Adaptation strategies for Australian birds

A collaborative project between Charles Darwin University, James Cook University, CSIRO, Birds Australia and BirdLife International

NCCARF meeting 15 May 2012, University of Melbourne
Objectives:
Identify adaptation strategies for Australian birds based on modelling, building on a current review of Australian bird status

Deliverables:
A “Climate change adaptation action plan for Australian birds” that
• identifies/prioritises which birds require adaptation strategies
• where/when to implement these to maximize positive outcomes.
Important for targeting effective investment by government, land managers and conservation organisations
Approach

1. Determine scope of study
2. Assess exposure
3. Assess sensitivity
4. Calculate susceptibility and prioritise taxa
5. Determine required actions
6. Estimate cost of actions
7. Combine results into plan of action
1. Scope – all Australian bird taxa

The taxonomic unit for bird conservation in Australia is the ultraxon

- 1,555 taxa in total
- 1,265 ultrataxa in 734 species
  - 444 monotypic species
  - 290 polytypic species containing 821 subspecies
1. Scope – all Australian bird taxa

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<table>
<thead>
<tr>
<th>Bird Group</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mainland</td>
<td>1239</td>
</tr>
<tr>
<td>Oceanic Island</td>
<td>21</td>
</tr>
<tr>
<td>Freshwater</td>
<td>108</td>
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<tr>
<td>Coastal</td>
<td>102</td>
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<tr>
<td>Marine</td>
<td>85</td>
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2. Exposure

the extent of climate change likely to be experienced by a species or locale

Approach

• Assemble existing location records
• Model current and future climate suitability for all Australian bird taxa
2.1 Assembly of records

- Has drawn data from 23 different databases
- Has created largest database of bird locality records ever assembled in Australia = over 8 million records

<table>
<thead>
<tr>
<th>Database</th>
<th>Records</th>
<th>Database</th>
<th>Records</th>
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<tbody>
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</table>
Spawned additional project funded by Australian National Data Service to make data in Atlas of Living of Australia readily accessible
- Many records are vagrants, too inaccurate for modelling or just straight wrong – 120,000 records or 1.5% overall
- Tried getting birdwatchers to correct records online – but they were overwhelmed

<table>
<thead>
<tr>
<th>Database</th>
<th>Proportion suspect</th>
<th>Database</th>
<th>Proportion suspect</th>
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<tr>
<td>Victorian Waterbird Database</td>
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</table>
• Created shape file for each taxon for vetting records - the first GIS layer delineating a distribution of all Australian subspecies
• Will be used to vet all records coming into the Birds Australia Atlas database and to assign unspecified observations to subspecies
• Will be made available to all other database custodians
• About 90% done – about 150 out of 1350 left to do

Hooded Robin vetting map showing core range of each subspecies and hybrid zones as currently understood
2.2 Modelling

- Modelling all 1260 terrestrial and 82 waterbird taxa
- Includes historical records and records from areas where successfully introduced
- Models
  - whole species
  - core range of subspecies with hybrid zones
  - hybrid zones alone
- Latest high, medium and low emission scenarios for 2080
Malleefowl

Current

2080 – Low Emissions

2080 – Business as usual

2080 – High emissions
Squatter Pigeon

Species

Now 2080 Low 2080 BAU 2080 High

Southern subspecies

Northern subspecies
Exposure - summary

• Determine proportion of the current Range and Summed Environmental Suitability that falls below a climate suitability threshold in 2080 under three modelled scenarios.

• Calculate the area of each major vegetation type currently within existing climate space and currently within each potential future climate space, before and after clearing.

• Allow calculation of most exposed taxa at species and ultrataxon levels.

• Also calculate measures of climatic marginality and specialisation for each taxon for use in sensitivity analysis.
3. Sensitivity

*species-specific properties that modify the potential impact experienced from exposure*

Approach

- Assemble database on biological characteristics
- Determine taxa with highest sensitivity to climate change
3.1 Database assembly

For all 1555 Australian bird taxa an Access™ database has been assembled with a full suite of values needed to assess climate change sensitivity (and many others) – to be published as a data paper so available for other analyses.
3.2 Sensitivity variables

- Relative brain size
- R-Max – clutch size x broods/year
- Generation time
- Age at first breeding
- Climate sensitivity (modelling data ENFA)
- No. habitat types
- No. foraging substrates
- No. food types
- Capacity to cross habitat gaps
The Australian bird with the biggest brain for its weight
The Australian bird with the biggest brain for its weight - Palm Cockatoo
The Australian bird with the biggest brain for its weight - Palm Cockatoo

Most cranially challenged Australian bird
The Australian bird with the biggest brain for its weight - Palm Cockatoo

Most cranially challenged Australian bird - White-rumped Swiftlet
Sensitivity - summary

• Review of options for assessing sensitivity completed, justifying choice of variables chosen and rejected
• Database should be completed today, apart from modelled parameters to come when vetting complete
• No. variables will be reduced to a few factors using Principal Components Analysis
• Will then have a ranked list from most to least sensitive taxa
4. Prioritization

- Exposure and sensitivity treated as separate dimensions
- A bird can be highly exposed, but not very sensitive or hypersensitive but little exposed (e.g. malleefowl climate space may change little but it may be near its limit within its home range in terms of moisture needed for successful egg incubation)
- Rankings for susceptibility to climate change will be determined by distance from origin against exposure and sensitivity gradients
Issues

Modelling to determine exposure difficult or impossible for many taxa

• Marine birds – will calculate shifts in Sea Surface Temperature under different scenarios
• Shorebirds – seeking advice from Richard Fuller
• Island birds – will assess susceptibility based on sensitivity measures

Each group probably a separate chapter in book
5. Required actions

• Will use results from NCCARF Terrestrial Biodiversity Network workshops

• Hierarchical process developed in Workshop 1 can be followed for overall decision

• Where relocation needed, will follow guidelines from Workshop 3 on assisted colonisation
6. Costs

• Empirical current costs of most actions are being assembled for another project on threatened birds – estimating how much has been spent in the last decade for each type of action for each taxon

• Includes examples of costs of assisted colonisation, *ex situ* conservation, monitoring, research and ongoing management of threats

• Will be approximate
7. Final product

The climate change action plan for

AUSTRALIAN BIRDS

CSIRO
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