EVALUATION OF DIFFERENT BAITING STRATEGIES FOR THE CONTROL OF FERAL CATS IN EASTERN AUSTRALIA

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ABSTRACT

Feral cats (*Felis catus*) are notoriously difficult to control using traditional management approaches such as baiting, reportedly due to their preference for hunting live prey. Many factors, however, can potentially influence the success of feral cat baiting programs. As baiting efficacy is rarely measured, the factors contributing to low baiting success are often assumed, but poorly understood. We used a combination of camera traps and cat-borne GPS collars to measure the efficacy of two feral cat baiting programs at Taunton National Park (Scientific) in central Queensland. We trialled a fresh meat bait (the Queensland 'Curiosity 1080 Cat Bait', ~125 g fresh kangaroo meat, 6 mg 1080) during winter 2016, and a chipolata-style meat bait (Eradicat®, ~20g kangaroo mince, chicken fat and flavour enhancers, 4.5 mg 1080) during winter 2017. Track-based ground baiting using Curiosity baits was ineffective, with only 11% of collared cats killed and no observed reduction in population-level feral cat abundance across the site. Low track use by cats and rapid removal of baits by non-target species contributed to low bait encounter rates by cats. In addition, palatability of baits rapidly declined due to meat-ant infestations and bait desiccation. Aerially deployed Eradicat® baits were more effective, with 40% of collared cats killed, and a similar significant reduction in population-level feral cat abundance across the site. The key factors contributing to the observed differences in efficacy were compared and evaluated. We discuss the implications of our findings and recommend approaches to improve the efficacy of feral cat baiting programs.

Keywords: Curiosity, Eradicat®, efficacy, *Felis catus*, Queensland.

INTRODUCTION

Reducing the impact of feral cats is a key priority for many conservation and land managers, but feral cat populations are notoriously difficult to control. Baiting is often considered one of the most effective approaches for the landscape-scale control of wild dogs (*Canis familiaris*) and foxes (*Vulpes vulpes*), but it is often ineffective for controlling feral cats. Low baiting success has often been attributed to cats' preference for hunting live prey, however a range of factors could potentially influence the success of feral cat baiting programs to varying degrees. As baiting program efficacy is rarely measured, the factors contributing to low baiting success are often assumed, but poorly understood.

For any baiting program to be effective, five requirements need to be met. For each target animal, the baits must be: 1) encountered, 2) available, 3) attractive, 4) palatable, and 5) toxic. Accordingly, in order to understand the reasons for low baiting success and identify potential opportunities to increase baiting efficacy, each of these five stages need to be measured and quantified.

We used a combination of camera traps and cat-borne GPS collars to measure the efficacy of two different feral cat baiting programs at Taunton National Park (Scientific) in central Queensland, and to identify key components that could be improved to increase efficacy of future baiting programs.

MATERIALS AND METHODS

Study sites

Baiting trials were performed at Taunton National Park (Scientific) ('TNP') located in the Northern Brigalow Belt bioregion of central Queensland. Predator control programs are undertaken regularly across the 116 km^2 park to reduce numbers of wild dogs and feral cats that threaten the last naturally occurring wild population of the endangered bridled nailtail wallaby (*Onychogalea fraenata*) (Fisher et al. 2003; Department of Environment and Resource Management 2011).

A 120 km^2 'nil-treatment' (unbaited) site was also used to monitor any changes unrelated to baiting that may occur in feral cat populations and non-target species during the bait monitoring period. The nil-treatment site comprised three adjoining cattle properties located approximately 30 km to the north-east of TNP. No predator control activities were undertaken on these properties during the current study.

Baiting trials

We performed two baiting trials at TNP during 2016-2017 to test and compare the efficacy of two different cat baits. Baiting trials were conducted during the dry season each year, when activity of non-target and alternative prey species was at an annual low. Baits were deployed across the entire 116 km^2 park, however no baits were laid within 2 km buffer zones surrounding residences on neighbouring properties, nor within 500 m of the park residence (~10 km^2 excluded).

