

## **Project Plan SP 2011-005**

# **Ecology and management of the northern quoll in the Pilbara**

**Animal Science**

### **Project Core Team**

<b>Supervising Scientist</b>	Judy Dunlop
<b>Data Custodian</b>	Judy Dunlop
<b>Site Custodian</b>	Judy Dunlop

### **Project status as of Feb. 26, 2020, 12:25 p.m.**

Approved and active

### **Document endorsements and approvals as of Feb. 26, 2020, 12:25 p.m.**

<b>Project Team</b>	granted
<b>Program Leader</b>	granted
<b>Directorate</b>	granted
<b>Biometrician</b>	required
<b>Herbarium Curator</b>	not required
<b>Animal Ethics Committee</b>	not required

# Ecology and management of the northern quoll in the Pilbara

## 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	Judy Dunlop	1.0
Technical Officer	Neal Birch	0.5

## Related Science Projects

### Proposed period of the project

None – None

## Relevance and Outcomes

### Background

The northern quoll, *Dasyurus hallucatus*, is the smallest of all Australian quolls (300 – 1000g) and is restricted to five regional populations across Queensland, the Northern Territory and Western Australia, both on the mainland and offshore islands. The species distribution has declined gradually over the last 50 years with a number of threats, either directly or in combination with each other, thought to be contributing to the species decline. Threats include mortality caused by poisoning from cane toads, inappropriate fire regimes (and predation by introduced animals after fire) and the removal, degradation and fragmentation of habitat as a result of development actions, mining activities and pastoralism. The northern quoll is listed as a threatened ('Endangered') species under the Commonwealth's Environment Protection and Biodiversity Conservation Act 1999. A recovery plan has been prepared (Hill and Ward 2010), and the research proposed is consistent with the actions of this plan. Northern quolls occupy a variety of habitats across their current range including rocky areas, eucalypt forest and woodlands, rainforests, sandy lowlands and beaches, shrublands, grasslands and desert. Habitat usually requires some form of rocky area or structurally diverse woodland/forest for denning and shelter purposes with surrounding vegetated habitats used for foraging and dispersal. Northern quolls are a highly mobile species with home ranges in the northern parts of their range known to cover 100 ha or more. They reproduce once per year and have on average seven young. Many of the males and females have only a short lifespan, surviving for one breeding season. However where resources are more abundant some males and females will survive into their second or even third breeding season. Little is known about northern quolls in the Pilbara region of WA. Most information on the demographics, biology and ecology of this species comes from studies conducted in the Kimberley, Northern Territory or Queensland (Begg, 1981; Schmitt et al., 1989; Braithwaite & Griffith, 1994; Oakwood, 1997 & 2000). These studies have highlighted differences in the northern quoll's ecology between regions and populations and a need to address the gaps in our knowledge of the species in the Pilbara. Genetic studies indicate a primary genetic division between Western Australian populations (Kimberley and Pilbara) and Northern Territory / Queensland populations of the northern quoll (How et al. 2009). These authors further show that there is also marked genetic divergence between the Kimberley and Pilbara populations, and identify the Great Sandy Desert as a substantial and long standing barrier to gene flow.

## Aims

The aim of this project is to improve our understanding of northern quoll population distribution, ecology and demographics in the Pilbara and provide information to environmental regulators and resource development companies that will allow appropriate management to ensure the persistence of resident northern quoll populations.

There are two major components of the project.

1. Regional monitoring - Regional survey and monitoring of Pilbara northern quoll populations over 10+ years.
2. Disturbed area monitoring - Monitoring northern quoll populations at disused BHPBIO mine sites and quarries over a three to four year timeframe to provide information relevant to impacts identified in the EPBC Act Policy Statement on Significant Impact Guidelines for the Endangered Northern Quoll *Dasyurus hallucatus* (DSEWPac 2011). These impacts include: Loss of known or potential habitat critical to the survival of the species; Loss of known or potential foraging / dispersal habitat; Introduction of barriers restricting dispersal opportunities and genetic flow.

## Expected outcome

- Improved understanding of northern quoll ecology in the Pilbara and comparison with published studies in the Kimberley, Northern Territory and Queensland.
- Better management of northern quoll populations in and around mining sites and other developments.
- Confirmation of taxonomic and conservation status of the Pilbara northern quoll population.
- This project will provide a model for other proposed regional fauna projects in the Pilbara.

