



**Biodiversity and  
Conservation Science**

# Summary of knowledge for six faunal species that are Matters of National Environmental Significance in the Pilbara: Progress Report



Amy Northover, Russell Palmer, and Lesley Gibson

February 2023



Department of **Biodiversity,  
Conservation and Attractions**

Department of Biodiversity, Conservation and Attractions  
Locked Bag 104  
Bentley Delivery Centre WA 6983

[www.dbca.wa.gov.au](http://www.dbca.wa.gov.au)

© Department of Biodiversity, Conservation and Attractions on behalf of the State of Western Australia 2023, February 2023

This work is copyright. You may download, display, print and reproduce this material in unaltered form (retaining this notice) for your personal, non-commercial use or use within your organisation. Apart from any use as permitted under the *Copyright Act 1968*, all other rights are reserved. Requests and enquiries concerning reproduction and rights should be addressed to the Department of Biodiversity, Conservation and Attractions.

Questions regarding the use of this material should be directed to:

Lesley Gibson - Program Leader, Animal Science  
Biodiversity and Conservation Science  
Department of Biodiversity, Conservation and Attractions  
Locked Bag 104  
Bentley Delivery Centre WA 6983  
Email: [lesley.gibson@dbca.wa.gov.au](mailto:lesley.gibson@dbca.wa.gov.au)

The recommended reference for this publication is:

Department Biodiversity, Conservation and Attractions, 2023, *Summary of knowledge for six faunal species that are Matters of National Environmental Significance in the Pilbara: Progress Report, February 2023*, Department of Biodiversity, Conservation and Attractions, Perth.

Cover image (left to right): Greater bilby (*Macrotis lagotis*) © John Lawson; Northern quoll (*Dasyurus hallucatus*) © Judy Dunlop; Pilbara leaf-nosed bat (*Rhinioncteris aurantia*) © Kanyirninpa Jukurrpa; Ghost bat (*Macroderma gigas*) © Carly Bishop; Pilbara olive python (*Liasis olivaceus barroni*) © David Pearson; Night parrot (*Pezoporus occidentalis*) © Steve Murphy

# Contents

Context..... 1

Project 1: Review of greater bilby research and management priorities..... 1

    Progress..... 2

Project 2: Synthesis of information for MNES species ..... 3

    Progress..... 3

References..... 4

Appendices ..... 5



## Context

To build on existing fauna research and on-ground conservation management projects in the Pilbara, the Department of Water and Environmental Regulation (DWER) is developing a fauna investment plan for the Pilbara Environmental Offsets Fund (PEOF) to guide the delivery of offset projects. The Department of Biodiversity, Conservation and Attractions (DBCA) is currently undertaking two projects with funding from PEOF, that will provide direct input into the development of the fauna investment plan by synthesising the current knowledge, gaps, research and management priorities for six fauna species that are Matters of National Environmental Significance (MNES) in the Pilbara region, Western Australia (WA). DBCA will aggregate published and grey literature for the greater bilby (*Macrotis lagotis*), northern quoll (*Dasyurus hallucatus*), Pilbara leaf-nosed bat (*Rhinonicteris aurantia*), ghost bat (*Macroderma gigas*), Pilbara olive python (*Liasis olivaceus barroni*), and the night parrot (*Pezoporus occidentalis*) to provide a comprehensive list and summary of all existing literature and knowledge for each species.

DBCA will provide DWER with a comprehensive understanding of the work conducted to date and provide a clear picture on the state of MNES conservation priorities in the Pilbara, so that duplication can be avoided, investment leveraged and conservation outcomes for these species maximised.

## Project 1: Review of greater bilby research and management priorities

In 2013, DBCA hosted a series of workshops for several fauna species that are MNES in the Pilbara, to review existing knowledge and identify key research priorities through a facilitated process involving scientists, environmental consultants, mining proponents and government regulators (see Cramer et al., 2016a; 2016b; 2017). Focusing on the bilby, five key areas for future research effort were identified (Cramer et al., 2017):

- Refine survey methods appropriate for all habitat types
- Improve understanding of habitat use in relation to substrate type and food availability
- Improve understanding of the genetic structure of bilby meta-populations
- Improve understanding of the threats posed by introduced predators and herbivores
- Improve understanding of how fire regimes affect bilby conservation

In partnership with universities and other stakeholders, including consultancies, CSIRO and traditional owners, DBCA has been conducting bilby research focusing on these five research priorities.

