



Biogeography and richness in non-resprouting and mallee post-fire response types in *Eucalyptus*

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LAND AND WATER
www.csiro.au

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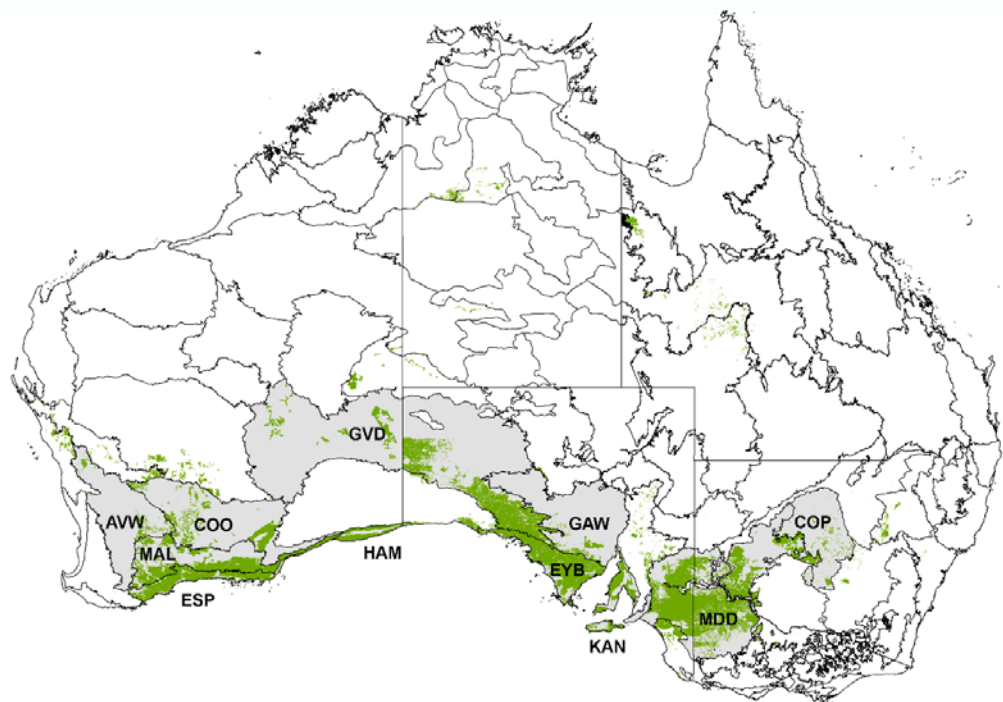
Department of
Parks and Wildlife



