Ecology and management of the northern quoll *Dasyurus hallucatus* in the Pilbara

Progress report 2013/2014

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Contents

Figures

Tables

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Summary

This report summarises the work undertaken on the conservation and monitoring of the northern quoll (*Dasyurus hallucatus*) in the Pilbara during the period 2013-2014.

Work undertaken during this period included:

1. Refinement of the project plan and experimental design.
2. Collation of current and historic distribution data.
3. Launch of the NatureMap Threatened Species Portal.
4. Finalisation of ten sites to be trapped for long term monitoring.
5. Extensive searches in the south-east Pilbara region for potential additional sites.
6. Development of standard monitoring protocols to be used by Parks and Wildlife as well as external agencies.
7. Establishment of a collaboration with Edith Cowan University to undertake species distribution modeling.
8. Trapping undertaken at regional monitoring sites for the first time.
9. Collection of DNA samples for genetic analysis

1 Refinement of the Project Plan

Following the Pilbara northern quoll workshop and key priorities identified, we refined the goals for the long term monitoring project. Specifically, we aim to:

1. determine the northern quoll distribution in the Pilbara (including updating NatureMap records), and enhance our understanding of processes influencing distribution.
2. estimate northern quoll abundance in the Pilbara and how this changes temporarily and spatially.
3. improve understanding of northern quoll ecology and other demographic parameters in the Pilbara and allow comparison with studies in the Kimberley, Northern Territory and Queensland.
4. inform management actions with regard to the persistence of northern quoll populations in and around mining sites and other developments in the Pilbara.
5. clarify the taxonomic and conservation status of the Pilbara northern quoll population.

To achieve these objectives, Parks and Wildlife are undertaking a series of trapping surveys, conducting searches for northern quolls and liasing with industry, consultants and pastoralists for ecological data.

2 Launch of NatureMap Threatened Fauna Portal

An online portal through Parks and Wildlife's NatureMap webpage has been designed and set up to manage the database of Pilbara threatened fauna records. An online user-contributable data entry site has also been developed to provide the ability to maintain the database and keep it current with the addition of new records. This has been developed using the open source Atlas of Living Australia Biological Data Recording System in collaboration with Gaia Resources and Parks and Wildlife Science Applications. The Pilbara Threatened Fauna is now online at: http://naturemap.dpaw.wa.gov.au/threatenedfauna .

Figure 1. Screenshot of the NatureMap Pilbara Threatened Species Portal available at http://naturemap.dpaw.wa.gov.au/threatenedfauna

External contributors are encouraged to upload records of the five Pilbara specially protected Pilbara threatened fauna (bilby, northern quoll, Pilbara leaf-nosed bat, mulgara and Pilbara olive python) directly into NatureMap via the Pilbara Threatened Fauna Portal. Records can be uploaded individually with attachments such as photos, or in bulk spreadsheet form. Parks and Wildlife Science and Conservation division staff verify all records before they become publicly available on NatureMap.

All new records of northern quoll collected during the long term monitoring project will be uploaded to NatureMap via this portal.

3 Collation of distribution data

Current and historic records of northern quolls in the Pilbara region have been accessed from the following sources;

- Western Australian Museum databases
- Published and “grey” literature (including Parks and Wildlife and consultant reports)

- Liason with Parks and Wildlife staff, pastoralists, minesite ecologists and environmental consultants
- Scat and track searches and remote camera surveys in the Pilbara region (74 locations)

Northern quolls were detected at 28 locations new to NatureMap during the 2013/2014 field season. Additional records from grey literature/liason not already available on NatureMap are being uploaded via the Pilbara Threatened Fauna Portal (as above).

Approximately 100 northern quoll scats were collected during this fieldwork. These will be used for dietary analysis in 2015, to reveal the composition of quoll diet and to detect differences in diet according to location.

We collected approximately 74,000 images from 2,700 nights of remote camera images at 14 locations in 2013/2014. Processing of these images is underway. In addition to species presence data, these will provide data on activity times, feral presence and relative abundances based on activity.