## Knowledge transfer

- DSEWPac – provide guidance with quoll survey and monitoring protocols and the development of impact guidelines.
- Pilbara mining industry - provide information to resource development companies that will allow appropriate management of mining sites to ensure the persistence of resident northern quoll populations.
- Consultants – provide information and guidance relating to quoll monitoring and survey protocols.
- Other researchers – provide opportunities for more integrated and collaborative research projects to be undertaken, share knowledge with other participants.

## Tasks and Milestones

### Major task

#### Milestones

#### Outputs

1. Undertake literature review
  1. Assess the type of distributional information to be collected in liaison with DSEWPac and subject matter experts by August 2010.
  2. Set up data spreadsheet.
  3. Complete search of DEC, EPA, and WAM libraries for published and unpublished literature on northern quolls and other EPBC Act listed species by October 2010.
  4. Complete report and lodge in DEC Library by November 2010.
    1. Literature review report, spreadsheet and bibliography.
2. Develop a Pilbara wide survey and monitoring program
  1. Develop an effective survey protocol for northern quolls by April 2012.
2. Identify the key quoll and habitat data variables to be collected at monitoring sites, develop appropriate datasheets by August 2011.
  3. Identify an appropriate spatial scale and pattern for a Pilbara wide monitoring program by December 2011.
  4. Identify key landholders, mining companies etc for consultation re quoll distribution by December 2011.
    1. Northern quoll survey and monitoring protocols.
  2. Data collection field sheets.
  3. Undertake quoll survey and landholder consultation
    1. Commence field surveys and data collection using protocols developed above, by April 2012.
    2. Develop appropriate databases for storage of data.
    3. Commence landholder consultation re quoll distribution by May 2012.

1. Annual progress reports.
2. Technical Report on northern quoll distribution in the Pilbara.
4. Implement Pilbara wide monitoring program
  1. Conduct annual monitoring at sites selected from Project 3 above, commence in May 2013.
  2. Analyse data, ongoing
1. Annual progress reports
2. Technical reports.
3. Published paper on population trends and factors influencing.
5. Undertake ecological and demographic study at selected sites
  1. Establish study sites by May 2013.
  2. Commence ecological, mark-recapture and radiotracking studies, ongoing.
  3. Compare life history traits to Kimberley, NT and Qld northern quoll populations, ongoing.
4. Compare population genetic structure and variation, within the Pilbara, and between WA, NT and Qld populations, by December 2013.
  5. Examine potential impacts of mining activities on quoll ecology and survivorship, by December 2014.
1. Annual progress report.
2. Published papers.
3. Protocols for quoll management on mining sites.

## References

- Begg, R.J., (1981). The small mammals of Little Nourlangie Rock, N.T III. Ecology of *Dasyurus hallucatus*, the Northern Quoll (Marsupialia: Dasyuridae). *Wildlife Research*, 8, 73-85.
- Braithwaite, R.W. and Griffiths, A.D., (1994). Demographic variation and range contraction in the Northern Quoll, *Dasyurus hallucatus* (Marsupialia: Dasyuridae). *Wildlife Research* 21, 203-217.
- DSEWPAC (2011). EPBC Act Policy Statement 3.21 – Significant Impact Guidelines for the endangered northern quoll *Dasyurus hallucatus*.
- Hill, B. and Ward, S. (2010). National recovery plan for the Northern Quoll *Dasyurus hallucatus*. Northern Territory Department of Natural Resources, Environment, the Arts, and Sport, Darwin.
- How, R.A, Spencer, P.B.S., and Schmitt, L.H. (2009). Island populations have high conservation value for northern Australia's top marsupial predator ahead of a threatening process. *Journal of Zoology* 278: 206-217.
- Oakwood, M. (1997). The ecology of the northern quoll *Dasyurus hallucatus*. PhD Thesis, ANU.
- Schmitt, L.H., Kemper, C.M., Kitchener, D.J., Humphreys, W.F. and How, R. A., (1989). Ecology and physiology of the northern quoll, *Dasyurus hallucatus* (Marsupialia, Dasyuridae), at Mitchell Plateau, Kimberley, Western Australia. *Journal of Zoology*, 217, 539-558.

## Study design

### Methodology

#### Site selection:

Pilbara-wide distribution/detection study: Motion sensor cameras will be deployed at up to 100 sites to record presence/absence data and patterns of distribution across the Pilbara region, and to assist in identifying key quoll habitat characteristics. This will also facilitate the identification of appropriate long-term monitoring sites.

