs were not serviced during deployment, which is a likely situation for remote areas where access may be limited. During deployment, all ejector units corroded and plastic capsules containing 1080 degraded (but did not leak). For CPEs to remain effective in the field, they require regular inspections and servicing, particularly in wet conditions. Interference by nontarget corvid species was observed. Six CPEs were interfered with by corvids, with the lures removed from three, partially removed from another two and one disassembled. Our data suggest that corvid interference with ejectors may have a significant impact on the efficiency and safety of their use. Further investigation into the usefulness of Canid Pest Ejectors as method of canid control is required for rangeland use.

Introduction

Broad-scale baiting occurs regularly in Australia to control invasive pests for biodiversity conservation and land management, and to reduce losses to agriculture (Marlow *et al.* 2015). Successful bait uptake is reliant upon the target species locating the bait, consuming the bait and thereby ingesting a lethal dose of the toxin. While this process seems simple, multiple complicating factors can prevent this from happening, including behavioural and physiological aspects of the target species itself as well as nontarget species interference (Allsop *et al.* 2017).

Mechanical ejectors have been developed as an alternative to baits. The concept of mechanical ejectors was originally developed in the United States in the 1930s through the ‘humane coyote-getter’ (Robinson 1943), and further refined as M-44 ejectors in the 1950s (Shivik *et al.* 2014). The device consists of a lure head, poison capsule, spring-loaded piston and trigger. When the lure head is pulled upwards, the trigger is released, causing the piston to strike the poison capsule and eject its contents into animal’s mouth. The mechanical ejectors are designed to be specific for target species to eliminate the risk of sublethal doses due to toxin leaching and to reduce bait caching (Marks *et al.* 2003; Marks & Wilson 2005).

Testing and further refinement of the M-44 in Australia have resulted in the development of Canid Pest Ejectors (CPE) for use in controlling Red Fox (*Vulpes vulpes*) and wild Dog (*Canis familaris:* dingoes, feral/escaped domestic dogs and their hybrids). In June 2017, CPEs were made available for both commercial use and private use in WA (Department of Primary Industries and Regional Development and the Department of Health Western Australia 2017). In Australia, only canids have sufficient vertical pull force to activate the device’s trigger to release the poison, which promises increased specificity of CPEs (Animal Control Technologies Australia Pty Ltd 2017). Two published studies investigating these devices in Australia report CPEs to be an effective control method for foxes and wild dogs, with significant reductions in activity for both species following CPE deployment (Marks *et al.* 1999; Hunt *et al.* 2015). However, another pilot study confirmed only one fox activation from 18 CPEs set over 2 months despite 24 fox visitations (Moseby & Read 2014). In a small trial in the southern rangelands of Western Australia, we tested the effectiveness of CPEs deployed for the control of wild dogs.

Methods

This project was carried out between 27 July 2017 and 15 October 2017 under approval of the Murdoch University Animal Ethics Committee – RW2954/17.

Site description

The trial was conducted at a pastoral station in the southern rangelands of Western Australia. The region has an arid environment dominated by *Acacia* spp. woodlands with a mean maximum temperature of 38.2°C in January (summer) and 18.8°C in July (winter). The annual rainfall for the area is 239.1 mm (Mount Magnet Station, 007057; Bureau of Meteorology 2017). Rainfall in this area is cyclonically influenced, and significant flooding rainfall events can occur. This area has a history of sheep farming, although since 2009 most pastoralists in

