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# The Atlas of Living Australia: ~~Logging Native Forests~~ Supporting Research



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University of Tasmania, July 26 2011

# Mission

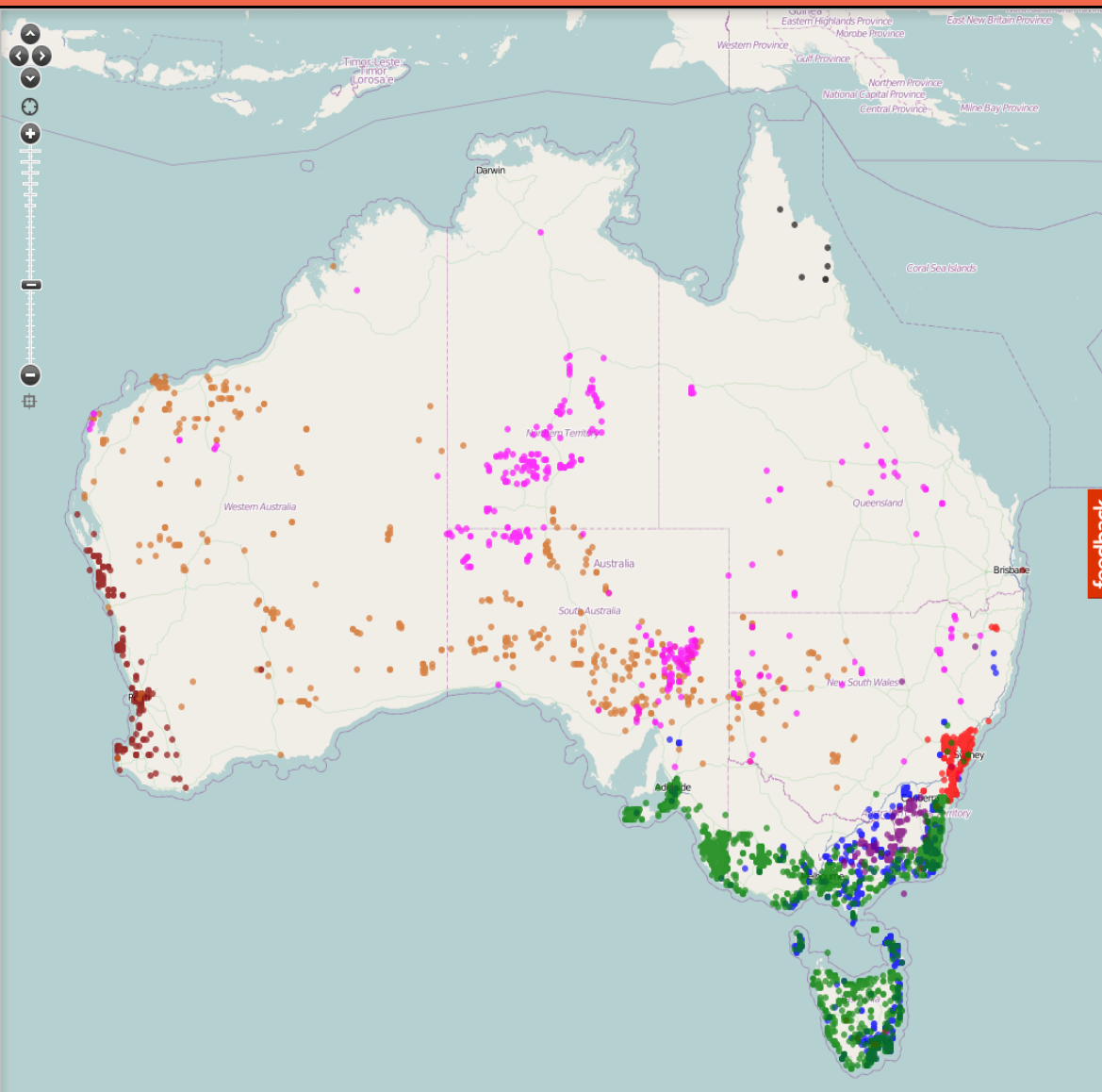


To develop an authoritative, freely accessible, distributed and federated biodiversity data management system

# Key Benefits for Research?

- Integrated biological and environmental **data**
- Human and machine oriented **services** that tap that data
- Data upload and download
- Expose issues: We have many!