Aims

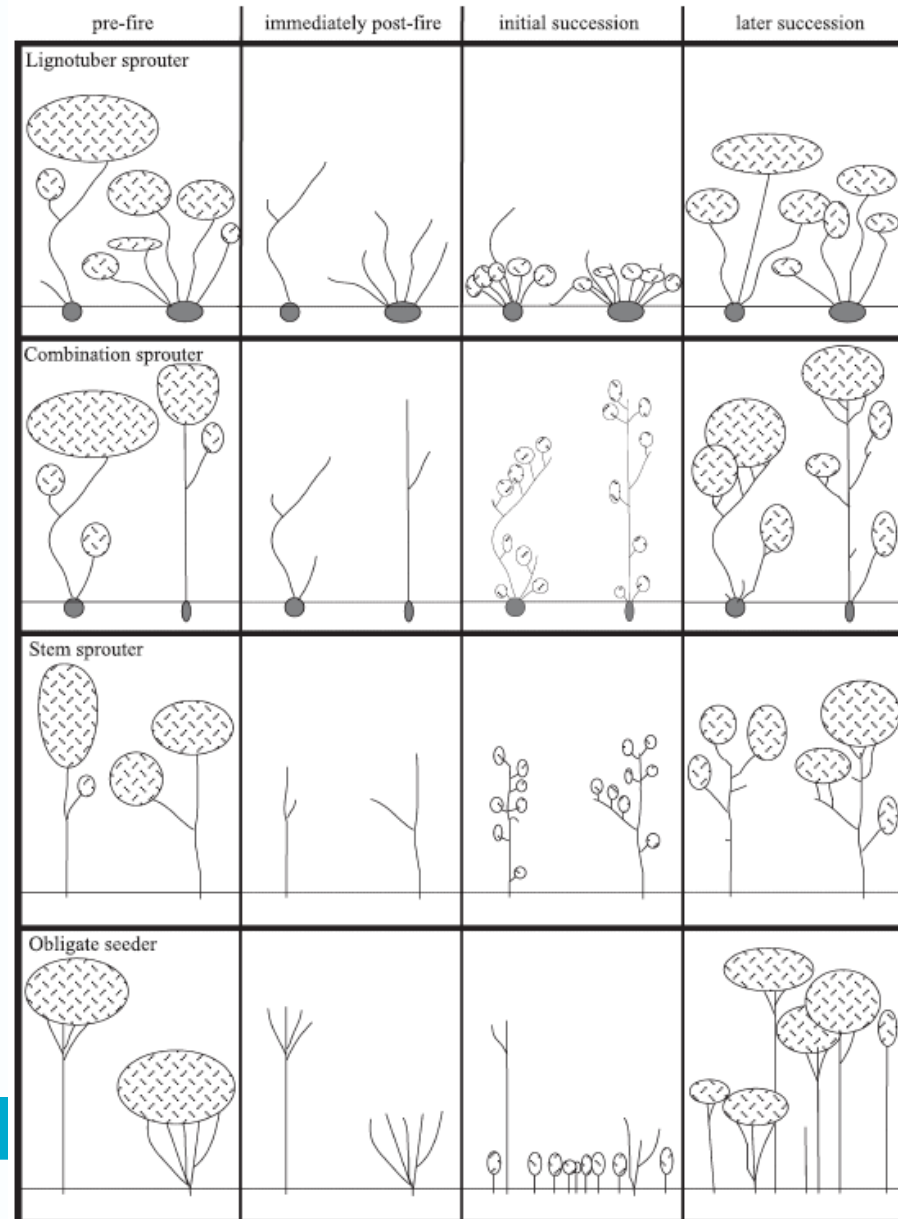
- Explore continental-scale patterns in richness and biogeography of post-disturbance response types in *Eucalyptus*
- Focus on lignotuber resprouting and non-resprouting response types
- Form distinctive shrublands to low forests in landscape mosaics
- Dry to arid Mediterranean to non-seasonal climate

NVIS Mallee Woodlands and
Shrublands MVG



Post-disturbance responses

- Lignotuber resprouter (mallee)
- Combination resprouter
- Stem resprouter
- Non-resprouter (maalok)



Nicolle (2006) *Aust. J. Bot.* **54**, 391–407

Response to fire:

Maalok

Mallee



Data source

- <http://www.ala.org.au/>
- Advanced search with bioregion geospatial filter

Atlas Of Living Australia ALA Apps ALA Info Search the Atlas Search

Search for records in Atlas of Living Australia

Simple search Advanced search Batch taxon search Catalogue number search Spatial search

Find records that have ALL of these words (full text)

Find records for ANY of the following taxa (matched/processed taxon concepts)

Species/Taxon

Species/Taxon

Species/Taxon

Species/Taxon

Find records that specify the following scientific name (verbatim/unprocessed name)

Raw Scientific Name eucalyptus

Find records from the following species group

Species Group -- select a species group --

Find records from the following institution or collection

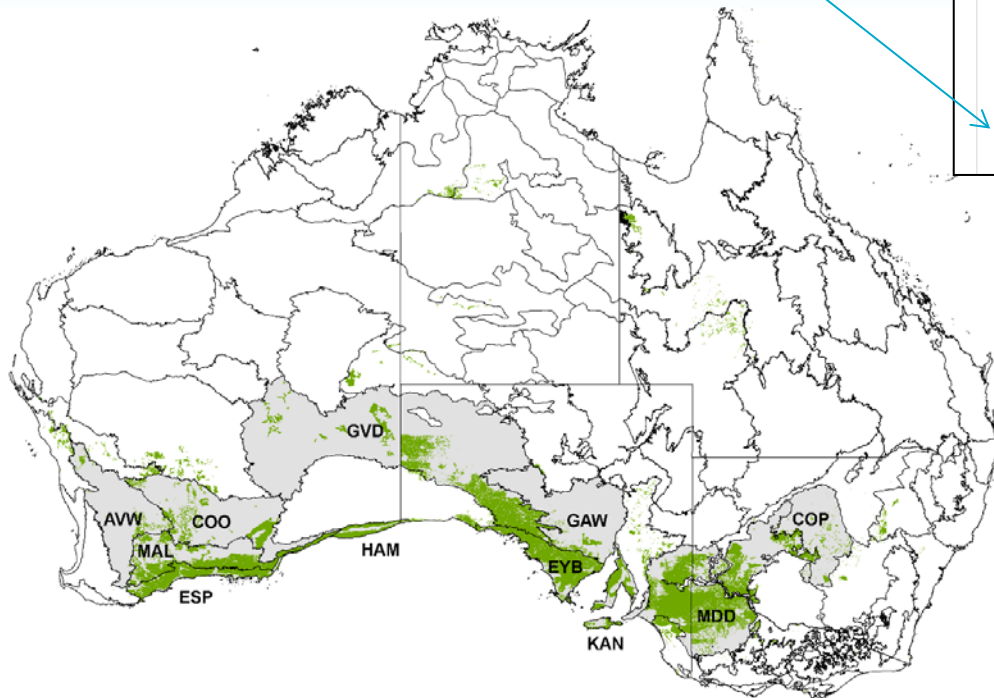
Institution or Collection -- select an institution or collection --

