

Project Plan SP 2015-016

Improved fauna recovery in the Pilbara – benefitting the endangered northern quoll through broad-scale feral cat baiting.

Animal Science

Project Core Team

Supervising Scientist	Russell Palmer
Data Custodian	Russell Palmer
Site Custodian	

Project status as of Sept. 22, 2020, 11:32 a.m.

Approved and active

Document endorsements and approvals as of Sept. 22, 2020, 11:32 a.m.

Project Team	granted
Program Leader	granted
Directorate	granted
Biometrician	granted
Herbarium Curator	not required
Animal Ethics Committee	granted

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Biodiversity and Conservation Science Program

Animal Science

Departmental Service

Service 6: Conserving Habitats, Species and Communities

Project Staff

Role	Person	Time allocation (FTE)
Supervising Scientist	Russell Palmer	1.0
Technical Officer	Hannah Anderson	1.0
Technical Officer	Brooke Richards	1.0

Related Science Projects

None

Proposed period of the project

Aug. 1, 2014 – Dec. 31, 2015

Relevance and Outcomes

Background

Since European settlement, 29 (9.2%) of Australia's terrestrial mammal species have become extinct, and another 57 species (18.3%) have declined significantly and are considered threatened (Woinarski *et al.* 2014). Predation by introduced predators (particularly the European red fox and feral cat) has been identified as a significant factor in mammal declines in Australia. In the 1980-90s, predation by foxes was shown to be a significant threatening process for native fauna (Kinnear *et al.* 2002, Morris *et al.* 2000). More recently, feral cat predation has been identified as a major issue (Fisher *et al.* 2014, Wayne *et al.* 2013) and Woinarski *et al.* (2014) regard this as the factor now affecting the largest number of threatened and near threatened mammal taxa.

Twelve species of terrestrial mammal have become extinct on the Pilbara mainland in the last 200 years, and another seven species have declined (McKenzie *et al.* 2006). Fortunately, some of the species that have become extinct on the mainland still persist on offshore islands (Abbott and Burbidge 1995). A review of the conservation values, threats and management options for biodiversity conservation in the Pilbara (Carwardine *et al.* 2014) identified that for terrestrial vertebrates of conservation significance, feral cat control would provide most benefits but probably had a low chance of success. However, without cat control it is likely that another five species of terrestrial vertebrate will become functionally extinct in the Pilbara in the next 20 years, and another 18 species will continue to decline.

The northern quoll (*Dasyurus hallucatus*) is one of the seven Pilbara medium-sized mammal species that has persisted in the Pilbara bioregion (McKenzie *et al.* 2006). All of these species, except perhaps the echidna (*Tachyglossus aculeatus*), have declined to some extent in the Pilbara, and three, including the northern quoll, are listed as threatened species. The northern quoll was once distributed widely across northern Australia from the Pilbara and Kimberley across the Top End to southern Queensland, but as now contracted to several disjunct populations (Braithwaite and Griffiths 1994, Oakwood 2008). An alarming decrease or complete collapse in once locally abundant populations of northern quoll has occurred in recent years as a direct result of the invasion of the cane toad, *Rhinella marina* (Woinarski *et al.* 2008; Woinarski *et al.* 2010). Three other factors have also been identified as contributing to the decline of northern quolls and other medium-sized mammals across northern Australia: changed habitats through widespread fires, predation by feral cats, and novel disease (Woinarski *et al.*

al. 2011). Due to these factors, the northern quoll is listed as Endangered under both the Commonwealth's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act 1999) and the Western Australian *Wildlife Conservation Act 1950*.

The *Eradicat*® feral cat bait will shortly be registered for operational use in WA and could potentially be used in the Pilbara to reduce feral cat (and fox and dog) densities and improve conservation outcomes for northern quolls and other threatened fauna such as the bilby (*Macrotis lagotis*) and mulgara (*Dasycercus* sp.). Prior to using operationally, potential non-target bait impacts have to be identified and resolved. As a top order native predator, the northern quoll is at a potential risk to poisoning after ingestion of the sausage baits. Based on a 1080 LD₅₀ of 7.5mg/kg (King *et al.* 1989), an average size Pilbara northern quoll (380-580g) would only need to ingest approximately one cat toxic bait to be at risk. Calver *et al.* (1989) identified that in the laboratory, the northern quoll was at risk from accidental poisoning from crackle baits containing 1080 for dingo control. However, King (1989) showed that an aerial dingo baiting program did not pose a hazard to free ranging northern quolls. A field trial using toxic cat baits and closely monitored northern quolls is the only certain way of assessing cat baiting risk to a free-ranging northern quoll population. Assessing the impact on quolls of baiting to control feral cats in the Pilbara is an important component in the development of a landscape scale program to control introduced predators and reduce the extinction risk for northern quolls and other medium-sized mammals in the Pilbara.