# Where is it?



WA



*Anigozanthos manglesii*  
Mangles' Kangaroo Paw

NT



*Gossypium sturtianum*  
Sturt's Desert Rose

SA



*Swainsona formosa*  
Sturt Pea

QLD



*Vappodes phalaenopsis*  
Cooktown Orchid

NSW



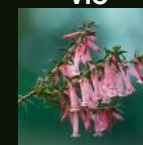
*Telopea speciosissima*  
Waratah

ACT



*Wahlenbergia gloriosa*  
Royal Bluebell

VIC



*Epacris impressa*  
Common Heath

TAS



*Eucalyptus globulus*  
Blue Gum

# What's here?

## Species List Results Preview

preview of all 82 species found

Family	Scientific name	Common name/s	Taxon rank	LSID	# Occurrences
Acanthizidae	<i>Acanthiza chrysorrhoa</i>	Yellow-rumped Thornbill, Yellow-rumped Thornbill, Yellow-rumped Thornbill, Yellow-rumped Thornbill, Yellow-rumped Thornbill, Yellow-rumped Thornbill	species	urn:lsid:biodiversity.org.au:afd.tax:3d46-4c6e-a233-1ba9e82a2886	7
Acanthizidae	<i>Acanthiza ewingii</i>		species	urn:lsid:biodiversity.org.au:afd.tax:278f-4e84-ac57-87494d836689	2
Acanthizidae	<i>Acanthiza pusilla</i>	Brown Thornbill, Brown Thornbill, Brown Thornbill, Brown Thornbill, Brown Thornbill, Brown Thornbill, brown thornbill	species	urn:lsid:biodiversity.org.au:afd.tax:9ef1-4a2c-839d-0efd7e794af4	13
Acanthizidae	<i>Sericornis humilis</i>	Tasmanian Scrubwren, Tasmanian Scrubwren, Tasmanian Scrubwren; Brown Scrubwren	species	urn:lsid:biodiversity.org.au:afd.tax:bd51-42bc-bcf9-7ea22359d483	5
Acanthizidae	<i>Acanthiza pusilla</i>	Wedge-tailed, Wedge-tailed, Wedge-tailed, Wedge-tailed Eagle, Wedge-tailed Eagle, Wedge-tailed Eagle, Wedge-tailed Eagle	-----	urn:lsid:biodiversity.org.au:afd.tax:-----	-----

[Download](#) [Close](#)



Frederick Henry Bay

### Lime Bay State Reserve

Area (sq km)	15.12	<a href="#">Info</a>
Species	<u>82</u>	
Occurrences	<u>511</u>	<a href="#">Map all</a>
Expert distributions	0	

area report for "My Area 1"  
metadata for "Occurrences in My Area 1 1"  
load species list for "My Area 1"  
load all records for "Occurrences in My Area 1 1" in "My Area 1"  
state classification for "My Area 1"

- ~172,00 taxa
- Online and freely accessible (view/download)
- Anyone can enter observations (online/offline)
- Plants, animals and microorganisms
- Marine and terrestrial
- Native and non-native
- ~26,000,000 observations and specimen records (largely Darwin Core fields)
- Checklists, expert distributions and tracks\*
- Links to related information (status, images, papers, keys, sequences, interactions...)