Find records from the following regions

Country -- select a country --

State/Territory -- select a state/territory --

IBRA region Coolgardie



Data verification

- ALA data quality check fields (cultivated, escapes, duplicates, inadequate location information)
- Taxonomic checking:
 - terminal taxa
 - consistent taxonomy
 - hybrids excluded
 - manuscript name taxa retained

	Number records
Selected bioregions	157170
ALA data checks	137946

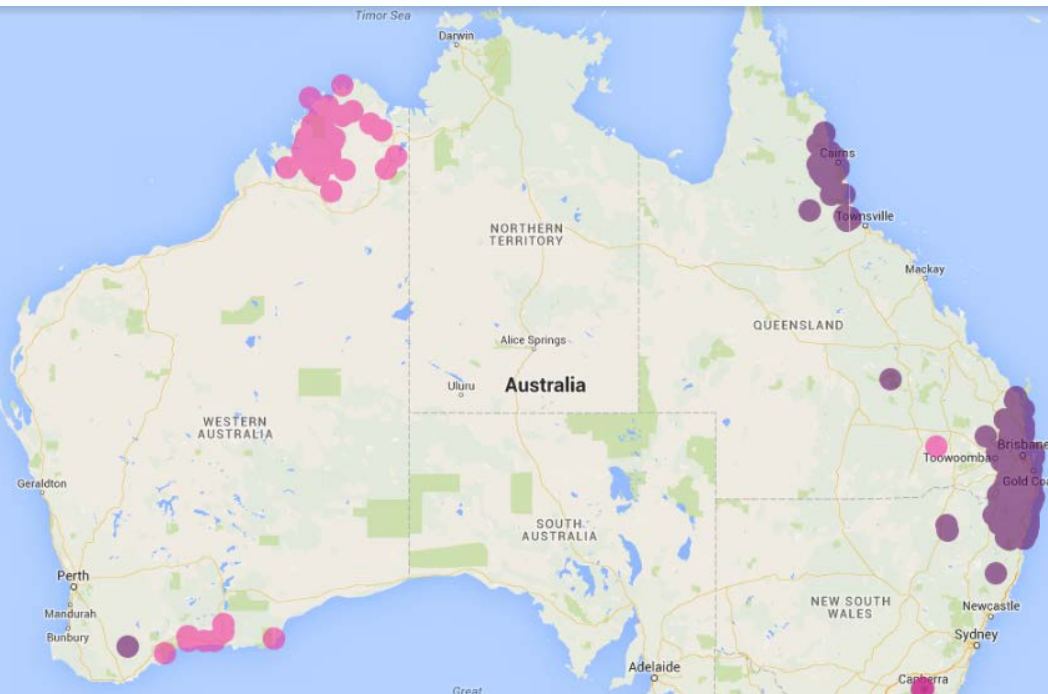
The screenshot shows the FloraBase website interface. At the top, there is a navigation bar with links for Home, Themes, Find, Nuytsia, Tools, Help, and Sign in. Below the navigation bar, the text "Name Currency" is displayed. The main content area shows the taxonomic name *Eucalyptus erythronema* var. *marginata* (Benth.) Domin in red text. Below this, a message states: "This taxon name is **not current**. The available references for this name are:". A table with two columns, "Browse" and "Note", is shown. The "Browse" column contains the word "Backward". The "Note" column contains the text: "Eucalyptus erythronema var. marginata (Benth.) Domin is more recently known as *Eucalyptus armillata* D.Nicolle & M.E.French. Reason: See D. Nicolle & M.E. French in Nuytsia 22:456(2012)".