Regional monitoring: Based on existing knowledge of the distribution of the northern quoll in the Pilbara region and consultation with landholders and regional DEC staff, surveys will be undertaken using motion sensor cameras (as described above) and preliminary trapping to identify sites where northern quolls are relatively abundant. Up to 9 monitoring sites will then be established across the region.

Disturbed areas monitoring: Disturbed areas have been identified by BHPBIO and include three quarries and two mining areas. These have been matched with analogue sites 5 km from the disturbed site.

#### Survey and monitoring:

Once suitable monitoring sites are identified trap locations will be fixed and marked for the duration of the study. Depending on the habitat present trapping array will consist of grids or parallel transects utilising small Sheffield wire cage traps (45 cm x 17 cm x 17 cm). Where grids are used, at each site one grid of 50 traps will be deployed consisting of 5 rows of 10 traps spaced 50 m apart with 100m between rows. In linear habitats two transects of 25 traps spaced 50 m apart will be used. Traps will be opened for 4 consecutive nights at each

site (200 trap nights). Trapping will be conducted 2 times per year at each site. One trapping session will be conducted after dispersal on juveniles and prior to the onset of the breeding season (April-May) and the second after breeding activity has ceased (Sept-Oct) to obtain data on breeding success and male survival.

Effective trapping area for quolls will be estimated from movement data collected by radiotracking studies. Relative abundances and population densities can then be calculated and compared. Trapping will be supplemented with motion sensing cameras (10 per site).

All captured quolls will be implanted with a subcutaneous microchip for individual identification. Photographs of dorsal and lateral spot patterns will be taken to enable identification of individuals from motion sensor camera images.

Standard measurements of captured quolls will be taken – body weight, short pes length, head length, age estimation, sex and breeding condition. In addition, a small amount of ear tissue will be collected from all individuals at initial capture for genetic comparison, both within the Pilbara and with Kimberley, Northern Territory and Queensland populations. A small amount of blood will also be collected to screen for blood parasites. Scats will be collected opportunistically for dietary analysis and frozen for faecal steroid analysis. Morphometric, dietary, breeding and genetic information will be compared with other populations of northern quolls.

Radiotransmitters will be fitted to a sample of quolls at selected sites to obtain estimates of home range (using RANGES VII) and to obtain information on diurnal den sites. Field trials will be undertaken with GPS transmitters to establish whether a small enough transmitter can be developed to suit northern quolls. This would allow more accurate information on habitat use, home range, movements and denning sites to be obtained.

Impact of mining activities:

Additional trapping grids or transects will be established at disused mine sites and quarries that are / were considered to be suitable northern quoll habitat. Analogue sites at least 5 kilometres from each disturbed site will also be trapped. Captured quolls will be processed as above. Depending on survey outcomes and with the support of BHPBIO, it is possible that one or more of these sites will be incorporated into the Pilbara regional northern quoll monitoring program.

Analysis:

Existing records and preliminary trapping indicate that quolls have a wide distribution in the Pilbara region yet occur at relatively low densities with seasonal peaks in abundance. Because of anticipated low capture rates and seasonal fluctuations in population density it will be necessary to monitor over a long period to detect any changes or trends in abundance and demography in this species. If preliminary trapping success rates at long-term monitoring sites are low it may be necessary to reduce the number of sites and increase trapping effort over increased areas at fewer sites. Data will be analysed to detect population trends using MARK software and population viability using VORTEX software. Control charts will also be trialed for monitor long-term trends and status of quoll populations.

Habitat attributes will be recorded at all sites (including camera and trapping survey sites) and analysed to help predict the spatial distribution of suitable habitat and the probability of quolls occupying at locations based on environmental attributes.

## **Biometrician's Endorsement**

required

## **Data management**

### **No. specimens**

No northern quolls will be intentionally taken as specimens. however, if any are killed accidentally, or found as road kill, they will be lodged with the WA Museum.

## **Herbarium Curator's Endorsement**

not required

## **Animal Ethics Committee's Endorsement**

not required

## Data management

Access databases will be established for this project. Data will be backed up on the Woodvale server. Annette Cook and Keith Morris.

## Budget

### Consolidated Funds

Source	Year 1	Year 2	Year 3
FTE Scientist			
FTE Technical			
Equipment			
Vehicle			
Travel			
Other			
Total			

### External Funds

Source	Year 1	Year 2	Year 3
Salaries, Wages, Overtime			
Overheads			
Equipment			
Vehicle			
Travel			
Other			
Total			