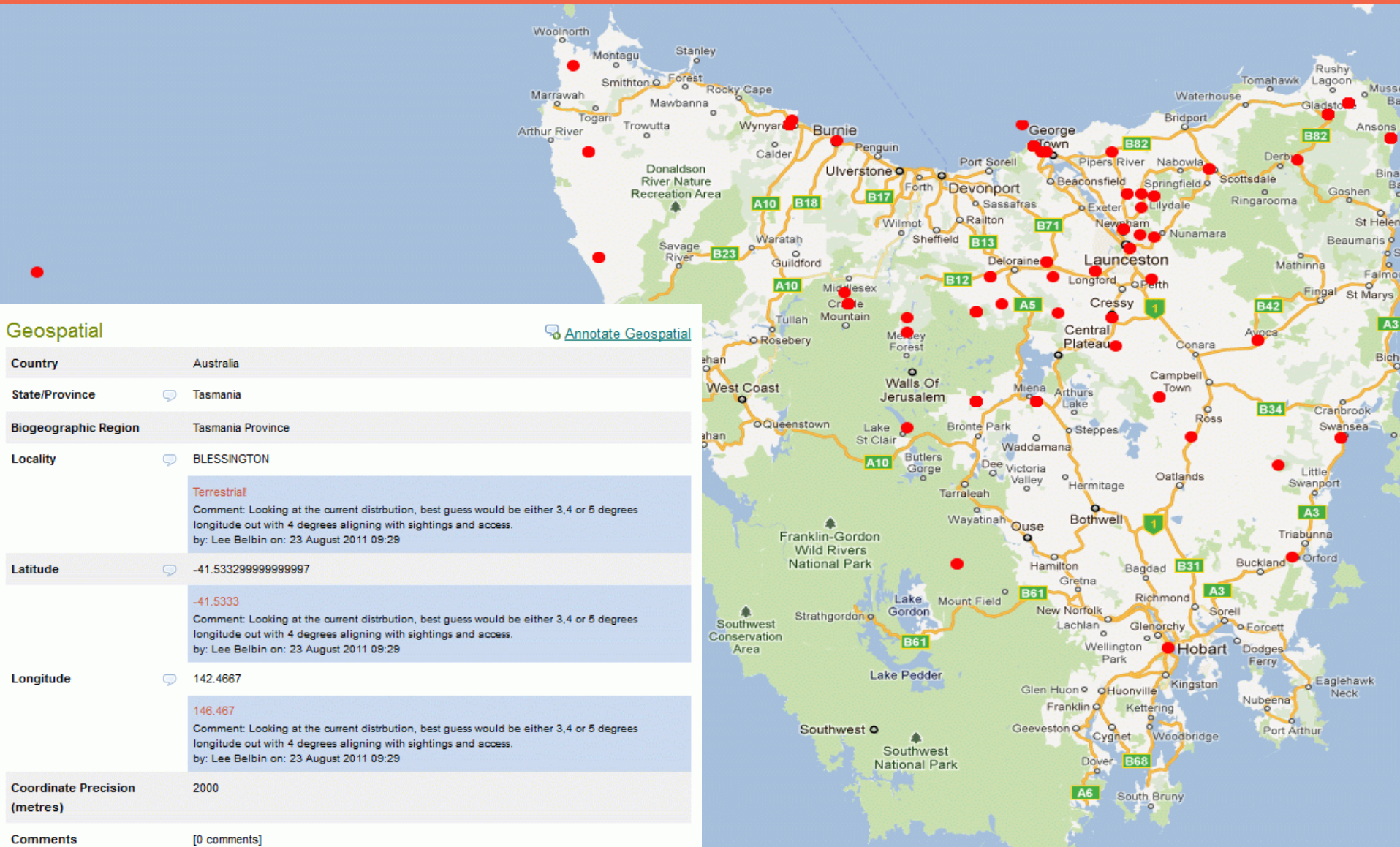
- 'Fitness for Use' > 'Data Quality'!
- Data quality is largely in the hands of the data provider...
- Display of aggregated and integrated data exposes issues
- The Atlas runs a series of checks on received data
  - Most errors need to be referred to the custodian/provider
  - Some errors can be automatically corrected (all logged)
- The Annotation Services provides invaluable crowd-sourcing feedback