ALA_name	Count(records)	Data check	Reason/notes	Sprouter type
Eucalyptus arachnaea	10	Exclude	Insufficient taxonomic resolution c.f. Subsp.	INDETERMINATE
Eucalyptus arachnaea subsp. arachnaea	88	No issues		Lignotuber
Eucalyptus arachnaea subsp. arrecta	14	No issues		Non-resprouting
Eucalyptus armillata	91	RETAIN	With Eucalyptus erythronema var. marginata as E. armillata	Lignotuber
Eucalyptus erythronema var. marginata	26	MERGE	With Eucalyptus armillata as E. armillata	Lignotuber

Data verification

- Location checking
- record detail queried for suspect records
 - cultivated, naturalised, erroneous location

ALA records of *E. tindaliae* (purple), *E. houseana* (pink)



	Number records	Number taxa
Selected bioregions	157170	
ALA data checks	137945	594
Taxonomy and location checks	99144	447

Eucalyptus houseana Maiden

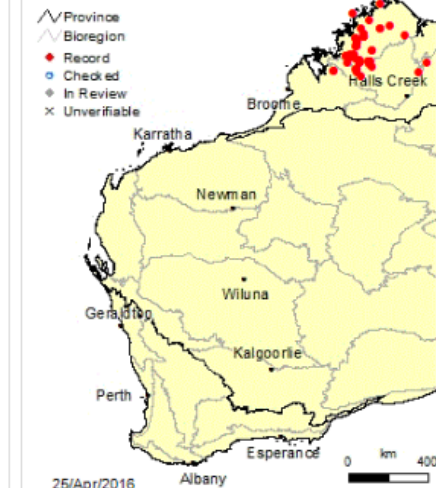
J.Proc.Roy.Soc.New S.Wales 49:318-322 (1915)

Conservation Code: Not threatened

Naturalised Status: Native to Western Australia

Name Status: Current

Eucalyptus houseana



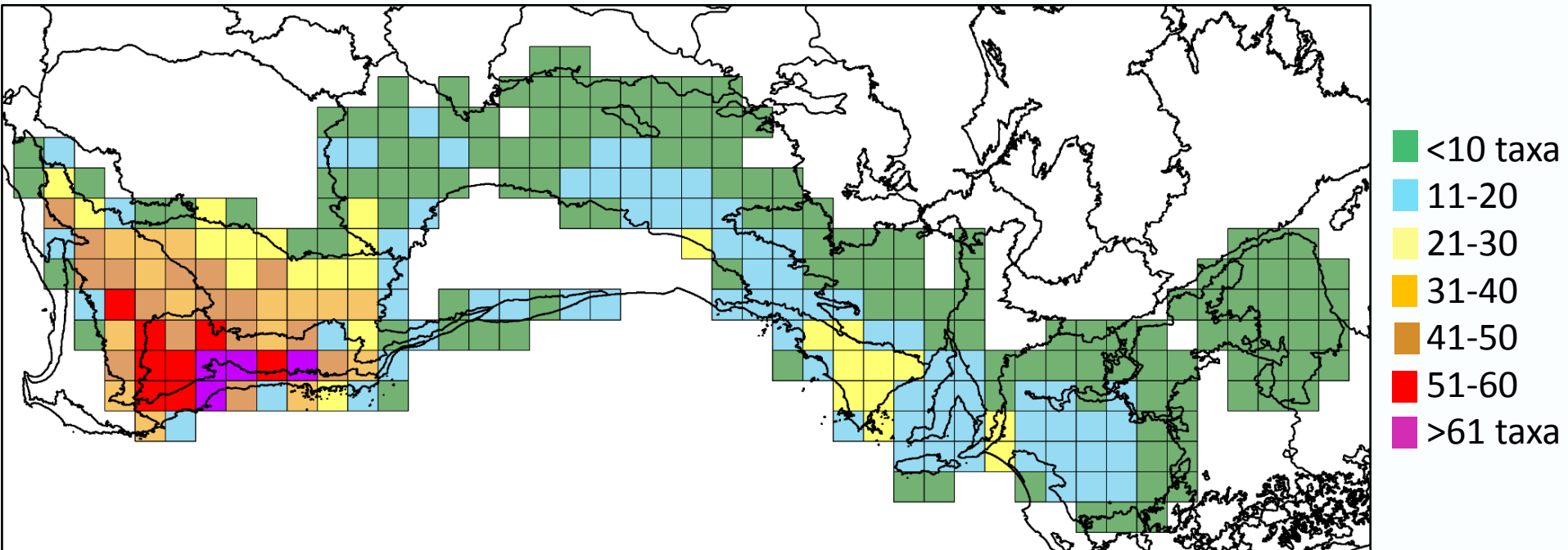
Analyses

- Post-disturbance response type (Nicolle 2006)

