

# Existing knowledge and data analysis



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# Overview

- Databases:
  - Public
  - Private
- Data analysis
  - Presence only vs abundance data analysis
  - Habitat based analysis
  - Analysis based on fauna assemblages
  - What data has not been captured
  - Reliability and veracity of data and reporting



# Fauna Survey Database

- Contributors
  - Licence returns
- Fauna Survey Database (DPaW)
  - Only submitters can access data
  - Limited to species searches
  - Maximum of 500 records
  - Only includes records where a licence was required
  - Data are not linked to a report, so there is no contextual data
- **Limited value**



# NatureMap

- Contributors
  - AoLA
  - WA Museum
  - Fauna survey database
  - Others
- Themes – Pilbara Threatened Fauna
  - Records for some threatened fauna (i.e. Bilby, Mulgara, Pilbara Olive Python, Northern Quoll, Pilbara Leaf-nosed Bat)
- Area searches
  - Limited to 40km radius
  - Species list
- Species searches
  - Maximum of 500 records
  - Not sure what is not included
  - Data not linked to a report, so no contextual data
- Some downloadable datasets, mostly requires contacting someone
- **A source of useful information, but generally not adequate to provide contextual information as a single source for a fauna assessment**



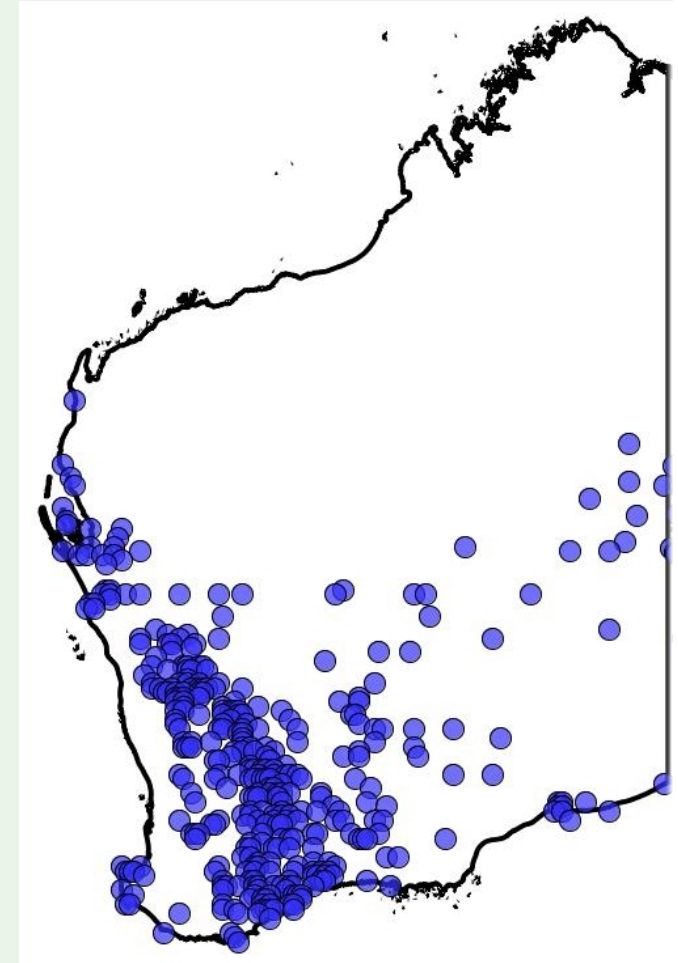
# Atlas of Living Australia (AoLA)

- Contributors (WA, fauna):
  - WA Museum
  - DAFWA
  - Birds Australia
  - Others (e.g. individuals)
- Searches by:
  - Species
  - Location
  - Area

The logo for the Atlas of Living Australia, featuring a stylized orange starburst icon to the left of the text "Atlas Of Living Australia" in orange, all contained within a dark grey rectangular box with a thin white border.