# Data: Auto Checks

A	B	C	D	E	F	G	H	I
Code	Name	Creator	Description	Wiki	Failure implication	Severity/Verification/Metric	Darwin Core Class	Darwin Core Fields
Geospatial								
1	NEGATED_LATITUDE	GBIF	Record appears to be referencing a location in the wrong hemisphere	Wiki	Fix and report	Warning	Location	decimalLatitude
2	NEGATED_LONGITUDE	GBIF	Record appears to be referencing a location in the wrong hemisphere	Wiki	Fix and report	Warning	Location	decimalLongitude
3	INVERTED_COORDINATES	GBIF	Latitude and longitude have been transposed accidentally (typically bad database mapping)	Wiki	Fix and report	Warning	Location	decimalLatitude, decimalLongitude
4	ZERO_COORDINATES	GBIF	Coordinates given as 0,0. Typically a result of bad default values for empty database fields	Wiki	Exclude from mapping and other reports. Make viewable in error report	Error	Location	decimalLatitude, decimalLongitude
5	COORDINATES_OUT_OF_RANGE	GBIF	Latitude > 90 or < -90 and Longitude > 180 or < -180	Wiki	Exclude from mapping and other reports. Make viewable in error report	Error	Location	decimalLatitude, decimalLongitude
6	UNKNOWN_COUNTRY_NAME	GBIF	Unrecognised or unparseable country name	Wiki	Report	Warning	Location	country
7	ALTITUDE_OUT_OF_RANGE	GBIF	Altitude greater than 10000m, or less than -100m	Wiki	Report	Warning	Location	verbatimElevation
8	BADLY_FORMED_ALTITUDE	GBIF	Free text string provided as altitude	Wiki	Report	Warning	Location	verbatimElevation
9	MIN_MAX_ALTITUDE_REVERSED	GBIF	Typically a column mapping issue	Wiki	Fix and report	Warning	Location	verbatimElevation
10	DEPTH_IN_FEET	GBIF	Darwin core specifies metres should be used	Wiki	Fix and report	Warning	Location	verbatimDepth
11	DEPTH_OUT_OF_RANGE	GBIF	Depth greater than 10000	Wiki	Report	Warning	Location	verbatimDepth
12	MIN_MAX_DEPTH_REVERSED	GBIF	Typically a column mapping issue	Wiki	Fix and report	Warning	Location	verbatimDepth
13	ALTITUDE_IN_FEET	GBIF	Darwin core specifies metres should be used	Wiki	Fix and report	Warning	Location	verbatimElevation
14	ALTITUDE_NON_NUMERIC	GBIF	Should be a numeric value in metres	Wiki	Report	Warning	Location	verbatimElevation
15	DEPTH_NON_NUMERIC	GBIF	Should be a numeric value in metres	Wiki	Report	Warning	Location	verbatimDepth
16	COUNTRY_COORDINATE_MISMATCH	GBIF	Coordinates outside the range for the reported country	Wiki	Report	Warning	Location	country, decimalLatitude, decimalLongitude
17	STATEPROVINCE_COORDINATE_MISMATCH	DM	Coordinates dont match the supplied state	Wiki	Report	Warning	Location	stateProvince, decimalLatitude, decimalLongitude
18	COORDINATE_HABITAT_MISMATCH	DM	Marine species reported in terrestrial area ** could be an identification or name match error instead of geospatial (MN)	Wiki	Exclude from mapping and other reports. Make viewable in error report	Error	Location	decimalLatitude, decimalLongitude, decimalLongitude, various spatial layers
19	DETECTED_OUTLIER_ENVIRONMENTAL	DM	Record marked as outlier either because it is outside the known range of the species or detected using environmental variables.	Wiki	Optionally exclude from mapping and other reports	Error	Location	decimalLatitude, decimalLongitude, various spatial layers
20	COUNTRY_INFERRED_FROM_COORDINATES	GBIF	Country field supplied was empty, but was inferred in processing by the supplied coordinates	Wiki	Report	Warning	Location	country
21	COORDINATES_CENTRE_OF_STATEPROVINCE	DM	The coordinates given are in the centre of the state, indicating they have been generated post collection event, erroneously by software. MN - should be verified as being an issue (as opposed to genuine record in the centre of the state) by checking the uncertainty is large or the record is imprecise.	Wiki	Exclude from mapping and other reports. Make viewable in error report	Error	Location	stateProvince, coordinatePrecision, coordinateUncertaintyInMeters
22	COORDINATE_PRECISION_MISMATCH	MN	Coordinate data does not match precision indicated - could be incorrect precision or truncation or rounding of the coordinate data (most likely with trailing zeros)	Wiki	Report	Warning	Location	coordinatePrecision
23	PRECISION_RANGE_MISMATCH	MN	A precision value should be between >0 and <=1 if entered according to DwC specifications	Wiki	Report	Warning	Location	coordinatePrecision
24	UNCERTAINTY_RANGE_MISMATCH	MN	Uncertainty should be a whole number >0	Wiki	Report	Warning	Location	coordinatePrecision
25	UNCERTAINTY_IN_PRECISION	MN	The value in precision is a mismatch with the precision spec but matches the uncertainty spec	Wiki	Report	Warning	Location	coordinatePrecision
26	SPECIES_OUTSIDE_EXPERT_RANGE	MN	Coordinates are outside the known "expert" range of the species	Wiki	Report	Warning	Location	decimalLatitude, decimalLongitude, expert range
27	UNCERTAINTY_NOT_SPECIFIED	NC	Uncertainty was not supplied with the record	Wiki	Report	Warning	Location	coordinateUncertaintyInMeters
28	MISSING_COORDINATEPRECISION	MN	coordinatePrecision not supplied with the record	Wiki	Report	Warning	Location	coordinatePrecision
29	MISSING_GEODETDATUM	MN	geodeticDatum not supplied for coordinates	Wiki	Report - also implies uncertainty	Warning	Location	geodeticDatum
30	MISSING_GEOREFERENCEDBY	MN	GeoreferencedBy not supplied with the record	Wiki	Report	Warning	Location	georeferencedBy
31	MISSING_GEOREFERENCEPROTOCOL	MN	GeoreferenceProtocol not supplied with the record	Wiki	Report	Warning	Location	georeferenceProtocol
32	MISSING_GEOREFERENCE_SOURCES	MN	GeoreferenceSources not supplied with the record	Wiki	Report	Warning	Location	georeferenceSources
33	MISSING_GEOREFERENCEVERIFICATIONSTATUS	MN	GeoreferenceVerificationStatus not supplied with the record	Wiki	Report	Warning	Location	georeferenceVerificationStatus
34	INVALID_GEODETDATUM	SB	The geodetic datum is not valid	Wiki	Report	Warning	Location	geodeticDatum