Response type	Number of taxa	Number of records
Stem resprouter	3	1277
Combination resprouter	70	23988
Lignotuber resprouter	281	66541
Non-resprouter	82	6313
Unknown	11	1025
Total	447	99144

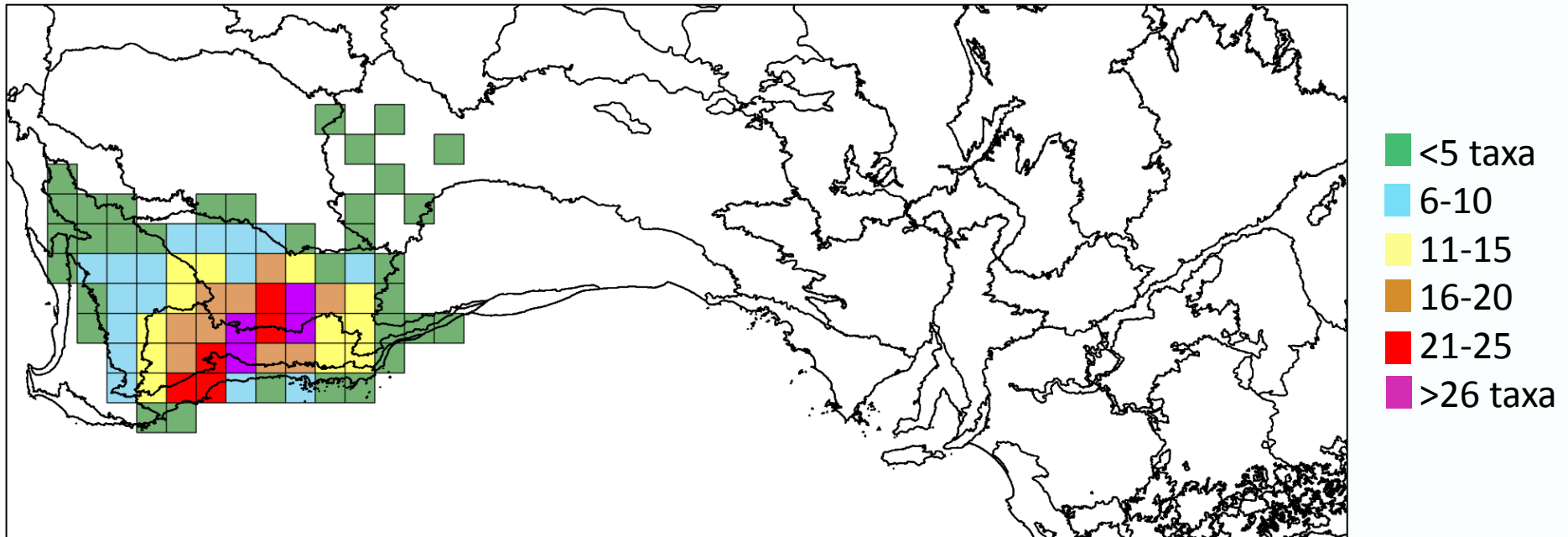
- 0.75° x 0.75° cells
- Biodiverse software (Laffan et al. 2010 *Ecography* 33, 643-47)
- Taxa richness