# Atlas of Living Australia (AoLA)

- Has a range of mapping options
- Details about each record
- Can map records
- Provides species images
- **A very useful database and set of tools**



# Pilbara Biological Survey Database

- The then Department of Resources Development required a review of all environmental survey work carried out in the Pilbara biogeographical region
- Now with DPaW - <https://science.dpaw.wa.gov.au/projects/pilbaradb/>
- 789 reports were identified, of which 200 have been sourced and metadata statements completed
- The database provides an abstract for reports
- It's dated, but contains references to numerous reports
- Useful in identifying early reports, but no data

# Species Profile and Threats Database (SPRAT)

- Provides information on:
  - species description
  - population and distribution
  - habitat
  - movements
  - feeding
  - reproduction
  - taxonomic comments

- Valuable source of information on some EPBC listed threatened taxa

The screenshot displays the SPRAT search interface with the following sections:

- Search species names:** Includes a search box and a "Search" button. Below it are radio buttons for "Wildcard" (selected) and "Scientific". Text instructions define "Wildcard" as entering one part of the common or scientific name (e.g., cockatoo) and "Scientific" as entering the start of the genus or genus and species (e.g., ba go for *Banksia goodii*).
- Faceted search of species metadata:** Includes a search box and a "Search" button.
- Faceted search of species threat classes:** Includes a search box and a "Search" button.
- Faceted search of species profiles:** Includes a search box and a "Search" button.
- Search community names:** Includes a search box and a "Search" button. Below it are radio buttons for "Wildcard" (selected), "Community", and "All". Text instructions define "Wildcard" as entering one part of any word in the community name (e.g., grass), "Community" as entering the starting phrase of up to three words in the community name (e.g., euc grass for various Eucalyptus grasslands), and "All" as showing all threatened communities (ignoring data typed into the search box).
- Faceted search of community metadata:** Includes a search box and a "Search" button.
- Faceted search of community threat classes:** Includes a search box and a "Search" button.
- Faceted search of community profiles:** Includes a search box and a "Search" button.



# Protected Matters Search (EPBC database)

## Threatened species search

- Some dated records (e.g. Malleefowl in the southern metropolitan area)
- Missing lots of recent threatened species records
- Includes a large buffer around a search area, and picks up species unlikely to be in the search area
- Widespread species! [e.g. *Ardea ibis* (Cattle Egret)]
- Should be used in most vertebrate fauna assessments
- **Understand its limitations**

Report by Coordinates

To define an area of interest for an environmental report using coordinates, first choose a respectively but no more than one hundred and fifty pairs. For area searches, enter at least two pairs in the Coordinates box separated by a comma. You may enter coordinates directly in the Coordinates box.

- -33.6401,150.6381
- -33.8500,150.6381

Feature Type

Coordinate Type  
 Decimal Degrees  
 Degrees Minutes Seconds

Latitude

Longitude

[Add to List](#)

Coordinates

[Clear List](#)

Buffer (km)

Format  
 PDF  
 HTML

Email Address

[Preview in map](#) [Report](#) [Clear](#)

# Australian Fauna Directory (AFD)

- Provides taxonomic and biological information on some Australian fauna
- Phylogenetic tree for Australian fauna (<http://www.environment.gov.au/biodiversity/abrs/online-resources/fauna/afd/mainchecklist>)
- Bibliographic search tool
- Detailed information about nomenclature for individual species (<http://www.environment.gov.au/biodiversity/abrs/online-resources/fauna/afd/search/names>)
- Advanced searches (<http://www.environment.gov.au/biodiversity/abrs/online-resources/fauna/afd/search/advanced>)
- Bulk downloads available for checklist of species names and bibliography for taxon groups

# Western Australian Biodiversity Science Institute

- The Institute is intending to provide the knowledge platform that is required for better policy decisions and on-ground management of the State's terrestrial biodiversity
- It is intended that it will ensure information is available in a form that is relevant and accessible to government policy makers, industry, land managers and other stakeholders

# State government promise

- Provide \$8million to develop a publically available online biodiversity, water and cultural heritage database and virtual library to assist the resources sector in protecting the State's unique biodiversity, natural environment and cultural history by capturing and aggregating historical and new environmental and heritage information and knowledge (<https://www.wa.liberal.org.au/sites/default/files/plans/Mines.pdf>)
- No \$8m, but DMP are working on this – small scale and it is not clear what has or will be included in the database
- DMP web address for this database will be made available in the near future
- Link / coordination with WA Biodiversity Science Institute database is not clear
- Links to other databases are not clear