Aims

- To assess the field uptake of feral cat baits *Eradicat*® by northern quolls *Dasyurus hallucatus*, and impact on survivorship.
- To develop an effective cat control strategy that will benefit the northern quoll and other threatened fauna in the Pilbara

Expected outcome

- An effective feral cat baiting strategy in areas of the Pilbara where northern quolls occur.
- Improved conservation outcomes for northern quoll and other threatened Pilbara fauna.

Knowledge transfer

Parks and Wildlife regional staff, mining companies, consultants.

Tasks and Milestones

Tasks	Outputs	Timelines
Undertake Yarraloola site reconnaissance.	Knowledge of logistics, access, and potential study sites	August / September 2014
Organise and hold planning workshop.	Report on reconnaissance, record of meeting, agreement on design of bait uptake study – sites, methods.	October 2014
Identify likely areas for the cat baiting trial – 20,000ha cat baited area on Yarraloola, plus Red Hill control site (unbaited).	Maps showing baited and unbaited sites.	October 2014
Prepare operational introduced predator control program.	Indicative plan prepared, may need to be adjusted following results of quoll cat bait uptake trial.	October 2014, review and revise if necessary in October 2015.
Meet with traditional owners regarding 1080 baiting risks.	Agreement from TOs for baiting program to continue.	November 2014

Pen trial to assess quoll ability to wear GPS radio-collars (includes sourcing 4 quolls from the wild for trial).	Knowledge on whether GPS collars can be used on quolls.	February 2015
Undertake 1080 baiting risk assessment, warning signs, notify neighbours (Pilbara Region). Obtain APVMA approval for cat bait trial (approval for 2014 program obtained, but need to re-apply for 2015).	Approval for cat baiting to proceed.	March 2015
Trapping of Yarraloola (baited) and Red Hill (unbaited control) sites to assess quoll numbers, and fit VHF radio-collars. Some GPS collars may be deployed depending on outcomes of trial in Feb and numbers of quolls trapped.	Sufficient quolls for radio-collaring (n= at least 20 at each site, approx. equal sex ratio)	April - May 2015
Select area to be cat baited at Yarraloola to ensure adequate coverage of sites with radio-collared quolls.	Appropriate cat baiting cell provided to Western Shield.	First week of June 2015
Monitor pre-baiting survivorship of quolls via aerial and ground radio-tracking, camera array.	Ensure all quolls are alive before baiting.	June/early July 2015
Aerial baiting undertaken.	Cat baits delivered to impact site 50 baits / km ²	Early July 2015
Monitor post-baiting survivorship of quolls via aerial and ground radio-tracking, camera array.	Assess impact of baiting on quolls through survivorship.	Mid – July to late August
Monitor breeding success of quoll (sub-lethal 1080 impacts) via trapping.	Assess impact of baiting on quolls through breeding success (presence and persistence of pouch young)	September – October 2015
Prepare report on cat baiting study for Rio Tinto.	Final report submitted to Rio Tinto	November 2015
Prepare paper for publication.	Paper submitted to journal	December 2015

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Study design

Methodology

a) Study sites: This trial will be undertaken at two sites in the western Pilbara region of WA. An approximately 20,000 ha site on Yarraloola pastoral lease (managed by Rio Tinto) will be baited with *Eradicat®* feral cat baits, and another site at Red Hill pastoral lease, 60 km south of Yarraloola, will be used as an unbaited control site. The actual sites will be determined in March/April 2015 taking into account accessibility and presence of adequate numbers of northern quolls.

Habitat attributes will be recorded at all sites on Yarraloola and Red Hill where quolls are trapped using the standard habitat data sheets for the northern quoll Pilbara regional monitoring project (Dunlop *et al.* 2014). These will be incorporated into the regional predictive habitat modeling project currently underway with Edith Cowan University. Fire history and other disturbances such as livestock impacts will also be assessed.

b) Cat baiting: Approximately 10,000 *Eradicat®* feral cat baits will be dropped from a twin-engine aircraft at an altitude of 500 'agl) and travelling at 130kts, at a density of 50 baits / km² (Algar *et al.* 2013). Each bait will contain 4.5 mg 1080, and the biomarker Rhodamine B. The presence of Rhodamine is detected in animals as a pink dye around the mouth, in the gastro-intestinal track, and in scats and provides evidence that a bait has been consumed. Baiting will be undertaken in early July when diurnal and nocturnal temperatures are the coolest as this factor enhances uptake of baits by feral cats (Note: the effectiveness of cat baiting on feral cats is not being assessed during this trial). The track of the aircraft and GPS location of each cat bait drop will be recorded, and overlaid on known quoll locations (from trapping and radio telemetry) to ensure the quolls are in close proximity to cat baits and have the opportunity to consume them. Note that an indicative baiting cell will be provided to Western Shield by end of May 2015, but that this can be refined until mid-June, to ensure baits are dropped in the areas where quolls have been trapped, and move to.

c) Northern quoll survivorship: The impact of feral cat baiting on northern quolls will be assessed by comparing survivorship at the Yarraloola and Red Hill sites, before and after cat baiting at Yarraloola.(BACI

design). Survivorship will be assessed by two methods a) survival of radio-collared individuals at each site, and b) detection of quolls on a camera array.