4 Selection of long-term monitoring sites

The regional monitoring project includes standardised trapping (Dunlop et al., 2014) at several locations throughout the Pilbara, in order to obtain detailed information on population demographics and abundance. Ten sites were selected on the basis of geographic distribution, land tenure, accessibility and site security. These sites include Indee Station, Millstream Chichester National Park, Mt Florance Station, De Grey Station, Mallina Station, Cane River Conservation Park, Yarrie Station, Red Hill Station, Dolphin Island Nature Reserve and Karijini National Park (see Table 1). The land tenure and security of the site has been taken into consideration, as these sites are required to remain free of mining and / or major pastoral disturbance for the duration of the project. Because of anticipated low capture rates and seasonal fluctuations in quoll population abundance, sites will be monitored over a long period (10 years) to detect trends in abundance and other demographic parameters.

Table 1. Locations of trapping sites and dates trapped. NP: National Park, CP: Conservation Park, NR: Nature Reserve

Site	Latitude	Longitude	Trapping dates (inclusive)	
Dolphin Island NR	-20.48	116.83	16/06/2014	20/06/2014
Mt Florance Station	-21.77	117.91	15/07/2014	19/07/2014
Karijini NP	-22.35	118.28	21/07/2014	25/07/2014
Millstream NP	-21.34	117.33	27/07/2014	31/07/2014
Yarrie Station	-20.88	120.11	12/08/2014	17/08/2014
De Grey Station	-20.29	119.11	18/08/2014	22/08/2014
Indee Station	-20.88	118.58	24/08/2014	28/08/2014
Mallina Station	-21.18	117.95	9/09/2014	13/09/2014
Cane River CP	-21.98	115.57	15/09/2014	19/09/2014
Red Hill Station	-22.17	116.27	20/09/2014	24/09/2014

5 South-east Pilbara site searches

Suitable sites in the south-eastern Pilbara had not been found at the commencement of the 2014 monitoring season, so additional searches were undertaken in August. This latest survey effort covered approximately 4000 km^2 with a total of 202 cage trap and 359 remote camera trap nights. It was undertaken in two phases combining searching and cage trapping with camera surveillance over 25 locations.

Quoll scats were recorded at seven sites, and remote camera photographs of quolls were taken at three sites including one site where scats were not observed. Five individual quolls were captured from two separate sites including one male and two females from the rock outcrop complex (Quoll Knoll) within the Roy Hill Special Rail Lease. The other successful trapping site was toward the western extent of the survey at Cockeraga Creek. These colonies, in the context of the broader low abundance of quolls in the Pilbara, are at or near the south-east limit of Pilbara quoll distribution and should be considered significant.

6 Development of standard monitoring protocols

The review of northern quoll records undertaken by Cook (2010) examined the survey efforts in the Pilbara region from grey literature and other unpublished reports. From these reports, 74 previously unrecorded northern quoll locations were added to NatureMap. Of these, the majority involved indirect observations such as tracks, scats, bones and carcasses rather than direct animal captures (Cook, 2010). This finding highlighted that the majority of surveys involve desktop surveys or area searches, rather than trapping. Where trapping occurred, there was a lack of consistency in monitoring protocols. It is therefore difficult to draw conclusions comparing quoll populations throughout the region. Standardised trapping procedures were created (Dunlop et al., 2014), based on protocols from DSEWPaC (2011) for small mammal trapping. These cover methods for cage trapping, scat searches and remote camera detection.

7 Species distribution modeling

One of the key research priorities that emerged from the northern quoll workshop was to better map the northern quoll distribution in the Pilbara. Collaboration between Parks and Wildlife and Edith Cowan University has been initiated to undertake predictive species distribution modeling based on historic data and data collected within this project.

Specific objectives are to:

a. Develop a predictive model of Northern Quoll habitat on a finer scale than is currently available based on a combination of Parks and Wildlife monitoring data, existing survey data, improved habitat data and dispersal estimates.

b. Incorporate known threats to this species, such as climate change, fire regimes, pastoralism, mining infrastructure and cane toads, into models to identify important future/core habitat. In this vein, identifying refugia is also important.

c. Develop a data set that identifies areas of key/core habitat to support land use planning and environmental impact assessments processes, including the need for environmental offsets.