# WA Govt. Open Data Policy

- WA Govt. has an ‘Open Data Policy’
- Data are considered open when:
  - released and available for the general public (not for exclusive use);
  - easily discoverable;
  - in formats that are modifiable, non-proprietary and machine-readable;
  - licensed to enable reuse and redistribution; and
  - available at no cost to users.
- Focus is on ‘raw data’
- ‘Open by default’
- Up-to-date as possible
- Made available to users in a timely manner
  
- This may give the public better access to:
  - DPaW’s Fauna Survey Database
  - DPaW’s NatureMap
  - OEPA data and reports
  - DMP reports
  - WAM collections



# Public vs Private databases

- Public databases typically don't contain:
  - important contextual information (e.g. trapping effort, vegetation communities, etc);
  - non-specimen captured data (e.g. echolocation records, scats and tracks observations, camera trap observations)
  - incidental records / observations
- Private databases are therefore essential in the preparation of comprehensive fauna assessments

# Private databases

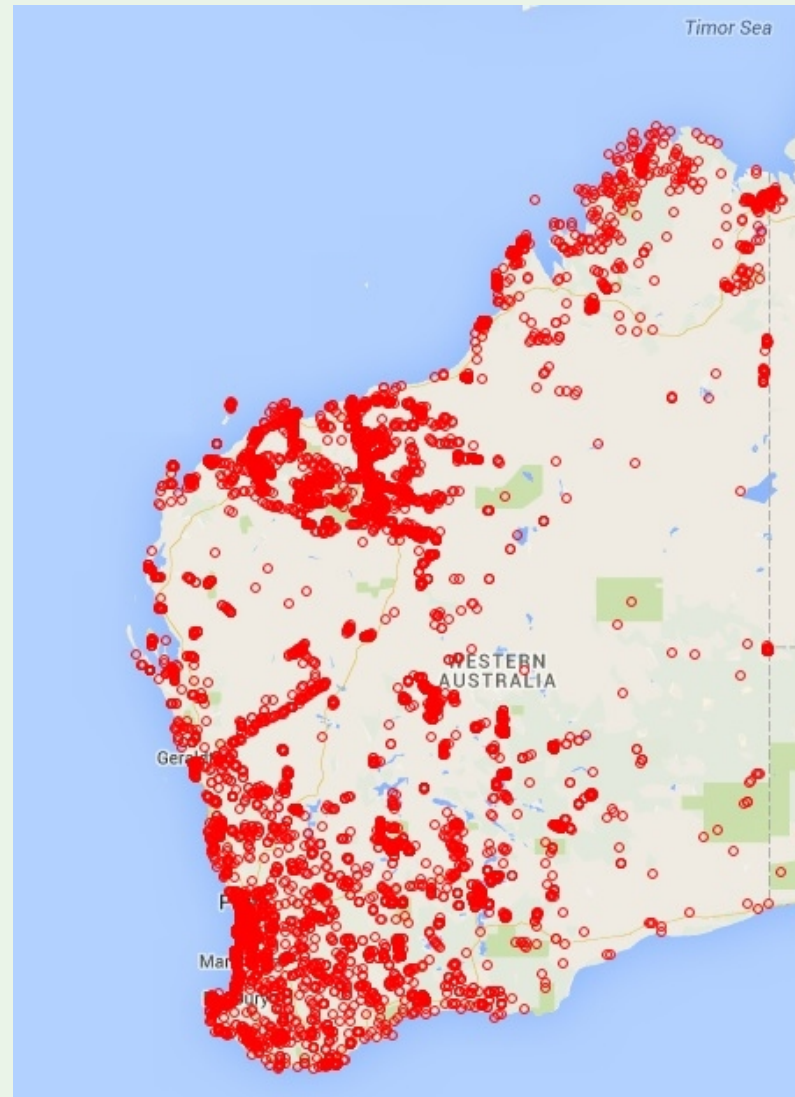
- There are consultants with:
  - no database
  - database of their own surveys
  - a database containing multiple sources of data from the private and public domains
- All consultants need to have access to a comprehensive database to undertake a fauna assessment

# Private databases

- Vertebrate fauna reports
  - Spatial search capacity (i.e. find all reports or records within a given location)
- These reports provide:
  - Fauna data
    - species lists
    - capture records
    - species coordinates
  - Contextual information
    - trapping effort
    - habitat characteristics:
      - vegetation
      - soils
      - relief
- Current species list for WA vertebrate fauna
- Search capability by:
  - species
  - area
- Plot data to a map
- Bibliographic references
- Options:
  - Use shape files for searches
  - Use aerial photography
  - Plot surveys and sites