The analysis of northern quoll survivorship will be undertaken using the Kaplan-Meier procedure, as used by Pollock *et al.* (1989). The survivorship rate of quolls (based on radio telemetry study) in the cat baited area will be included in a Population Viability Analysis (PVA, VORTEX: Lacy *et al.* 2009) to assess the longer term impact of cat baiting on the Yarraloola northern quoll population. Prediction of the risk of population extinction can be made using parameters such as demographic structure, mortality and survival rates, and reproductive rates (Brook *et al.* 2000). These can be derived either from this study (if available), from the Pilbara regional quoll monitoring program, or from other quoll demographic studies e.g. Oakwood 2000). The risk to the quoll population will be determined by examining the population trends provided by the PVA. The risk would be considered unacceptable if the PVA identifies that the population will decline to extinction.

d) Northern quoll trapping and monitoring: Quolls will be trapped using transects of 50 small Sheffield cage traps baited with peanut butter, oats and sardines. This is similar to the methodology used by the northern quoll regional monitoring project (Judy Dunlop). Traps will be covered with a hessian bag for protection of any trapped animal, and placed in a sheltered, shady location. Traps will be set along rocky breakaways where quolls are known to be (from preliminary surveys). Trapped quolls will be weighed, measured and sexed, and a small tissue sample taken from the ear for DNA analysis. At least 20 adult quolls (380-580 g body weight) will be fitted with VHF neck mounted radio-transmitters fitted with mortality mode (Sitrack, 18g). These radio-collars will be tasked with operating only during daylight hours to prolong battery life for six months. A radio-transmitter failure rate of 10% is anticipated and will be taken into account when trapping quolls. It is intended to fit radio-collars to equal numbers of males and females, and to have equal numbers of quolls radio-collared at the Yarraloola baited site and the Red Hill control site. Quolls will be re-trapped in August to remove radio-collars. Trapping will be repeated in September/October to assess whether breeding is occurring (presence and persistence of pouch young). A small number of quolls may be fitted with GPS collars if pen trials with these new radio-collars are successful. These would provide information on movements and habitat use of the quolls before and after cat baiting.

Ground and aerial radio-tracking will be undertaken in the 4-6 week period prior to cat baiting and 8 week period post cat baiting to determine survivorship of the radio-collared quolls. If dead quolls are detected through the mortality signal, carcasses will be retrieved where possible and autopsied to determine cause of death. In particular, the carcasses will be examined closely for the presence of the Rhodamine B pink dye.

Two remote cameras (Reconyx Hyperfire HC900) will be set at each of the trapping transects to monitor presence of quolls at Yarraloola before and after cat baiting. Where possible individual quolls will be identified using their unique spot pattern (Hohnen *et al.* 2013). Remote cameras will also be used to monitor the uptake by quolls of non-toxic cat baits placed in front of cameras at the Red Hill control site.

References:

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Biometrician's Endorsement

granted

Data management

No. specimens

[variant=american]None anticipated, but any dead quolls recovered will be autopsied, and provide to the WA Museum if required. Ear tissue will be taken from all quolls captured and lodged with the WA Museum.

Herbarium Curator's Endorsement

not required

Animal Ethics Committee's Endorsement

granted

Data management

A MS Access data base will be developed and populated with the relevant spatial and morphometric capture data for the northern quolls.

Remote camera images will be cataloged and managed with an open source MS Access data base (Camera Base - <http://www.atrium-biodiversity.org/tools/camerabase>) which has been developed specifically for camera trapping data analysis.

All data will be backed up on the Parks and Wildlife (Woodvale) server.

Budget

Consolidated Funds

Source	Year 1	Year 2	Year 3
FTE Scientist	75,000		
FTE Technical	15,000		
Equipment	12,000		
Vehicle			
Travel			
Other			
Total	102,000		

External Funds

Source	Year 1	Year 2	Year 3
Salaries, Wages, Overtime	309,100		
Overheads	18,000		
Equipment	33,200		
Vehicle	Covered by Rio Tinto		
Travel	Covered by Rio Tinto		
Other: Fuel Cat baiting Radio tracking (DPaW) Travel (allowance) Region - liaison with neighbours	- 12,600 11,000 10,200 16,200 20,000		
Total	425,000		