Distributional data collected in the 2013/2014 season will be used in conjunction with GIS layers and habitat data collected on the ground to create a predicted distribution of northern quolls in the Pilbara. This model will be progressively tested and refined as additional data becomes available from onging survey and monitoring programs undertaken by Parks and Wildlife, environmental consultatant and other land managers and resource developers.

8 Trapping at monitoring sites

The regional monitoring project includes standardised trapping at several locations throughout the Pilbara, in order to obtain detailed information on population demographics and abundance. Ten sites were selected as detailed in Table 1.

The first trapping of all ten sites occurred in 2014 between June and September, following the trapping methods outlined in Dunlop et al. (2014). We undertook a total of 2,000 trap nights across the 10 trapping sites. In total, 83 individual quolls were captured, ranging from 0 to 23 individuals at each site. On average, we captured 8.3 ± 0.9 individuals per 1.25 km trapping site, consisting of 3.1 ± 0.6 females and 5.4 ± 0.7 males. Total quoll capture rate was 9.9% (198 captures, including re-trapped individuals). Other species captured included two individual *Pseudantechinus* sp., (0.1% capture rate) and 95 common rock rats, *Zyzomys argurus* (4.8% capture rate).

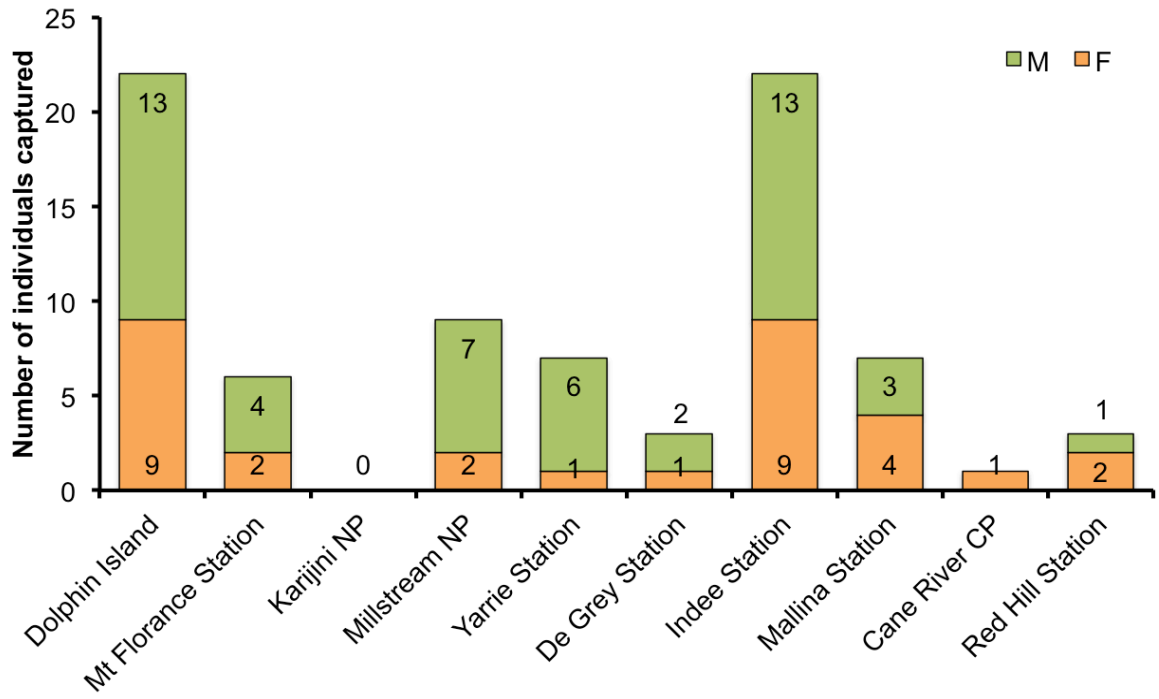

Figure 2. Individual northern quolls captured at each of the ten trapping sites surveyed in 2014. Sites are shown in the order that they were trapped: Dolphin Island NR in June, Mt Florance Station, Karijini NP and Millstream Chichester NP in July, Yarrie Station, De Grey Station and Indee Station in August, Mallina Station, Cane River CP and Red Hill Station in September.'