~80% of WA survey sites



\* Backlog of ~600 reports/surveys to upload

# Public provision of fauna data

- EPA Position Statement No 3 (p. 5):
  - The EPA expects that terrestrial biological surveys will be made publicly available and will contribute to the bank of data available for the particular region, to aid the overall biodiversity understanding and assessment by facilitating transfer into State biological databases.
- EPA Guidance Statement (p.17):
  - The EPA considers that:
    - the public availability of information on biodiversity is fundamental to the environmental review process and good decision-making; and
    - all survey work on fauna and faunal assemblages should contribute to the sum total of knowledge for the State.'
- We need the EPA to mandate the public provision of fauna data used in EIAs, vegetation clearing permit applications, etc
- We need greater access to NatureMap and the Fauna Survey Database to allow the download and review of data more appropriate to fauna assessments

# Presence only vs abundance data analysis

	Species 1	Species 2
Habitat 1	1	99
Habitat 2	99	1

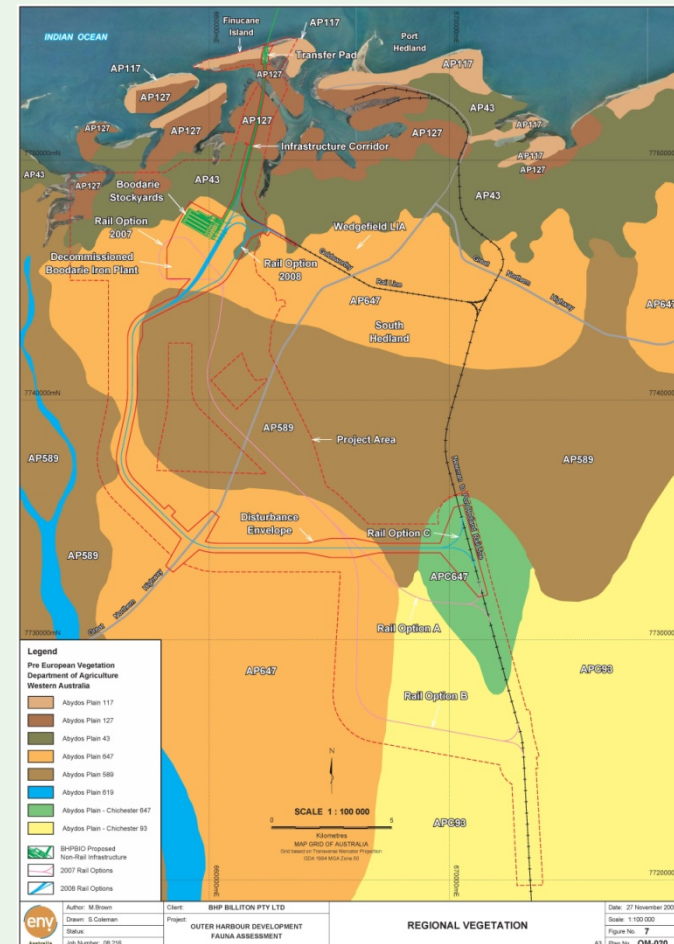
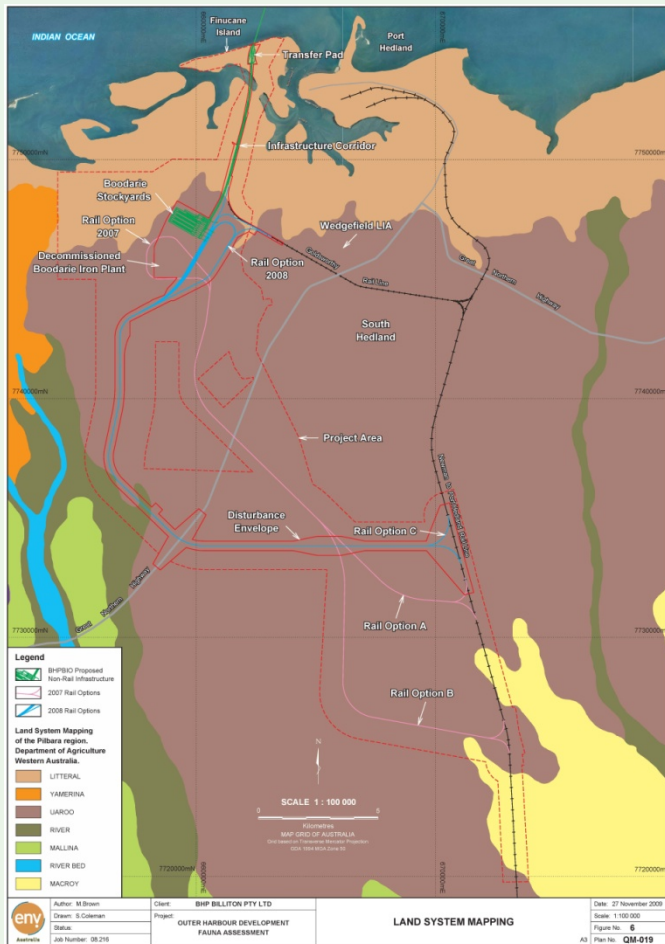
‘Presence only’ data analysis treats vagrants, singletons and doubletons the same as the most abundant species, and it is not an appropriate method of analysing fauna survey data.