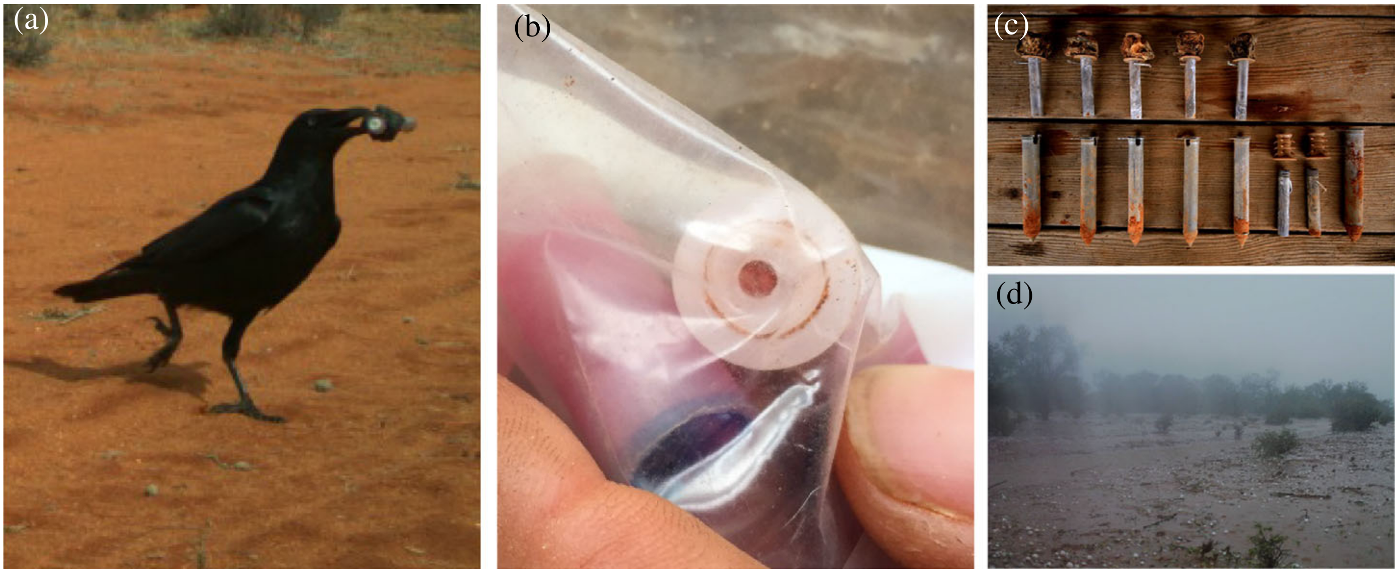

Figure 1. (a) Australian corvid (*Corvus* sp.) removing the ejector unit, trigger, poison capsule and lure head from a CPE, (b) degradation of the plastic capsule containing the 1080 poison, (c) corrosion of the CPE units, (d) hail events during the canid pest ejector monitoring and the flooding of wheel ruts on vehicle track and surface water run-off. [Colour figure can be viewed at wileyonlinelibrary.com]

the area have been unable to run small stock due to predation by wild dogs.

CPE placement and activity monitoring

Ten CPEs (Animal Control Technologies Australia Pty Ltd) were installed 3 km apart, in hard ground in the middle of station tracks, using the standard manufactured kangaroo dried meat lure head purchased with the CPE unit and a 6 mg 1080 capsule. Each CPE was positioned approximately 4 m in front of a Reconyx Hyperfire H500 remote sensing camera, mounted 0.3–0.5 m above the ground on a metal stake and directed at 22° facing down the track (Meek *et al.* 2012). The CPEs and cameras were deployed for a total of 81 days.

Weather

During the monitoring period, several significant rainfall events occurred at the study site, including hail (recorded on camera), totalling 71 mm of rain (Bureau of Meteorology 2017; Fig. 1d). It is probable that during this time, the CPEs were inundated.

Results

CPE observations

A total of 18,382 images were recorded by the cameras over the 81 days of monitoring (810 trap nights). A total of 436 triggers (three photographs were taken for each trigger event; a trigger event is defined as a species or multiples of a species seen on a camera within 10 min) by animals, including feral cat (*Felis catus*, $n = 41$), wild dog ($n = 1$), kangaroo (*Macropus robustus* and *M. fuliginosus*, $n = 259$), Echidna (*Tachyglossus aculeatus*, $n = 7$), Emu (*Dromaius novaehollandiae*, $n = 6$), European Rabbit (*Oryctolagus cuniculus*, $n = 75$), Varanus *sp.* ($n = 3$), corvids ($n = 20$), spinifex hopping mouse (*Notomys alexis*, $n = 1$), many varieties of small passerines ($n = 22$) and station stock ($n = 1$). During that time, no species triggered a CPE. Only two wild dog activity events (same occasion, two individuals) were captured on camera during the trial, and they did not interact with the CPE. At the time of the two wild dog records, the lure head had already been removed by a corvid (either an Australian Raven *Corvus coronoides* or Torresian Crow *C. orru*; both Corvidae species are potentially present at the site and are indistinguishable in most photographs).

Four CPEs remained unfired with an intact lure head at 81 days. The remaining six were interfered with by corvids. Lure heads were completely removed from three CPEs on days 19, 47 and 63 of the trial and had been partially removed from another two CPEs by corvids. A sixth CPE was partially disassembled by a corvid. This bird opened the locking ring and removed the ejector unit, trigger, poison capsule and lure head, which was found nearby (Fig. 1a).

None of the CPEs remained functional for the entire monitoring period. All ejector units experienced a build-up of corrosion internally, leading to the trigger and piston remaining locked in place (Fig. 1c). Eight of the ten 1080 capsules were degraded with a small hole at the end through the outer layer of plastic but did not appear to have leaked any poison (Fig. 1b). A test for the 1080 concentration would confirm whether leakage had occurred.

Discussion

Canid Pest Ejectors are designed to be target-specific. A study in the United States noted that many nontarget species interacted with or visited the area where M-44 ejectors were set up for the coyote (*Canis latrans*), yet the M-44 ejectors remained highly selective for the target species throughout the study, with only one noncanid activating an M-44 (Shivik *et al.* 2014). Studies performed in Australia also noted minimal occurrences of nontarget species triggering CPEs and few of the dried meat lures being removed from the CPEs (Marks *et al.* 2003; Marks & Wilson 2005; Hunt *et al.* 2015). By contrast with these studies, our data, while from a small trial study, suggest that corvids can significantly interfere with CPEs.