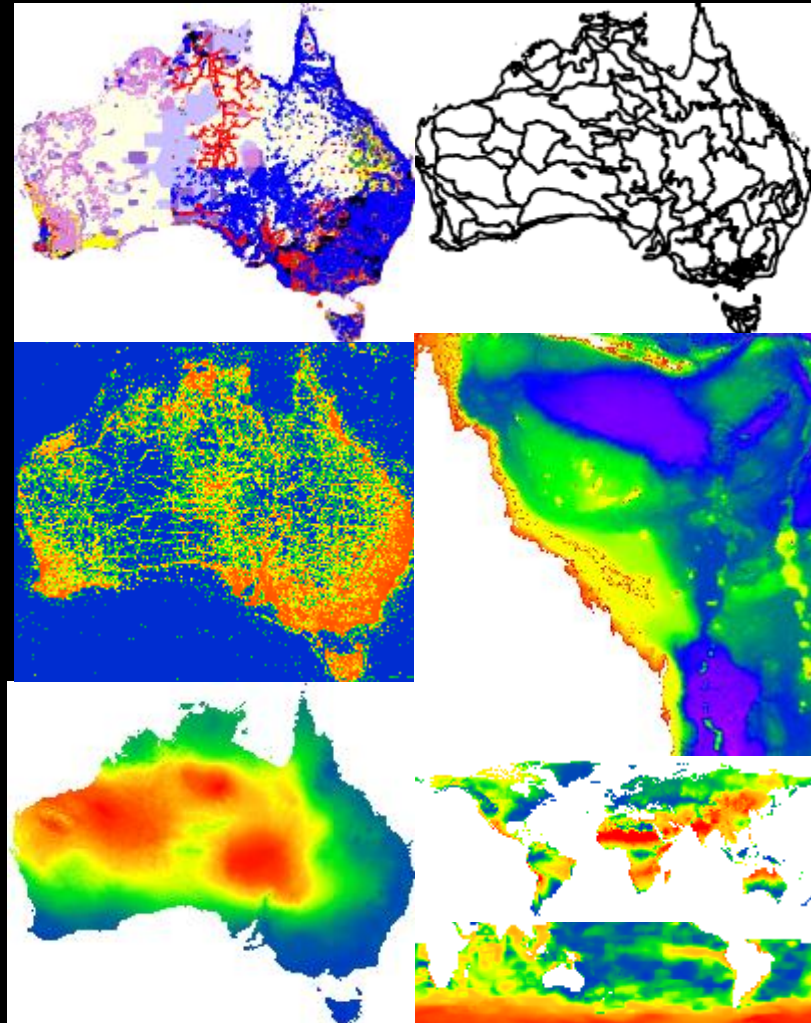


# Data: Annotations



# Data: Layers

- 217 'environmental' layers
  - Gridded layers with continuous values
  - Most at 1km resolution\*
  - Terrestrial and marine
  - E.g., C4 growth index, mean annual temperature, species richness...
- 46 'contextual' layers
  - Polygonal layers with class values
  - Terrestrial and Marine
  - E.g., Land use, coral ecoregions...
- Human/machine catalogue
  - <http://spatial.ala.org.au/layers>
  - Web service maps



# Data: 'Areas'

- 13 ways to define 'area'
- Australian Gazetteer (2010)
  - 322,000 points (only)
  - We allow for 1, 5, 10 and 20 km radii to form area
- Global Administrative Areas Database
  - 226,439 (global) areas
  - We use the coastline boundary one of the basemaps
- All named polygons within contextual layers
  - Many thousands
  - Map area vs. map layer
  - Will include 'non-unique' polygons\*

## Add Area

Select method to define area.

