Grooming traps and toxic trojans for targeted poisoning of feral cats (Available and potential new tools for control of feral cats)

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Introduction

Predation and disease transfer by feral cats continue to pose one of the most serious threats to small wildlife in Australia and elsewhere. Currently available techniques are unable to provide sustainable control of feral cats on mainland Australia to the level required for persistence or reintroduction of many threatened fauna. We review current and potential tools for feral cat control and identify key areas for further research and development

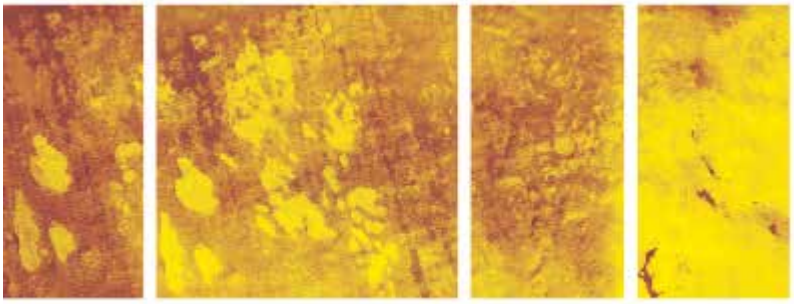
Biological Control

Biological agents are likely to provide the only feasible and sustainable (at least in the medium term) method for broadscale limitation of cat predation in Australia. Although several biological and social challenges limit the current availability of biological control agents for feral cats, we argue that community understanding and political will for the need for feral cat control has improved in recent years. This awareness is overcoming some of these barriers that may open doors for investigation of agents formerly considered off-limits in Australia.

In addition to promoting development of direct control agents for feral cats, we demonstrate dramatic declines in cat (and fox) populations following the spread of RHDV through rabbits, and associated response of several cat-vulnerable prey species using examples from Roxby Downs and Flinders Ranges. We propose that investment into improved biological control of key cat prey species (especially rabbits and house mice) may again yield cost-effective broadscale suppression of feral cat predation on threatened species.

Trapping

Conventional cage and leg-hold trapping of feral cats has been (and continues to be) important for control of cats in small areas of high biological value and also for eradication of cats from confined populations. However, feral cats are seldom attracted to baited traps when live prey are available and conventional trapping also suffers from many logistical, ethical and non-target challenges. Automated grooming



traps that spray toxin onto the fur of feral cats walking past, circumvent the need to lure wary cats into conventional traps and also eliminate the requirement to check traps on at least a daily basis. The grooming pathway also eliminates exposure to many nontarget species that are unable or unlikely to groom as fastidiously as feral cats (Read *et al*. 2014). Here we demonstrate current developments of an automated grooming trap that uses an array of sensors to distinguish cats from larger and smaller nontargets and instantaneously sprays them with a measured dose of toxin from a range of 4 metres. Because the new Grooming Traps can fire at a cat walking along a road or clearing, they should potentially be able to control any cat that is photographed by a camera trap.

Proposed developments include a fully programmable audiolure, a camera that records all activations and potentially radio frequency identification (RFID) readers and visual recognition software that can provide additional blocking tools to further minimise non-target exposure. Incorporation of technology to distinguish registered and tagged cats from strays or ferals will enable councils to control unregistered cats in jurisdictions where pet cats must be contained. At present these containment laws are largely benign due to the logistical challenges of identifying and enforcing control on wandering cats. Donors to this R&D, including South Australian Innovation Vouchers, Department of Environment, Water and Natural Resources, Sporting Shooters Association of Australia and the Foundation for Australia's Most Endangered Species Ltd, are gratefully acknowledged.

Baiting

Specially formulated poison baits have been integral to cat eradication from islands such as Faure (WA) (Algar *et al*. 2010) and have proven effective at short-term reductions in some mainland feral cat populations when conditions are favourable (Moseby and Hill 2011). However, poison meat baits have low uptake by feral cats in many areas when live prey are available or when weather conditions render baits unpalatable (Christensen *et al.* 2012). Increase in cat prey (including threatened species) is a desirable outcome of most feral cat control, which presents a conundrum for sustainable cat control using poisoned baits. Because cats are primarily visually-stimulated hunters rather than scavengers, bait uptake by scavenging birds, large reptiles and other mammals typically exceeds rates of cat ingestion of baits, which reduces their efficacy and poses nontarget and social risks in some environments.