During this trial, lure heads of six of the ten deployed CPEs were removed or partially removed by corvids and one of these was partially disassembled by the bird. Similarly, Speed and Gentle (Unpubl. Data) recorded corvids 'showing interest' in CPEs although they did not trigger the devices, while Moseby and Read (2014) recorded that CPE firing may have been caused by a corvid on one occasion. Australian Raven has also been credited with removing toxic baits during baiting programmes, and relocating or caching baits around the landscape (Thomson & Kok 2002; Moseby *et al.* 2011; Dundas *et al.* 2014). Furthermore, recent wild dog bait uptake trials (conducted at the same site as the present study) identified that corvids frequently removed baits (T. L. Kreplins, M. S. Kennedy, P. Adams, P. W. Bateman, S. J. Dundas and P. A. Fleming, unpublished data). Corvids can therefore cause interference during canid control programmes that render the programme ineffective and make retrieval of the CPE units difficult. It has been suggested that application of a low-strength thread locker increasing the force required to unscrew the device would be a relatively easy fix to prevent disassembly by corvids.

Varanids also interfere with baits intended for wild dogs, foxes and feral cats (Algar *et al.* 2007; Woodford *et al.* 2012; Doherty & Algar 2015), especially in warmer months when the reptiles are active. It should be noted that the present trial was run during cooler months, when Gould's goanna (*Varanus gouldii*, which are present in large numbers across the study site) were comparatively inactive. This study therefore did not provide useful data on the potential for interference with CPEs by varanids.

Regular servicing or inspection of CPEs is essential, especially following wet weather. The CPE manufacturer's manual advises lure heads should be checked and refreshed when damaged, weathered or eaten by ants, although no service interval is specified in the CPE guide (Animal Control Technologies Australia Pty Ltd 2017). The mechanical component of the CPE should also be serviced regularly; this includes oiling (Animal Control Technologies Australia Pty Ltd 2017), with either canola oil (pers. comm., Animal Control Technologies Australia Pty Ltd) or alternatively, Singer sewing machine oil (Speed and Gentle, Unpubl. Data).

If the CPEs we deployed were serviced as per the CPE guide, the dried meat lure heads lost to corvids would have been replaced, and corrosion of the ejector units (probably due to the high level of rainfall) could have been avoided. The CPE materials used in this trial were designed for the US conditions, and there are plans to create an Australian version of CPEs made from a different alloy (pers. comm., Animal Control Technologies Australia Pty Ltd). Marks *et al.* (2003) checked their deployed M-44 ejectors weekly compared to this study's inspection of CPEs after 81 days. However, given the size of the southern rangeland properties and challenges associated with access at some times of the year, the duration of this trial represents the likely regularity of CPE servicing that would be undertaken by pastoralists in the region.

In conclusion, the efficacy of CPEs in controlling wild dogs could not be assessed due to low wild dog activity. Given the low sample size and limited nature of the study, we recommend a comprehensive trial across multiple seasons to assess target and nontarget responses to CPEs is required. Future trials in the southern rangelands of Western Australia are required to determine the efficacy of CPEs for wild dog population control.

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Minimising noise disturbance during ground shooting of pest animals through the use of a muzzle blast suppressor/silencer

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Summary

Lethal control of vertebrate animals through the use of firearms is a component of land management in Australia. The reduction in muzzle blast noise in the area surrounding the shooter provides the opportunity to decrease disturbance of nontargeted animals and nearby humans. This study identifies the reduction in environmental noise footprint provided by suppressor use. This suggests that the use of a suppressor to reduce noise from the muzzle blast may increase operational effectiveness of ground shooting while minimising adverse environmental effects.

Introduction

Ground shooting as a technique for the management of overabundant animal species is regularly undertaken in Australia. Land managers are constantly seeking ways to optimise outcomes and cost-effectiveness of ground shooting operations by maximising the number of animals killed per unit effort (time and materials) of ground shooting.

Ground shooting operations require a shooter to track and target animals which are then dispatched. During this process, nearby individuals (or groups) of animals may be disturbed by firearm noise, taking flight from the locality and effectively excluding themselves from the control activity. By attenuating the intensity of noise produced by a firearm, the disturbance to nearby animals may be reduced, thereby increasing the number of animals that can be targeted within a given time period and increasing the cost-effectiveness of ground shooting operations. Reducing noise may also be desirable when controlling animals in urban and peri-urban environments to minimise disturbance to nearby residents.

Sufficient projectile velocity needs to be maintained to confidently kill target animals (Caudell 2013; Hampton *et al.* 2016). Therefore, high-velocity, supersonic ammunition is commonly used in conjunction with a projectile of appropriate calibre and mass, particularly when targeting large animals. Use of this ammunition will produce a loud impulsive noise consisting of two major but distinct components. The first impulse is the 'muzzle blast' produced by expanding, hot gasses from the propelling charge, at their exit from the muzzle. The second impulse is from the motion of the supersonic projectile moving through