### Interact with the map

- Draw bounding box
- Draw polygon
- Draw point and radius
- Select area from polygonal layer

### Searching

- Radius centered on street address
- Gazetteer polygon

### Preset areas

- Box - Australia
- Box - World
- Box - Current View

### Upload

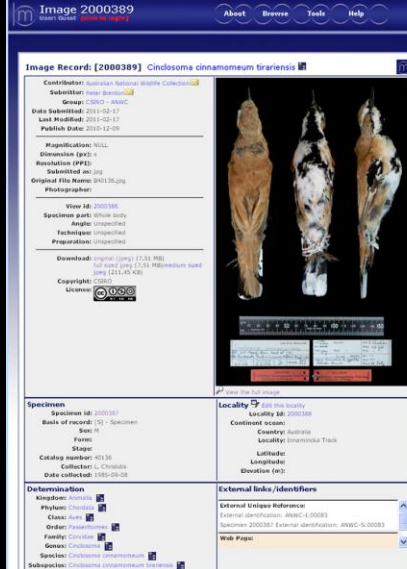
- Upload Shapefile
- Upload KML

### Other

- Define environmental envelope
- Paste Well Known Text (WKT)

# Data Integration

- >60% of my time as a scientist was spent on data acquisition and integration
- GIS layers are aligned and consistently rendered
- **Locations** of observations can be used to link to all environmental and contextual layers (Sampling)
- **Names** link observations to locations, images, videos, keys, sequences, literature, conservation and invasive status...



**Image Record: [2000389]** *Cindysoma cinnameum triseriensis*

**Contributor:** Australian National Wildlife Collection  
**Submitter:** Alan Baker  
**Group:** CAS - ANWC  
**Date Submitted:** 2011-03-17  
**Last Modified:** 2013-03-11  
**Public Date:** 2010-12-09

**Registration:** NULL  
**Dimensions (DPI):** 72  
**Resolution (PPSI):** 300  
**Submitted as:** jpg  
**Original File Name:** 001131.jpg  
**Photographer:**

**View ID:** 2000389  
**Specimen path:** [View Specimen](#)  
**Angle:** Unspecified  
**Technique:** Unspecified  
**Preparation:** Unspecified

**Download:** [original \(jpg\)](#) [EICAS PNG](#)  
547 (48K) [JPG](#) [EICAS PNG](#) [JPG](#) [EICAS PNG](#)  
**Copyright:** CC BY-NC  
**License:** CC BY-NC

**Specimen**  
Specimen ID: 2000389  
Stack of record: 10 - Specimen  
Sex: M  
Age:  
Stage:  
Catalogue number: 40130  
Collector: L. Chardis  
Date collected: 1989-09-08

**Locality**  
Locality ID: 2000389  
Continental region:  
Country: Australia  
Locality: Inverness Track  
Latitude:  
Longitude:  
Elevation (m):

**Determination**  
Kingdom: [Animalia](#)  
Phylum: [Chordata](#)  
Class: [Aves](#)  
Order: [Passeriformes](#)  
Family: [Cinclidae](#)  
Genus: [Cindysoma](#)  
Species: [Cindysoma cinnameum](#)  
Subspecies: [Cindysoma cinnameum triseriensis](#)

**External links/identifiers**  
External Unique Reference:  
External identification: [AWNC-0-00083](#)  
[Specimen 2000389](#) External identification: [AWNC-0-00083](#)  
**Web Page:**

- Taxonomic Name Service
- Taxonomic tools (TRIN)
- Literature (Biodiversity Heritage Library)
- Identification keys (Identify Life)
- Field data capture
- Australian Barcode of Life
- Imaging
- Annotation Services
- **Spatial services**

- Map taxa
  - Scientific or common names
  - Upload taxa coordinates or LSIDs (CSV-format)
  - Limit taxa to area
  - Display: Faceting/filtering, details, links, metadata
- Map/define Area
  - 14 options including digitizing, selecting, searching, environmental envelopes, upload...
  - Import, combine and export areas (Shapefiles, KML, WKT)
- Map layers
  - Environmental: hover, sampling, scatterplots, classification prediction
  - Contextual: Hover, areas and tabulation\*