Project 1 will deliver a report that reviews DBCA's progress against the five research priorities between 2013 and 2023 and provide recommendations to guide future research and the ongoing management of the bilby to ensure the species' long-term

persistence in the Pilbara. A summary of published research and other outputs will be included.

## **Progress**

The process of collating and summarising the relevant literature [i.e., published research; internal documents and reports; other key documents with DBCA input (e.g., recovery plans, Pilbara Conservation Strategy); guidelines, articles and factsheets; conference presentations and student theses] to review progress against each of the five research priorities for the bilby is now complete. A report, which identifies major outcomes and provides recommendations for future research and management has been drafted and has been circulated to co-authors for their input. The table of contents from the draft report includes:

- Summary
- Introduction
- Refine survey methods appropriate for all habitat types
  - Context
  - Improve methods to quantify bilby abundance
  - Establish clear survey guidelines and protocols
  - Implement broad-scale survey techniques
  - Outcomes
  - Future directions
- Improve understanding of habitat use in relation to substrate type and food availability
  - Context
  - Increase knowledge of the distribution of the bilby within the Pilbara
  - Identify important resources within the Pilbara
  - Diet
  - Outcomes
  - Future directions
- Improve understanding of the genetic structure of the bilby (meta)populations
  - Context
  - Refinement of a scat-based molecular monitoring technique
  - Enhancing evolutionary resistance
  - Outcomes
  - Future directions
- Improve understanding of the threat posed by introduced predators and herbivores
  - Context
    - Introduced predators
    - Introduced herbivores
  - Monitoring fauna occupancy in response to introduced predator management
  - Promoting integrated introduced predator management
  - Remote camera monitoring as a long-term landscape-scale monitoring tool in the Pilbara
  - Eradicat® and Felixer™
  - Outcomes
  - Future directions
- Improve understanding of how fire regimes affect bilby conservation
  - Context
  - Fire management at known bilby sites
  - Outcomes
  - Future directions
- Conclusion

## Project 2: Synthesis of information for MNES species

Project 2 involves aggregating published and grey literature (including data where accessible) on the current knowledge, gaps and research and management priorities for the northern quoll, bilby, Pilbara leaf-nosed bat, ghost bat, Pilbara olive python, and the night parrot that are MNES within the Pilbara.

Follow-up workshops have been conducted for the northern quoll (Cramer and Dunlop, 2018) and Pilbara leaf-nosed bat (Salt, 2022) to review progress against the previously agreed priorities and define areas for future research effort. A report has recently been prepared by DBCA for the northern quoll that reviews progress against identified priorities (similar to that being prepared for the bilby) and will be provided to DWER. An initial workshop for the ghost bat has also identified priorities (Cramer et al., 2022), and research priorities for the night parrot were revised at the 2018 Environmental Management Workshop (Jackson, 2018).

Project 2 will deliver a report that provides a comprehensive list of all existing literature and knowledge pertaining to each species and a summary of current knowledge, gaps and research and management priorities. All relevant literature will be provided to DWER (subject to copyright) with the intent that it will be housed on the PEOF website; raw data (where available) will be provided as an appendix.

### **Progress**

The process of collating information (as above) and cataloguing this according to the research priorities for each species is ongoing. A report summarising the current knowledge (i.e., general overview, distribution, habitat requirements, threats to persistence, conservation status, population status and genetic structure), gaps and established priorities for research and management for each species is being drafted.

The scientist appointed to the project provided a presentation to the PEOF Implementation Advisory Group in November 2022 on the progress of the two projects (see Appendix 1).