The number of individual quolls captured at each site was variable, with 23 individuals being captured at both Indee Station and Dolphin Island sites, and zero captures at Karijini NP, despite apparently suitable habitat (Figure 2). Males were, on average, larger than females. Sex ratios were skewed towards males, likely a

combination of a true male bias in the population and a greater tendency for mobility in males. These data will be added to comparable ecological data from researchers in Northern Australia for a more comprehensive life history analysis. Further analysis of trapping data will include population estimates created in program MARK, and correlations of populations according to habitat variables.

9 Collection of DNA samples for genetics work

In 2012-2013, Spencer et al. (2013) undertook preliminary analyses of the genetic diversity of northern quolls in the Pilbara from available samples. No further genetic work was undertaken by Murdoch University over this reporting period and thus progress on this subject matter is not captured in this report. However, a further 86 DNA samples were collected by Parks and Wildlife this year in addition to ~ 80 collected by fauna consultants. These samples will be analysed 2014-2015.

References

Cook, A. (2010) *Northern quoll Pilbara Distribution - A desktop review*. Department of Environment and Conservation Science Division, Perth, Western Australia.

DSEWPaC, D.O.S., Environment, Water, Population and Communities. (2011) *Survey guidelines for Australia's threatened mammals*. Department of Sustainability, Environment, Water, Population and Communities, Canberra.

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Spencer, P., How, R.A., Hillyer, M., Cook, A., Morris, K.D., Stevenson, C. & Umbrello, L. (2013) *Genetic Analysis of Northern Quolls from the Pilbara Region of Western Australia*. Murdoch University, Perth, Western Australia.

Appendix 1

Survey and monitoring guidelines

Pilbara northern quoll project

Surveying and monitoring *Dasyurus hallucatus* in the Pilbara, Western Australia

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April 2014

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This document is available in alternative formats on request.

Cover image: Annette Cook

Contents

Appendices

1.1 Scope

This document outlines the objectives of the Department of Parks and Wildlife Pilbara northern quoll project, and provides methodologies to be used to achieve these specific objectives. Other organisations undertaking quoll monitoring projects can then align with these methods and contribute comparable data in to the regional survey.

1.2 Background

The northern quoll, *Dasyurus hallucatus*, is the smallest of all Australian quolls (300–1200g) and is restricted to five regional populations across Queensland, the Northern Territory and Western Australia, both on the mainland and offshore islands. The species appears to have declined in number and distribution over the last 50 years with a number of threats either directly or in combination with each other, contributing to the species decline. Threats include mortality caused by poisoning from cane toads, introduced predators, inappropriate fire regimes (predation 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.*

The Pilbara northern quoll survey and monitoring project commenced in 2012 and will be conducted over 10 years with the aim of improving our understanding of distribution, ecology, abundance and demographics of the northern quoll in the region. The project aims to provide information to environmental regulators, biological consultants, resource development companies and other land managers that will allow appropriate management to ensure the persistence of resident northern quoll populations in the Pilbara region.

1.3 Objectives of the northern quoll project

1. To determine the northern quoll distribution in the Pilbara (including updating NatureMap records), and enhance our understanding of processes influencing distribution.
2. To estimate northern quoll abundance in the Pilbara and how this changes temporarily and spatially.
3. To improve understanding of northern quoll ecology and other demographic parameters in the Pilbara and allow comparison with studies in the Kimberley, Northern Territory and Queensland.
4. To inform management actions with regard to the persistence of northern quoll populations in and around mining sites and other developments in the Pilbara.
5. To clarify the taxonomic and conservation status of the Pilbara northern quoll population.