Mallee richness



- Strong richness gradient
- Higher alpha and beta diversity in SW WA

Maalok richness

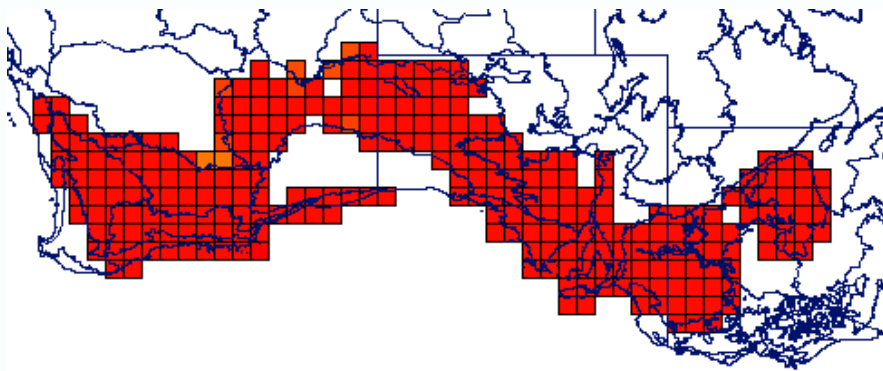


- Only found in south-western Australia
- Occur in diverse range of habitats

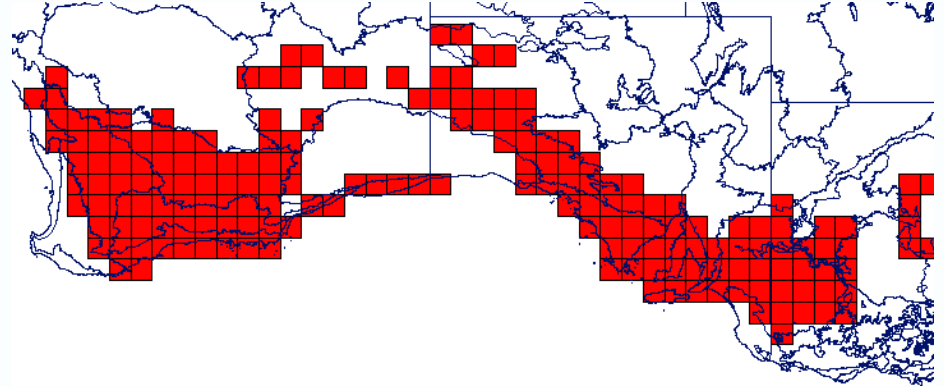
Mallee biogeography

- Mallee post-disturbance response type
- $0.75^\circ \times 0.75^\circ$ cells
- Cells with < 20 records and/or < 5 taxa were omitted
- 280 cells down to 182
- Agglomerative cluster analysis
- Biodiverse software