## References

- Cramer, V.A., Armstrong, K.N., Bullen, R.D., Ellis, R., Gibson, L.A., McKenzie, N.L., O'Connell, M., Spate, A., van Leeuwen, S., 2016a. Research priorities for the Pilbara leaf-nosed bat (*Rhinonicteris aurantia* Pilbara form). *Australian Mammalogy* 38: 149-157. <https://doi.org/10.1071/AM15012>
- Cramer, V.A., Dunlop, J., Davis, R., Ellis, R., Barnett, B., Cook, A., Morris, K., van Leeuwen, S., 2016b. Research priorities for the northern quoll (*Dasyurus hallucatus*) in the Pilbara region of Western Australia. *Australian Mammalogy* 38: 135-148. <https://doi.org/10.1071/AM15005>
- Cramer, V.A., Dziminski, M.A., Southgate, R., Carpenter, F.M., Ellis, R.J., Van Leeuwen, S., 2017. A conceptual framework for habitat use and research priorities for the greater bilby (*Macrotis lagotis*) in the north of Western Australia. *Australian Mammalogy* 39: 137-151. <https://doi.org/10.1071/AM16009>
- Cramer, V., Dunlop, J., 2018. The ecology of the northern quoll (*Dasyurus hallucatus*) in the Pilbara bioregion, Western Australia: Project plans for 2016-2020. Department of Biodiversity, Conservation and Attractions, Perth.
- Cramer, V.A., Armstrong, K.N., Bullen, R.D., Cross, S.L., Gibson, L., Hanrahan, N., Knuckey, C.G., Ottewell, K., Reiffer, S., Ruykys, L., Shaw, R.E., Thavornkanlapachai, R., Thompson, S.A., Wild, S., van Leeuwen, S., 2022. Research priorities for the ghost bat (*Macroderma gigas*) in the Pilbara region of Western Australia. *Australian Mammalogy* 45: 1-12. <https://doi.org/10.1071/AM21042>
- Jackson, J., 2018. EIA and the night parrot - The challenge of a cryptic and poorly known Critically Endangered species. PowerPoint presentation. Environmental Management Workshop, 16-18<sup>th</sup> May 2018, Kalgoorlie, WA.
- Salt, C., 2022. Pilbara Leaf-Nosed Bat Workshop TalkBook (Last updated 26 July 2022), held on 27 April 2022 at Curtin University. Curtin University, Bentley, WA

# Appendices

## Appendix 1 PEOF Implementation Advisory Group Meeting presentation

Department of Biodiversity, Conservation and Attractions

*We're working for Western Australia.*

**Summary of current knowledge, gaps, research and management priorities for six species that are Matters of National Environmental Significance in the Pilbara**

Amy Northover, Russell Palmer and Lesley Gibson  
**Biodiversity and Conservation Science**  
 Department of Biodiversity, Conservation and Attractions

Department of Biodiversity, Conservation and Attractions

*We're working for Western Australia.*

## Background

DWER is developing a fauna investment plan for PEOF to guide delivery of fauna offset projects. Building on existing research and on-ground projects in the Pilbara it will be developed in three stages:

- Stage 1: Define scope of investment plan
- Stage 2: Gather information about current knowledge & priorities
- Stage 3: Develop and finalise a fauna investment plan

# Background

DBCA is currently undertaking two projects with funding from PEOF, that will provide direct input to Stages 1 and 2 of the development of the fauna investment plan.



# Project 1

## Greater bilby (*Macrotis lagotis*)

Summarise current knowledge, gaps and research and management priorities for the bilby in the Pilbara, based on DBCA's research to date.



© John Lawson



# Project 1

In 2013, DBCA hosted a workshop to identify research priorities for the bilby in the north of WA.

Five key areas for future research effort were identified.



## Research priorities (Cramer et al., 2017)

1. Refine survey methods
2. Improve understanding of habitat requirements
3. Improve understanding of population dynamics (genetics)
4. Improve understanding of the threats posed by introduced predators and herbivores
5. Improve understanding of how fire regimes affect bilby conservation



## Deliverable

A report, which reviews DBCA's progress against the five research priorities (2013-2023) and identifies future research and management directions to ensure the persistence of the bilby in the Pilbara.



## Project 2

Aggregate published and grey literature on the current knowledge, gaps and research and management priorities for **six species** that are Matters of National Environmental Significance in the Pilbara.



© Judy Dunlop



# Northern Quoll (*Dasyurus hallucatus*)

CSIRO PUBLISHING  
*Northern Quoll*, 2016, 38, 111-148  
<http://dx.doi.org/10.1071/9781107108011>

## Research priorities for the northern quoll (*Dasyurus hallucatus*) in the Pilbara region of Western Australia

Viki A. Cramer<sup>a</sup>, Judy Dunlop<sup>a</sup>, Rob Davis<sup>b</sup>, Ryan Ellis<sup>c</sup>, Belinda Barnett<sup>d</sup>, Annette Cook<sup>e</sup>, Keith Akers<sup>f</sup> and Stephen van Leeuwen<sup>g,h</sup>

<sup>a</sup>Science and Conservation Division, Department of Parks and Wildlife, Locked Bag 116, Bentley Delivery Centre, WA 6102, Australia  
<sup>b</sup>School of Natural Sciences, Edith Cowan University, 270 Joondrup Drive, Joondrup, WA 6027, Australia  
<sup>c</sup>Department of Zoology, Western Australian Museum, 91 New Street, West Perth, WA 6005, Australia  
<sup>d</sup>Environment Department, BHP Billiton Iron Ore, 1-25 St Georges Terrace, Perth, WA 6000, Australia  
<sup>e</sup>Corresponding author. Email: stephen.vanleeuwen@dpaw.wa.gov.au