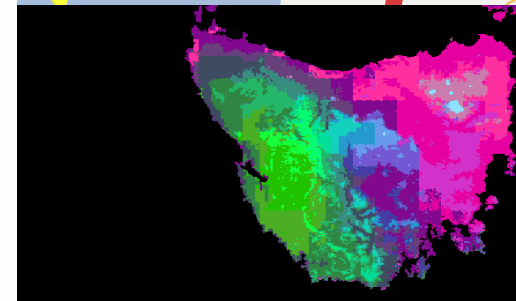
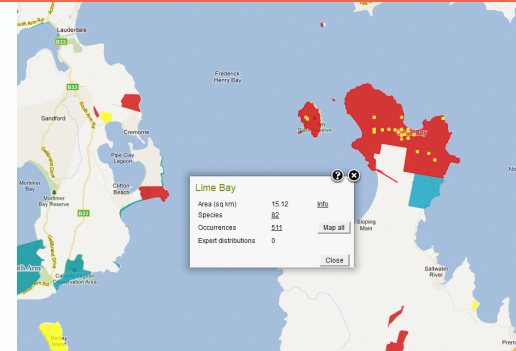
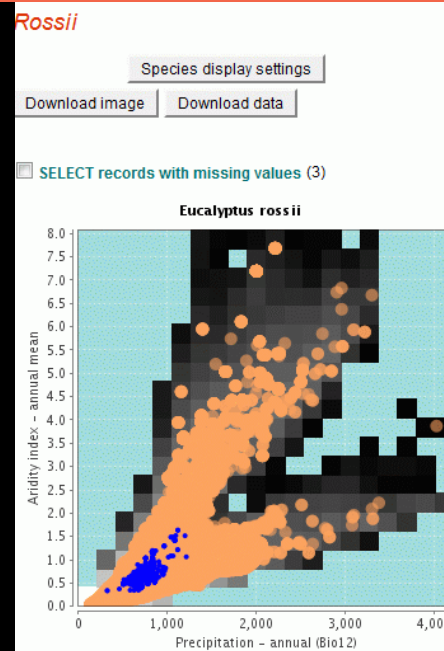
# Data Import and Export

- Taxa
  - Session upload taxa coordinates (CSV-format)
  - Session upload of assemblages (LSIDs: CSV)
  - Download of checklists (species in area)
  - Download records with optional layer values
- Areas
  - Defined area can exported as
    - Shapefile, KML (Google Earth/Maps) or WKT (Well Known Text)
    - Areas can be merged on export
  - Areas can be imported for session
    - Shapefile, KML or WKT
- Layers
  - Layers exported as images (WMS) due licensing
  - Plan to tap external layers (e.g., AusCover)

# Analysis Tools

- Exemplars
  - Area reports
  - Checklists
  - Sampling
  - Scatterplots
  - Classification
  - Prediction
  - GDM\*