1.3.1 Desktop review

A desktop review of northern quoll distribution was undertaken in 2010 in order to update NatureMap records (Objective 1) and identify suitable quoll habitat for further survey (Objectives 2 & 3). Records included landholder sightings, museum specimens and capture records by environmental consultants and Parks and Wildlife staff. The review helped to inform placement of long-term monitoring sites. This report and the associated data will be available on the NatureMap Pilbara Threatened Fauna portal located at:
www.naturemap.dpaw.wa.gov.au/threatenedfauna

1.3.2 Presence survey and distribution modelling

To inform species distribution modelling (Objectives 1 & 4), Parks and Wildlife has commenced a survey of quoll presence at 100 sites throughout the Pilbara. At each site, staff will undertake scat searches and establish transects of baited remote motion sensor cameras in rocky areas to detect quoll presence. Habitat characteristics of each site are recorded according to Appendix A. Additional presence records and habitat data from environmental consultants, pastoralists and mine site environmental staff will be used to build and validate models of distribution.

1.3.3 Long term monitoring sites

Parks and Wildlife is also undertaking annual trapping at 10 sites throughout the Pilbara in order to achieve more detailed information on population demographics and abundance (Objectives 2 & 3). Those selected include Indee Station, Millstream Chichester National Park, Mt Florance Station, Mallina Station, De Grey Station,

Cane River Conservation Park, Yarrie Station, Red Hill Station, Dolphin Island Nature Reserve and Karijini National Park. The land tenure and security of the site has been taken into consideration, as these sites will need to remain free of mining and / or major pastoral disturbance for the duration of the project. Because of anticipated low capture rates and seasonal fluctuations in quoll population abundance it will be necessary to monitor sites over a long period (10 years) to detect trends in abundance and other demographic parameters.

We anticipate that there will be opportunities for ecological research projects such as examining den and feeding habitat use, movements across the landscape, impact of introduced predators, interactions with mine-sites and characteristics of natural den sites in order to inform artificial habitat creation. Collaborations with Murdoch University, University of Queensland and Edith Cowan University are underway.

1.4 Methods

1.4.1 Trapping

Once a quoll population has been identified, the following methods should be used for ongoing monitoring to be comparable to the Department's regional survey.

Northern quoll trapping should be conducted from 1 April to 30 September to avoid times when females have large or denned pouch young.

As northern quolls frequently live in linear rocky habitats, population monitoring is undertaken using trapping transects rather than grids. Transects are configured to achieve optimal cover of the sites. Two parallel lines of 25 traps each are laid across broader habitat types such as breakaways or granite outcrops.

Specific quoll trapping methods:

- Trap type: wire cage traps covered with hessian or similar (e.g. small Sheffield traps: 45 cm x 17 cm x 17 cm, Sheffield Wire co, Welshpool WA)
- Bait type: Universal bait (peanut butter, oats) with sardines
- Layout: 50 traps, each spaced 50 m apart, in two lines of 25 traps, with at least 50 m between each transect.
- Duration: Traps opened for four consecutive nights at each site (200 trap nights). Traps are checked and closed within three hours of sunrise, rebaited and opened in the late afternoon.
- Marking: Individual trap locations are fixed and marked (GPS) for the duration of the monitoring program. Sites are marked with permanent markers such as metal site tags.
- Searches: To verify a zero-capture record, personnel should also undertake a total of 10 person-hours of scat searches per site, and use at least five remote cameras at the site/surrounding area during the four nights of trapping.

Information collected from trapped animals:

Morphometric, survivorship, dietary, breeding and genetic information is collected for comparison with populations of northern quolls in the Pilbara and across Australia.

- All captured quolls are implanted with a subcutaneous microchip (PIT) for individual identification.
- Standard measurements collected from all captured quolls (body weight, short pes length, head length, age class, sex and reproductive condition) (see example datasheet in Appendix B)
- A small amount of ear tissue is collected from all individuals at initial capture for genetic analysis (stored in 100% ethanol, to be lodged with Department of Parks and Wildlife).
- A sample of scats is collected where possible for dietary analysis (stored in a paper envelope, lodged with Department of Parks and Wildlife).

- An estimation of fox/cat/dog/dingo activity at each site will be derived using visual signs and remote cameras.
- Habitat data sheets (Appendix A) should be completed for each trapping site and submitted to the Department of Parks and Wildlife.