**Abstract.** The Pilbara population of the northern quoll (*Dasyurus hallucatus*) has been seldom studied, and the impacts of threats such as altered fire regimes, total grazing pressure, predation and mining and infrastructure development are not well understood. While the Pilbara was once thought likely to provide refuge for northern quolls from the pronounced eastward decline in quoll numbers, recent modelling suggests that size trends will persist in the region. The environmental approach process for mining development in the Pilbara has generated considerable offset funds that are to be directed towards research on the northern quoll. In an effort to identify future research priorities for this species in the Pilbara through a collaborative process, the Western Australian Department of Parks and Wildlife hosted a workshop attended by scientists, environmental consultants, mining proponents and state and federal regulators. Participants at the workshop identified five key areas for future research effort: (1) develop appropriate and standardised survey and monitoring methods; (2) define areas of critical habitat and better understand how disturbance affects habitat quality; (3) improve our understanding of population dynamics; (4) better understand the key threats to the northern quoll and the interactions between these threats in the Pilbara; and (5) determine whether the northern quoll still occupies natural areas or artificial habitat. We provide the expected timelines and current allocation of resources to these research priorities over the next 10 years. We reflect on the lessons learnt from the workshop process and consider ways to improve the outcomes of such collaborative exercises.



© Judy Dunlop



## Northern Quoll (*Dasyurus hallucatus*)

- Survey and monitoring
- Identify critical habitat
- Population dynamics
- Key threats & interactions
- Other research priorities

**A review addressing  
research priorities drafted**



© Judy Dunlop

## Pilbara Leaf Nosed Bat (*Rhinonictis aurantia*)

OSRD PUBLISHING

Arthropods Monograph, 2015, 38, 149-157  
<http://dx.doi.org/10.1071/AM15012>

Review

### Research priorities for the Pilbara leaf-nosed bat (*Rhinonictis aurantia* Pilbara form)

Viki A. Cramer<sup>1</sup>, Kyle N. Amstrong<sup>2</sup>, Robert D. Bullen<sup>3</sup>, Ryan Ellis<sup>4</sup>, Lesley A. Gibson<sup>5</sup>,  
N. L. McKenzie<sup>6</sup>, Morgan O'Connell<sup>7</sup>, Andy Spaid<sup>8</sup> and Stephen van Leeuwen<sup>9,10</sup>

**Abstract.** Significant biodiversity offset funds have been allocated towards conservation research on threatened species as part of the environmental approval process for resource development in the Pilbara region of Western Australia. One of these species is the Pilbara leaf-nosed bat (*Rhinonictis aurantia* Pilbara form), which is currently listed as nearing a limited number of extant and disjunct sites, many of which exist in the seasonal-bearing areas that are the focus of mining activity. A research agenda for the Pilbara leaf-nosed bat was developed during a workshop attended by scientists, environmental consultants and mining industry representatives. Five research priorities were identified: (1) collate existing data contained within unpublished environmental surveys; (2) clarify and better characterise the habitat and distribution of dry forests; (3) better understand habitat requirements, particularly foraging habitat, and the movement of bats between roosts; (4) provide more robust estimates of total population and colony size, and improve understanding of social behaviour; and (5) investigate appropriate buffers in a range of mining contexts and protocols for artificial roost construction. Meta-analysis of current data, coordination of potential dry forest, and long-term monitoring of activity patterns would greatly increase our knowledge of the Pilbara leaf-nosed bat to enable effective conservation actions.



© Kanyiminpa Jukurpa

# Pilbara Leaf Nosed Bat

*(Rhinonictis aurantia)*

- Collate records & data
- Habitat use
- Ecology
- Threatening processes



© Kanyiminpa Jukurpa

# Ghost Bat

*(Macroderma gigas)*

REVIEW  
MAMMALOLOGY

**Research priorities for the ghost bat (*Macroderma gigas*) in the Pilbara region of Western Australia**

Viki A. Cramer<sup>1</sup>, Kyle N. Armstrong<sup>1,2</sup>, Robert D. Bullen<sup>1</sup>, Sophie L. Cross<sup>1</sup>, Lesley Gibson<sup>1,3</sup>, Nicola Harrigar<sup>1,4</sup>, Chris G. Knuckey<sup>1</sup>, Kym Ottewill<sup>1</sup>, Scott Ruffell<sup>1</sup>, Laura Ruykyn<sup>1</sup>, Robyn E. Shaw<sup>1</sup>, Rujporn Thavornkanitapachai<sup>1</sup>, Scott A. Thompson<sup>1</sup>, Susi Wilf<sup>1</sup> and Stephen van Leeuwen<sup>1,5</sup>