- Case studies

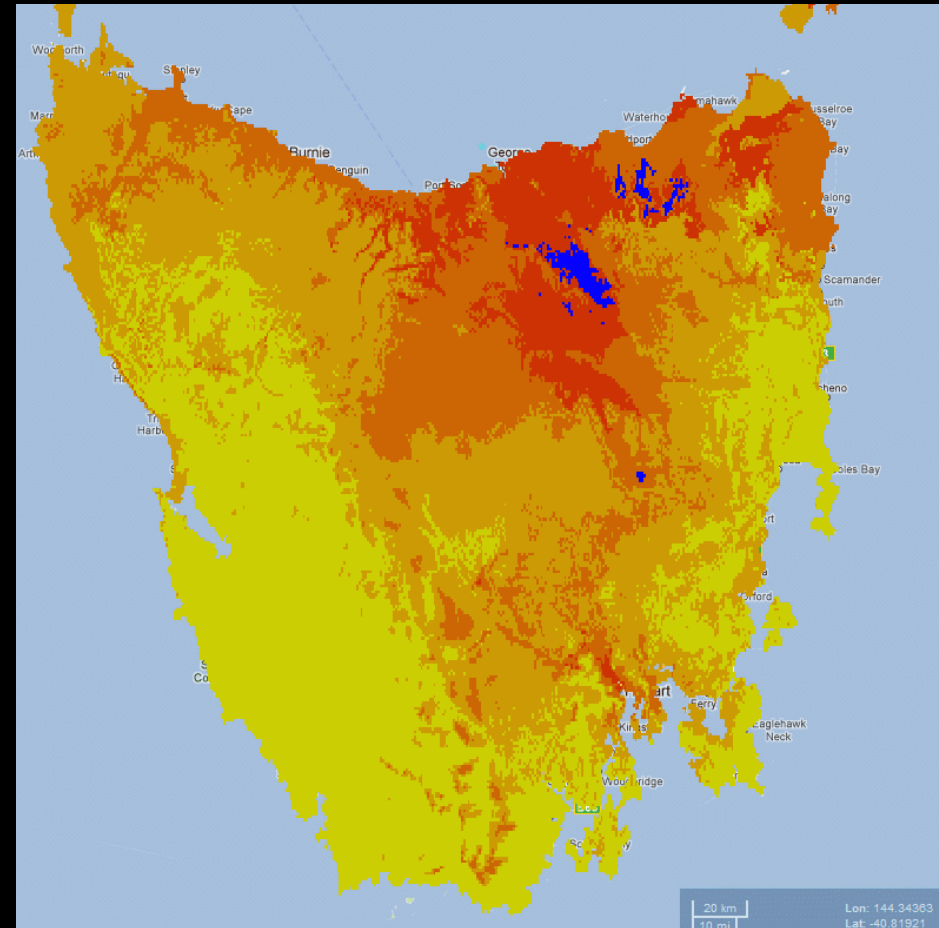


taxon_concept_id	id	kingdom	phylum	class	order	family	genus	species	taxon_name	data_provider	data_resource	rank	lat_long_precision	year	month	basis_of_record	longitude	latitude	Species Richness	Evaporation - month max
urn:lsid:biodiversity.org.au:afd.taxon:7c6c4836-0b6e-4268-a984-17f69745552f	186421737	Animalia	Chordata	Aves	Pelecanif	Phalacrocoracidae	Microcarbo	Microcarbo melanoleuco	Birds Australia	Birdata	species	100	2000	1	observation	147.641	-42.9508	1.185185	153.993	
urn:lsid:biodiversity.org.au:afd.taxon:7c6c4836-0b6e-4268-a984-17f69745552f	188051153	Animalia	Chordata	Aves	Pelecanif	Phalacrocoracidae	Microcarbo	Microcarbo melanoleuco	Birds Australia	Birdata	species	500	2002	12	observation	147.704	-42.9597	1.049383	152.7846	
urn:lsid:biodiversity.org.au:afd.taxon:c6f1688-c600-4171-aa54-620bbdccc838	199647921	Animalia	Chordata	Actinoptera	Perciformes	Aplodactylidae	Aplodactylus	Aplodactylus artidensis	OZCAM (Online Zoological Collections of Australian Museums) Provider	Tasmanian Museum and Art Gallery provider for OZCAM	species		1966		specimen	147.7	-42.96	2.518518	153.4384	
urn:lsid:biodiversity.org.au:afd.taxon:93831733e-1875-4eb4-b59e-3628e0f9afb4	199648354	Animalia	Chordata	Chondrichthyes	Torpediniformes	Narcinidae	Narcine	Narcine tasmaniensis	OZCAM (Online Zoological Collections of Australian Museums) Provider	Tasmanian Museum and Art Gallery provider for OZCAM	species		1974		specimen	147.64	-42.95	0.876543		
urn:lsid:biodiversity.org.au:afd.taxon:1fb65c6f-abdb-4be8-8442-20cde8fae408	199326111	Animalia	Mollusca	Gastropoda	Stylommatophora	Caryodidae	Caryodes	Caryodes dufruesii	OZCAM (Online Zoological Collections of Australian Museums) Provider	Queen Victoria Museum Art Gallery provider for OZCAM	species				unknown	147.7	-42.95	1.074074	154.1512	
urn:lsid:biodiversity.org.au:afd.taxon:9e2b0cbe-0135-4e0e-94ce-502b9272c74	199331510	Animalia	Mollusca	Gastropoda	Stylommatophora	Charopidae	Perna	Perna officieri	OZCAM (Online Zoological Collections of Australian Museums) Provider	Queen Victoria Museum Art Gallery provider for OZCAM	species				unknown	147.7	-42.95	1.074074	154.1512	



# Analysis Results

- Scatterplot
  - Export coordinates and values
- Classification (PATN's ALOC)
  - Analysis ID
  - Map image
  - Group means/colours
  - Layer dissimilarities
  - Data grids
- Prediction (MaxEnt)
  - Analysis ID
  - Map image
  - Layer diagnoses



# Spatial Portal



<http://spatial.ala.org.au>

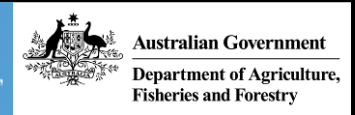
<http://spatial.ala.org.au/layers>

# Participants



## Government:

- CSIRO
- Dept. Environment, Water, Heritage and the Arts
- Dept. Agriculture, Fisheries and Forestry



## Representative bodies

- Council of Heads of Australasian Herbaria
- Council of Heads of Australian Faunal Collections
- Council of Heads of Australian Entomological Collections
- Council of Heads of Australian Collections of Microorganisms
- Council of Australasian Museum Directors



## State museums

- Australian Museum
- Museum and Art Gallery of the Northern Territory
- Museum Victoria
- Queensland Museum
- South Australian Museum
- Tasmanian Museum and Art Gallery
- Western Australian Museum



## Universities

- Southern Cross University
- University of Adelaide