## **Reporting**

Report and present all abundance data per site and per habitat type.

Abundance data should be the basis of ordinations to determine fauna habitats.

# Habitat based fauna assessments



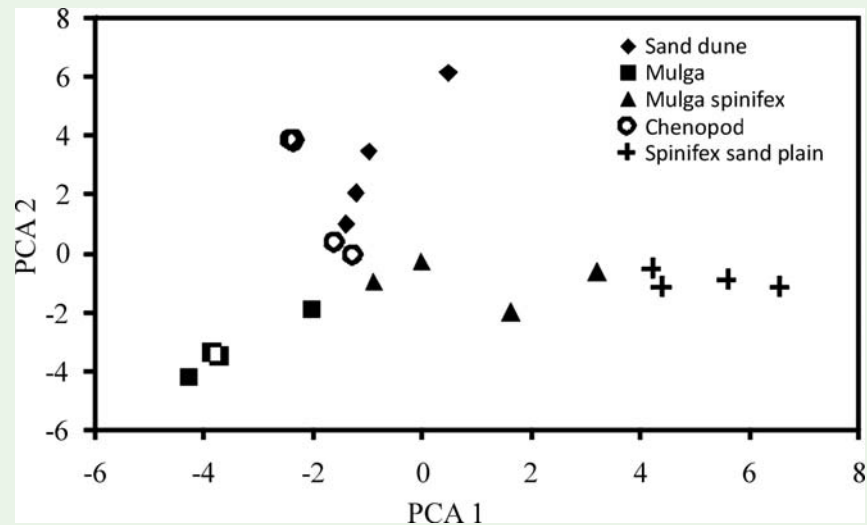
Env (2009) Outer Harbour Development Fauna Assessment, Unpublished report for BHP Billiton Iron Ore Ltd. Perth, Figs 6 and 7

# Fauna habitat based analysis

## Goldfields survey

- Two surveys – different seasons
- Five perceived habitat types
- Four sites in each habitat type
- Four trap-lines in each site
- Each trap-line had 3 buckets, 3 pipes, 3 pair of funnel traps, 3 aluminium box traps
- 16,800 trap-nights
- 2,783 reptiles and mammals from 61 species caught in a two season survey

## Ordination



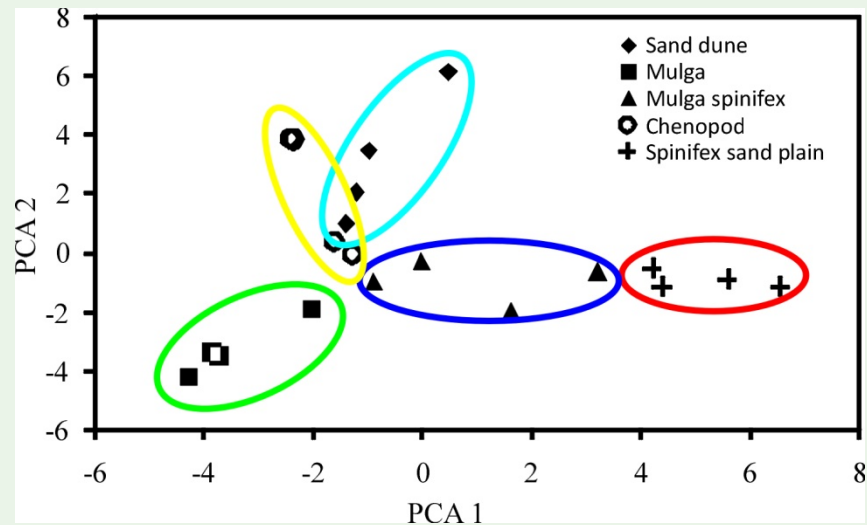
Thompson and Thompson (2008) JRSWA, 212-228