These protocols outline the methods for regular monitoring of a population of northern quolls, in order to answer questions about abundance, survivorship and breeding demographics. More information on surveying for threatened mammals can be found here: http://www.environment.gov.au/system/files/resources/b1c6b237-12d9-4071-a26e-ee816caa2b39/files/survey-guidelines-mammals.pdf

1.4.2 Camera trapping

Remote cameras can be useful to supplement trapping, for initial area searches to detect quolls and to assess quoll presence and activity in an area. Unlike traps, cameras can be used at any time of year. Duration of camera trapping will depend on the circumstances and goals of the individual project, but more information is collected from a longer set time. In general, camera traps should not be baited with food rewards for longer than five consecutive nights, to prevent impacts on normal animal behaviour (See Parks and Wildlife standard operating procedure 5.2 available from http://www.dpaw.wa.gov.au/plants-and-animals/96-monitoring/standards/99-standard-operating-procedures). Scent lures with no associated food reward may be useful, for example burley oil.

For our presence survey (Objective 1), standard methods are as follows;

- Transects of ten baited remote motion sensor cameras spaced at least 100 m for four nights.
- 10 person hours of scat searches in rocky areas
- Habitat data sheet (Appendix A) completed

It is important to note that this does not confirm absence, and proponents managing species-specific surveys will need to undertake more extensive searches.

1.4.3 Habitat monitoring and distribution modelling

Habitat attributes will be recorded at all sites (including camera survey and monitoring sites) and will be analysed to help predict the spatial distribution of suitable habitat and the probability of quolls occupying locations based on environmental attributes. Fire history and other disturbances such as livestock impact will also be assessed and monitored. Photo points and digital rain gauges will be established at all long-term monitoring sites. Site characteristics will be correlated with quoll presence or likely absence in order to inform predictive models. Standard data sheets used to record habitat attributes are in Appendix A.

1.5 Reporting

Much of the survey and monitoring data collected will be suitable for comparison with studies for quolls in the Kimberley, Northern Territory and Queensland. An annual report on population and habitat monitoring will be prepared, and peer reviewed papers prepared throughout the duration of the project.

All presence records, including those from the grey literature review and historical record, will be uploaded to NatureMap. Environmental consultants, mine-site environmental staff and others encountering Pilbara priority species (northern quoll, bilby, mulgara, Pilbara leaf-nosed bat and Pilbara olive python) are also encouraged to add records to NatureMap, via the Pilbara Threatened Fauna theme

www.naturemap.dpaw.wa.gov.au/threatenedfauna .

Appendices

PILBARA NORTHERN QUOLL DATA SHEET – Habitat Survey

Site name:		Recorder/s:
Date:	Time:	Contact email:
GPS datum:		GPS Accuracy:
GPS Co-ords:		Height above sea level:

Please consider a 50m x 50m patch for all questions. Many of these categories are derived from: National Committee on Soil and Terrain (2009) 'Australian Soil and Land Survey Field Handbook', CSIRO Publishing, Melbourne

1. *LANDFORM ELEMENT*

Morphological type 13

C	*Crest*	F	*Flat*
U	*Upper slope*	V	*Open depression (vale)*
M	*Mid slope*	D	*Closed depression*
L	*Lower slope*	H	*Hillock*
S	*Simple slope*	R	*Ridge*

2. *ROCK OUTCROP*

TYPE (e.g. granite)

Abundance 101

0	*No bedrock exposed*	
1	*Very slightly rocky*	*<2%*
2	*Slightly rocky*	*2-10%*
3	*Rocky*	*10-20%*
4	*Very rocky*	*20-50%*
5	*Rockland*	*>50%*

3. *SOIL*

Colour

R	*Red*	Y	*Yellow*
O	*Orange*	G	*Grey*
B	*Brown*	D	*Dark*

Type **116**

1	*Clay*	5	*Coarse sand*
2	*Fine silt*	6	*Fine gravel*
3	*Coarse silt*	7	*Coarse gravel*
4	*Fine sand*	8	*None; rock only*

4. *GROUND COVER*

% Cover Leaf Litter

% Cover Bare Ground
(including litter, rock cover
and bare soil, excluding live vegetation)