All cells with records



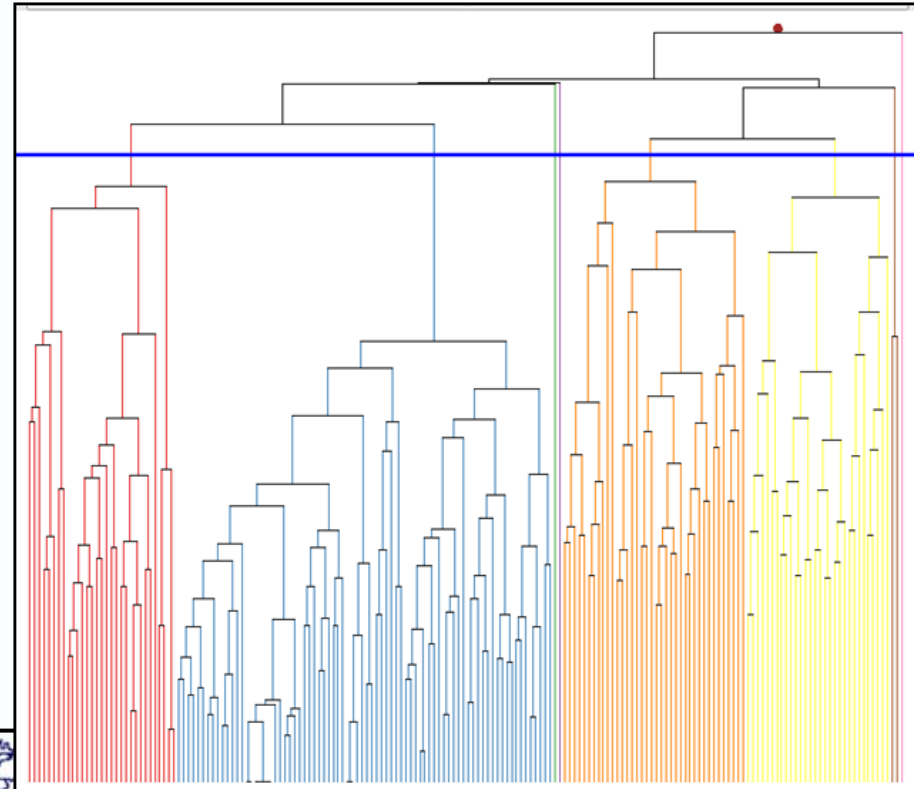
Cells with >20 records and >5 taxa



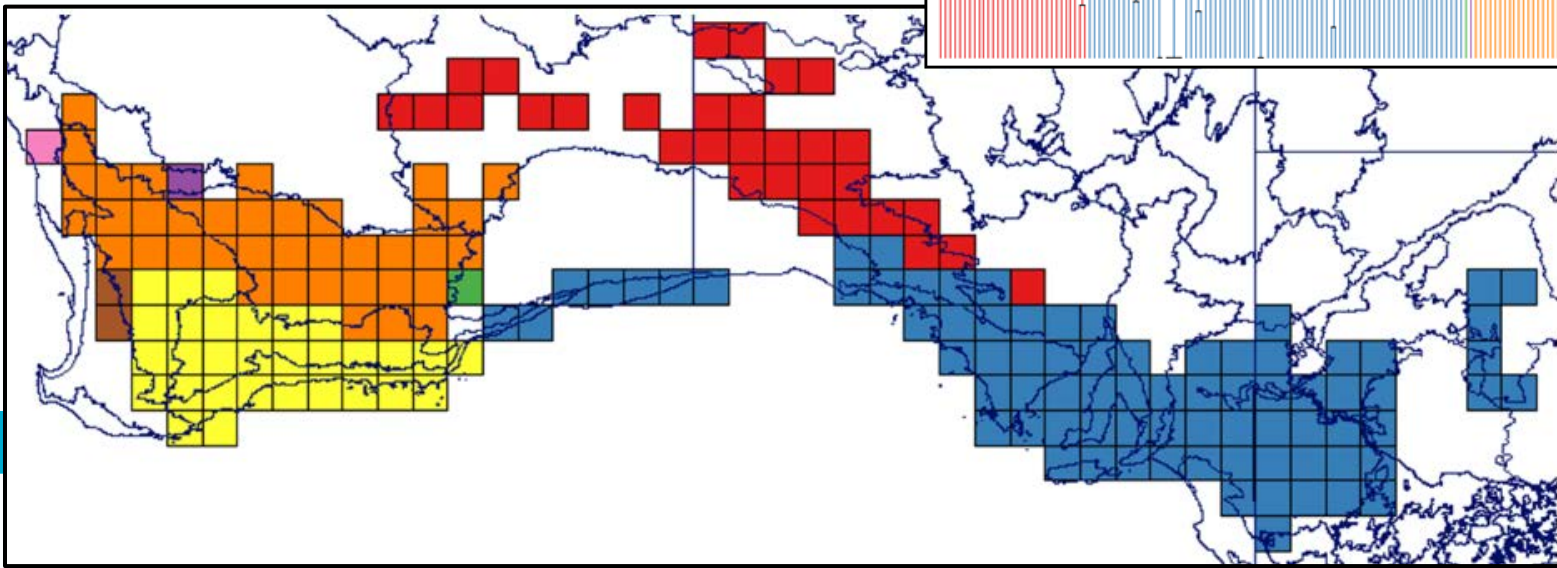
Mallee biogeography

- 4 main composition groups
- Eastern and central
- Two western groups
- Compositional link across coastal Nullarbor gap

Cluster analysis of 0.75° cells



Spatial distribution of clusters



Evolution of mallee and maalok diversity

- Centre of richness and endemism in SW WA
- Compositional groups occur in landscapes of vastly different ages and histories
- WA - deeply weathered, lateritized and ancient Yilgarn Plateau and Albany-Frazer Orogen
- Central and east - 'young' Pleistocene sandplains and dunefields of alluvial, marine and/or aeolian origin



Why is south-west Australia so rich?

- Southwest Australian Floristic Region
Global Biodiversity Hotspot
- Environmental history:
 - species diversification and accumulation
 - reduced extinctions
 - old, infertile, topographically quiescent, climatically buffered landscapes



Unresolved questions

- Why has the maalok growth form only evolved in SW WA?
- Do sister pairs of mallee and maalok taxa represent a gain or loss of a lignotuber?
- Have mallee eucalypts colonised eastern Australia from SW WA?



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Endemism

- Index: Weighted endemism central, normalised by groups