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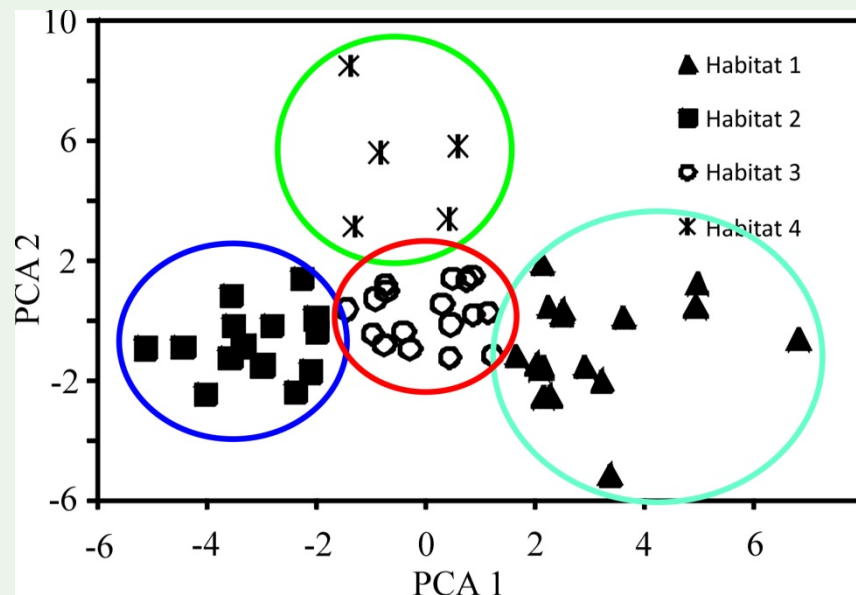
Thompson and Thompson (2008) JRSWA, 212-228

# Fauna habitat based analysis

## Pilbara survey

- Two surveys – different seasons
- 54 sites
- Four trap-lines in each site
- Each trap-line had 3 buckets, 3 pipes, 3 pair of funnel traps and 3 aluminium box traps
- 45,360 trap-nights
- 5,332 reptiles and mammals from 78 species caught

## Ordination



Thompson et al. (2010) JRSWA, 93, 51-64

# Fauna habitat based analysis

- Fauna survey data should be analysed on a fauna habitat basis, e.g.
  - SACs
  - Species richness
  - Conservation significant fauna
  - Impact assessment
- In many cases the grouping of sites into fauna habitat types will be obvious, but that will not always be the case



# Fauna habitat based analysis

The EPA Position Statement No 3 (p.12) states:

‘Best practice assessment now requires that biodiversity be considered to have two key aspects, namely:

- a) its biodiversity value at the genetic, and **ecosystem levels**; and*
- b) its ecological functional value at the **ecosystem level**.*

Biological surveys need to provide sufficient information to address both these values within the context of the type of proposal being considered and the relevant EPA objectives for protection of the environment.’