Trial 1: 'Curiosity' baits

We deployed the 'Queensland Curiosity 1080 Feral Cat Bait' at TNP on 3 August 2016. The bait comprised ~125 g of fresh kangaroo meat injected with 6 mg 1080 (sodium fluoroacetate). A total of 776 baits were surface laid along 155 km of tracks that dissected the park. Baits were spaced at 200 m intervals and were concealed in long vegetation or under logs or shrubs where possible to minimise removal by non-target species.

Trial 2: 'Eradicat' baits

We deployed the 'Eradicat®' feral cat bait at TNP on 26 July 2017. The ~20 g bait comprised a chipolata-style matrix of kangaroo meat, chicken fat, digestives and flavour enhancers, injected with 4.5 mg 1080. A total of 5 530 baits were lightly sprayed with permethrin (Coopex®, Bayer) to deter meat ants, and were aerially deployed across the park at densities up to 50 baits km^{-2}. Baits were dropped in groups of five every 200 m along flight transects spaced 500 m apart.

Monitoring

GPS collars

Prior to baiting, a number of feral cats (2016: 9 cats; 2017: 10 cats) were captured and fitted with GPS collars (Telemetry Solutions Quantum 4000E). Collars were programmed

to take high frequency fixes (every 15 mins) to monitor cat activity, bait encounter rates and mortality for 10-14 days following bait deployment.

Bait uptake cameras

For the 2016 Curiosity bait trial, 50 passive infrared heat and motion sensing cameras (Reconyx HC600) were deployed to monitor the uptake of 50 individual baits across five transects located in different areas of the park. Each 2 km transect consisted of 10 cameras to monitor 10 consecutive baits at 200 m intervals. Baits were monitored for 14 days or until the bait had been removed, whichever occurred first.

For the 2017 Eradicat bait trial, 75 passive infrared heat and motion sensing cameras (25 Reconyx HC600; 50 Ltl Acorn LT5310A) were deployed across three transects to monitor the uptake of 75 individual baits. Each 1 km transect consisted of 25 cameras, with clusters of five cameras monitoring groups of five baits at 200 m intervals between clusters. Baits were monitored for 14 days or until all baits in the cluster had been removed, whichever occurred first.

Population monitoring cameras

Camera traps (Reconyx HC600) were used to monitor changes in feral cat activity and abundance indices following baiting. Camera surveys were performed for 21 nights prior to baiting, and a further 21 nights after the 14-day bait monitoring period had lapsed. For each survey, 90 camera traps (both on- and off-tracks) were deployed across the baiting site, and a further 90 camera traps across the nil-treatment site.

Chemical residue testing

Collared cats that died during the 14-day bait monitoring period were retrieved within 48 hours of death. Stomach, intestine and liver samples were frozen and sent for chemical residue testing to confirm whether the cat had consumed a 1080 bait.

Data analysis

Baiting efficacy

Reduction in the feral cat population following baiting was estimated using a range of different measures and indices derived from collared cats and camera surveys, including 1) proportion of collared cats killed by baits; 2) reduction in naïve feral cat site occupancy (MacKenzie *et al.* 2002); 3) reduction in raw number of cat detections; and 4) reduction in the relative abundance of feral cats using the Royle Nichols abundance-induced heterogeneity model (Royle and Nichols 2003).

Factors influencing baiting efficacy

We used a combination of GPS activity and mortality data from collared cats, together with images from bait uptake cameras and population monitoring cameras to calculate bait encounter rates, availability, attractiveness, palatability and bait toxicity.

RESULTS

Trial 1: 'Curiosity' baits

Only 11% (1/9) of collared cats were killed during the baiting period after consuming a toxic bait within the first 24 hours after baiting. Population-level abundance indices all indicated no significant change in the feral cat population across the park.

GPS activity data revealed that cats were only active on tracks 4% of the time. Only 16% of monitored baits were encountered by cats during the 14-day monitoring period, but none were eaten. Baits were rapidly removed by non-target species, with 36% of monitored baits removed in the first two days, mostly by corvids. Bait palatability appeared to deteriorate rapidly, with meat ants deterring cats from eating baits encountered during the first 48 hours, followed by rapid desiccation of baits thereafter (Figure 1). Bait uptake plateaued after four days.