5. *COARSE FRAGMENTS ON THE SURFACE*

Rock Abundance **97**

0	*No coarse fragments*	0
1	*Very slightly; very few*	<2%
2	*Slightly; few*	2%-10%
3	*No qualifier; common*	10%-20%
4	*Moderately; many*	20%-50%
5	*Very; abundant*	50%-90%
6	*Extremely; very abundant*	>90%

Rock Size **99**

3	*Gravelly*	>60 mm
4	*Cobbly; or cobbles*	60-200 mm
5	*Stony; stones*	200-600 mm
6	*Bouldery; or boulders*	600 mm-2 m
7	*Large boulders*	>2 m

6. *LAND SURFACE*

Disturbance of site **88**

0	*No effective disturbance*
1	*No effective disturbance except grazing by hoofed animals*
2	*Limited clearing*
3	*Extensive clearing*
8	*Highly disturbed, e.g. mining, urban*

7. *EVIDENCE OF RECENT FIRE*

Frequency		**Intensity**	
0	*Long unburnt*	0	*No damage*
1	*Several years since burn*	1	*Minor*
2	*Burnt before last rainfall*	2	*Some defoliated*
3	*Burnt after last rainfall*	3	*Most defoliated*
		4	*Unknown*

Distance to nearest unburnt patch (>5 ha)

1	<100 m	2	100-500 m
3	500m – 1 km	4	>1 km

Patchiness, % of area burnt:

8. *NEARBY WATER BODIES*

		R	*River*
1	*Permanent*	S	*Soak/spring*
2	*Seasonal*	C	*Creek*
3	*Ephemeral*	P	*Pool*
		B	*Bore / windmill / dam*

Distance (m):

9. *EVIDENCE OF FERAL / INTRODUCED SPECIES (please list)*

Please collect any cat, dingo or quoll scats
Place into an envelope (not plastic),
label with collector's name, date, species, GPS location
and lodge with DPaW for dietary analysis.

10. *SITE PHOTOS (please attach)*

Photo number:

Direction facing:

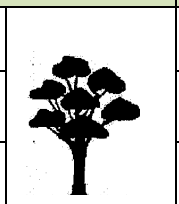
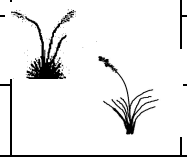
11. *VEGETATIVE GROWTH STAGE*

1	*Early regeneration*
2	*Advanced regeneration*
3	*Mature vegetation*
4	*Senescent phase*

12. *NATIVE FIG (FICUS) PRESENCE*

0	*Absent*
1	*1–10 plants*
2	*> 10 plants*

13. ***VEGETATION***

Please tick 1 box in each row, and record dominant species where known			**Absent**	**Isolated <2%**	**Very sparse 2–10%**	**Sparse 10–30%**	**Mid-Dense 30–70%**	**Dense 70–100%**
TREES	**Dominant species**							
	> 30 m							
	10–30 m							
	<10 m							
MALLEES	**Dominant species**							
	Over 8 m							
	Under 8m							
SHRUBS	***Dominant species***							
	Over 2 m							
	1–2 m							
	Under 1 m							
HERBS & SEDGES	***Dominant species***							
								
GRASSES	***Dominant species***							
	Hummock							
	Tussock							
	Bunch							

SITE MAP
Showing relevant landforms, vegetation types, creeks, landmarks etc as well as an indication of trap/camera placement

TOP VIEW

SIDE VIEW

Judy.Dunlop@dpaw.wa.gov.au DPaW Science and Conservation Division Woodvale

Pilbara northern quoll trapping datasheet

Site _____ Date _____/_____/_____

Personnel: Animal handling _____ Recording _____ # Traps set _____

Date	Trap Num	Species	Sex	PIT (use sticker for new animals)	N/R /RT^	Tot Wt	Animal Wt (g)	Age	Short Pes	Head Length	Pouch*, Testes W	Pouch young		Tail Diam (base)	Samples collected		Comments
d/m						Bag Wt						Number	Crown-rump length		Scat	Tissue	

*Pouch categories: U – undeveloped, D – developed, Y – pouch young, L – lactating. Any other info in comments. ^N/R/RT: N– new, R–recapture (caught in previous session), RT–retrap (caught already this session)