Recent reviews have determined that rather than being generalist predators that are efficiently controlled using a standard tool such as a bait, individual cats often exert disproportionate predation pressure on threatened species (Dickman and Newsome 2015; Marlow et al. 2015, Moseby et al. in prep.). We propose to target those cats responsible for 'catastrophic' predation of threatened species by making their first

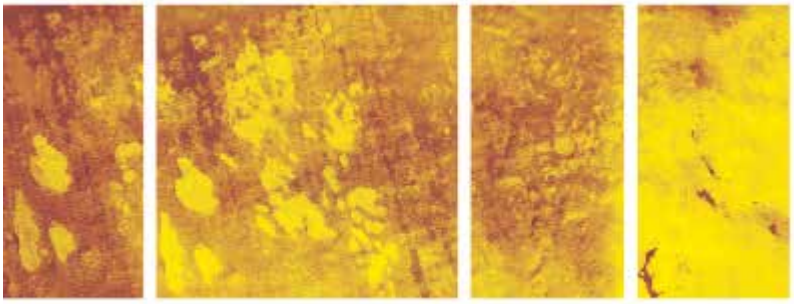
predation event lethal, rather than the cats learning to target remaining members of the threatened species population (Read *et al*. in prep.). *In situ* and particularly reintroduced threatened species could be fitted with an attachment to their radio-collar or harness that releases toxins into a cat's mouth when it seizes its prey on the back of the neck. Alternatively, a toxic dose could be contained within a microchip-style capsule that is inserted into live individuals of species preyed upon by cats. This capsule would be stable at the neutral pH of the subcutaneous environment but dissolve in the acidic gut of a cat. Both the kill collars and toxic implants are effectively creating 'live baits' that appeal to cat's hunting instincts and are far less available, and potentially less toxic, to nontarget scavengers than conventional baits.

Toxic Trojans

Cat predation on several threatened wildlife species in south-west WA has been restricted by the poisoning of cats feeding on more tolerant prey species that have consumed toxic seeds of several *Gastrolobium* species (Short et al. 2005). Historical accounts suggest that consumption of the flesh and even the bones of pigeons and other prey that have eaten *Gastrolobium* can be fatal for cats (Peacock *et al*. 2011), suggesting toxins other than 1080, which is not incorporated during ossification, may also be present in these seeds (Peacock 2003). The abundance and distribution of *Gastrolobium*, along with its ecological role in safeguarding threatened species from cat predation, has declined and we advocate for research and trials of the benefits of restoring and promoting *Gastrolobium*, through appropriate fire or disturbance regimes, to confer advantages to cat-vulnerable prey. We also note that cats are particularly sensitive to toxins found in a variety of other native and exotic plants and suggest that attention is paid to identifying whether changes in these species could help explain contemporary declines in cat-sensitive fauna in northern Australia. Enhancement, reintroductions, or introductions of toxic plants may prove to be a cost effective and sustainable means to curb cat predation in a range of environments, provided that weediness and off-target poisoning issues are manageable.

An alternative technique to render live cat prey toxic to feral cats is to make toxic food pellets or grain available to targeted prey species. Bronzewing pigeons, for example, are tolerant of *Gastrolobium* and 1080 and could be provided with 1080 oats or *Gastrolobium* seed at sublethal doses that render them lethal to predating cats. Targeted cat control could thus be provided by multiple toxic feeding stations for pigeons and potentially other species that could act as a permanent predator sink for immigrating cats.

Further justification and details of these novel potential feral cat control techniques will be available in Moseby et al. (in prep.) and Read et al. (in prep.), which have been submitted for publication. Financial and logistical requirements for future R&D



and trials of these techniques to deliver continuous targeted cat control are discussed.

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