Trial 2: 'Eradicat' baits

Eradicat baits were more effective than Curiosity, with 40% (4/10) of collared cats killed during the 14-day monitoring period. Population-level abundance indices all indicated significant reductions (29-38%) in feral cat populations across the park.

Like Curiosity baits, Eradicat® baits were rapidly removed by non-target species, with 37% of monitored baits removed in the first 2 days, mostly by corvids. However, higher initial bait densities (~50 baits km^{-2}) meant that high bait numbers (>30 baits km^{-2}) were still available after two days, and up to 23 baits km^{-2} were still available after 14 days. Baits appeared to remain palatable longer that Curiosity baits, with collared cats consuming baits up to 11 days after deployment, and a steady rate of bait removal from days 1-14.

Figure 1. A feral cat mouthing a 6-day old desiccated Curiosity bait. After unsuccessfully trying to chew it, the cat eventually left without eating the bait.

DISCUSSION

We found that Curiosity baits were ineffective for feral cat control, with no observed reduction in the feral cat population. Eradicat® baits were more effective, yielding a 29-40% reduction in the feral cat population.

A number of factors contributed to the low baiting success using Curiosity baits, including:

1) *Low bait encounter rates*: the observed low cat activity along tracks suggests that the likelihood of cats encountering a bait deployed using track-based ground baiting programs is low. This could be improved by deploying baits to off-track parts of the

landscape as well as on tracks. Additionally, increasing bait densities would reduce the distance between baits and increase the likelihood of a cat encountering a bait.
2) *Low availability of baits to cats*: the rapid removal of baits by non-target species reduced the availability of baits to cats. Increasing bait densities would increase the number of baits still available to cats after some are removed by non-target species.
3) *Rapid declines in bait palatability*: many baits were infested with meat ants during the first 48 hours after baits were laid and became dried and tough thereafter. Baits sprayed with permethrin could deter meat ants, however addressing desiccation of fresh meat baits is more challenging and could only be improved by using a different bait with a different matrix.

Some of the suggested recommendations could potentially improve the efficacy of Curiosity baits for the control of feral cats. However, under current label conditions, changes such as increasing bait densities are not permitted using the Curiosity bait. To address these identified weaknesses and potentially improve baiting efficacy, a different bait, such as Eradicat® would need to be used. We found that Eradicat® addressed all the weaknesses identified with the Curiosity bait, and consequently yielded a significant reduction in the feral cat population. Eradicat® can be aerially deployed across the landscape, including off-track habitats, thereby increasing the likelihood that cats will encounter baits by taking the baits to the cats rather than rely on the cats to come out onto tracks to find the baits. Higher permitted baiting densities (up to 50 baits km^{-2}) further increased bait encounter rates, and increased bait availability to cats by reducing the effects of bait removal by non-target species, which is a common problem with baiting programs (Dundas *et al.* 2014). The protective sausage-like skin encapsulating the Eradicat® bait helped to prolong bait palatability by reducing desiccation, with collared cats still consuming lethal baits up to 11 days after baits were laid.

Our study highlights the importance of understanding the reasons for control program failure. Only when the factors contributing to failure are known can opportunities for improvement be identified and addressed, thereby improving the outcomes of pest animal control programs.

REFERENCES

Department of Environment and Resource Management (2011). 'Taunton National Park (Scientific) Management Plan.' (Planning Services Unit, Department of Environment and Resource Management, Brisbane).

Dundas S.J., Adams P.J. and Fleming P.A. (2014). First in, first served: uptake of 1080 poison fox baits in south-west Western Australia. *Wildlife Research* 41: 117-126.

Fisher D.O., Blomberg S.P. and Owens I.P.F. (2003) Extrinsic versus intrinsic factors in the decline and extinction of Australian marsupials. *Proceedings of the Royal Society of London Series B, Biological Sciences* 270: 1801-1808.

MacKenzie D.I., Nichols J.D., Lachman G.B., Droege S., Royle A.J. and Langtimm C.A. (2002). Estimating site occupancy rates when detection probabilities are less than one. *Ecology* 83: 2248-2255.

Royle J.A. and Nichols J.D. (2003). Estimating abundance from repeated presence-absence data or point counts. *Ecology* 84: 777-790.