Use fauna habitat types as your ecosystems

# What's not captured

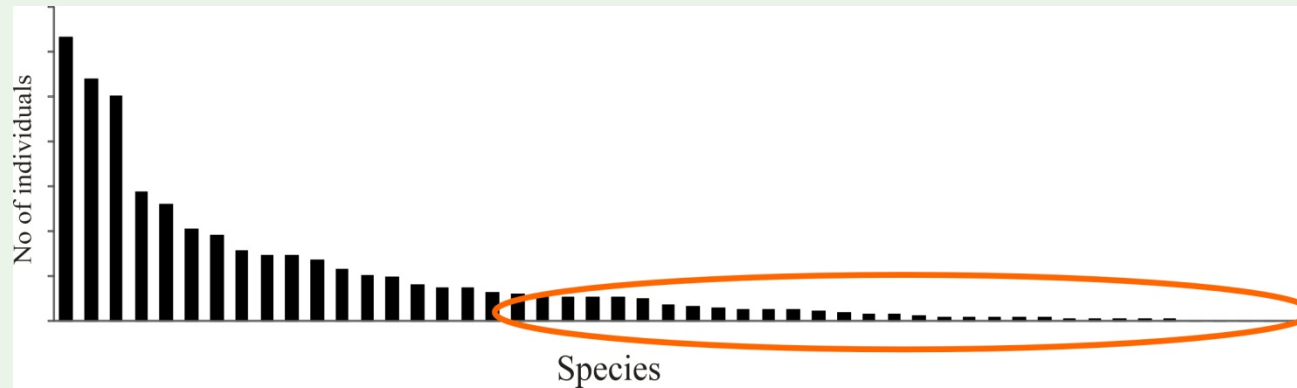
## Obvious

- Terrestrial fauna
  - Burrowing frogs - if it has not rained
  - Male dasyurids (some) – if it is after the breeding season
  - Reptiles in autumn and winter
- Birds
  - Migratory birds - outside the appropriate season
  - Marine and wetland species utilising inland lakes and water courses

# What's not captured

## Less obvious

- Low abundance species



- Difficult to trap or escape from trap species (e.g. *Anilios pinguis*)
- Species in difficult to access places (e.g. *Notoryctes typhlops*, *Sminthopsis longicaudata*)
- Semi-nomadic, shifts activity area or widely dispersing species (e.g. *Macrotis lagotis*)
- Low abundance and with large home ranges (e.g. *Varanus giganteus*)
- 'Boom and bust' species (e.g. *Leggadina lakedownensis*)
- Small and defined home ranges (e.g. *Liopholis inornata*, *L. kintorei*)
- Some sit-and-wait predators (e.g. *Acanthophis antarcticus*)

# Minimum expectations of fauna analysis

For each fauna habitat:

- Details of the survey methods used
- Method of determining fauna habitats
- Species accumulation curves
- Actual and estimated species richness
- Relative abundance of each species
- Species potentially present but not recorded
- Measure of diversity
- Threatened and conservation significant species
  - Present
  - Potentially present but not recorded
- Relative abundance of each fauna habitat in adjacent areas
- Potential impacts and the consequences of that potential impact

# Reliability and veracity

- Honest assessment of limitations
- Contextual fauna survey data reasonably available
- Adequate trapping and survey effort per habitat type
  - Asymptotes for species accumulation curves – what proportion of the fauna assemblage was not recorded?
  - Probability that threatened species are present and not detected – application of stopping rules
- Wrongly assumed a species is not present and therefore didn't look for it (e.g. *Dasyurus hallucatus*)
- Probability of misidentifying a new species (e.g. *Varanus hamersleyensis*)

# Quality control

- QA/QC is not just checking spelling, grammar and layout!
- QA/QC staff should be involved in the planning of the field work and proposed fauna surveys and assessments
- People reviewing reports should:
  - Have knowledge of industry best practice
  - Survey methodologies and procedures
  - Data analysis procedures
  - Fauna and fauna assemblages from the area

# Up-to-date nomenclature

- We need to have procedures in place to ensure that we are up-to-date with taxonomic changes, new species, etc
- Fauna databases need to be regularly up-dated
  - Public
  - Private

# Peer reviewing

## **EPA Guidance Statement No 56 p. 19:**

Peer review may be warranted for some EIA surveys, particularly where the EPA or the practitioner conducting the main fauna and faunal assemblage survey considers that the survey is in an area or bioregion which is poorly known or in which a limited range of specialists may be qualified or experienced. Such review must be undertaken by experienced and suitably qualified professionals.

- Peer reviewing is an important aspect of quality control
- As an industry we should seriously consider advocating that fauna assessments are peer reviewed by external, experienced and suitably qualified professionals
- This should be an independent process



# Peer reviewing

- Only as good as the reviewers' that are 'selected'!
- Limitations and caveats:
  - Based on a payment system (or repeat business), which can bring with it bias
  - Depends on who selects the reviewers
- Reviewers' names and reviews need to be appended to the reports to add strength and veracity to the report and assessment

Thank you

Questions