**ABSTRACT**  
The ghost bat (*Macroderma gigas*) is Australia's largest echolocating bat. It is restricted to several disjunct populations in the north of the continent, including a population in the Pilbara region of Western Australia. In 2010 the ghost bat was listed as 'Vulnerable' under Australian Federal legislation, owing to declining numbers across many regional populations. The most severe threat to ghost bats in the Pilbara region is the destruction and disturbance of habitat due to mining operations, but disturbance to their roosts from other infrastructure developments and changes to and loss of foraging habitats also pose significant threats. A set of research priorities for ghost bats in the Pilbara was developed during a workshop attended by mining industry representatives, environmental consultants, scientists and government regulators. Five research priorities were identified: (1) identify and characterise critical diurnal roosts and foraging habitats; (2) improve knowledge of the distribution, movement and dispersal patterns of ghost bats in the region; (3) improve knowledge of population size, persistence and long-term trends; (4) better understand the cumulative, direct and indirect impacts of mining and other development activities; and (5) better understand the threats posed by fauna entanglements, cane toads and feral cats.

**Keywords:** cane toads, colony, conservation, dispersal, distribution, diurnal roosts, fence, feral cats, foraging, habitat, mining, population, threats.



© Carly Bishop

## Ghost Bat (*Macroderma gigas*)

- Habitat use
- Population dynamics
- Population size, persistence and trends
- Impacts of mining, infrastructure and other human activities
- Other threats



© Carly Bishop

## Pilbara Olive Python (*Liasis olivaceus barroni*)

- Literature review
- Survey and monitoring
- Habitat requirements
- Breeding biology
- Prey relationships
- Predator relationships



© David Pearson



## Night parrot (*Pezoporus occidentalis*)

- Distribution
- Population size
- Roost/nesting habitat
- Foraging habitat
- Threats



© Steve Murphy



## Deliverable

A report, which lists publications and grey literature, and summarises current knowledge and research/management priorities for each of the six species



## Project 1 - Progress

- Amy Northover (Research scientist)
- Currently collating and summarising relevant information to review progress against each of the five research priorities
- Identify major outcomes for each priority
- Provide recommendations for future research and management

## Project 2 - Progress

- Russell Palmer (Research scientist)
- Collating information/data and cataloguing according to research priorities for each species
- Summarise current knowledge, gaps and established priorities for research and management for each species



# References

- Cramer, V.A., Armstrong, K.N., Bullen, R.D., Ellis, R., Gibson, L.A., McKenzie, N.L., O'Connell, M., Spate, A., van Leeuwen, S., 2016. Research priorities for the Pilbara leaf-nosed bat (*Rhinioncteris aurantia* Pilbara form). *Australian Mammalogy* 38: 149-157. <https://doi.org/10.1071/AM15012>
  - Cramer, V.A., Dunlop, J., Davis, R., Ellis, R., Barnett, B., Cook, A., Morris, K., van Leeuwen, S., 2016. Research priorities for the northern quoll (*Dasyurus hallucatus*) in the Pilbara region of Western Australia. *Australian Mammalogy* 38: 135-148. <https://doi.org/10.1071/AM15005>
  - Cramer, V.A., Dziminski, M.A., Southgate, R., Carpenter, F.M., Ellis, R.J., Van Leeuwen, S., 2017. A conceptual framework for habitat use and research priorities for the greater bilby (*Macrotis lagotis*) in the north of Western Australia. *Australian Mammalogy* 39: 137-151. <https://doi.org/10.1071/AM16009>
  - Cramer, V., Dunlop, J., 2018. The ecology of the northern quoll (*Dasyurus hallucatus*) in the Pilbara bioregion, Western Australia: Project plans for 2016-2020. Department of Biodiversity, Conservation and Attractions, Perth.
  - Cramer, V.A., Armstrong, K.N., Bullen, R.D., Cross, S.L., Gibson, L., Hanrahan, N., Knuckey, C.G., Ottewell, K., Reiffer, S., Ruykys, L., Shaw, R.E., Thavornkanlapachai, R., Thompson, S.A., Wild, S., van Leeuwen, S., 2022. Research priorities for the ghost bat (*Macroderma gigas*) in the Pilbara region of Western Australia. *Australian Mammalogy* <https://doi.org/10.1071/AM21042>
-