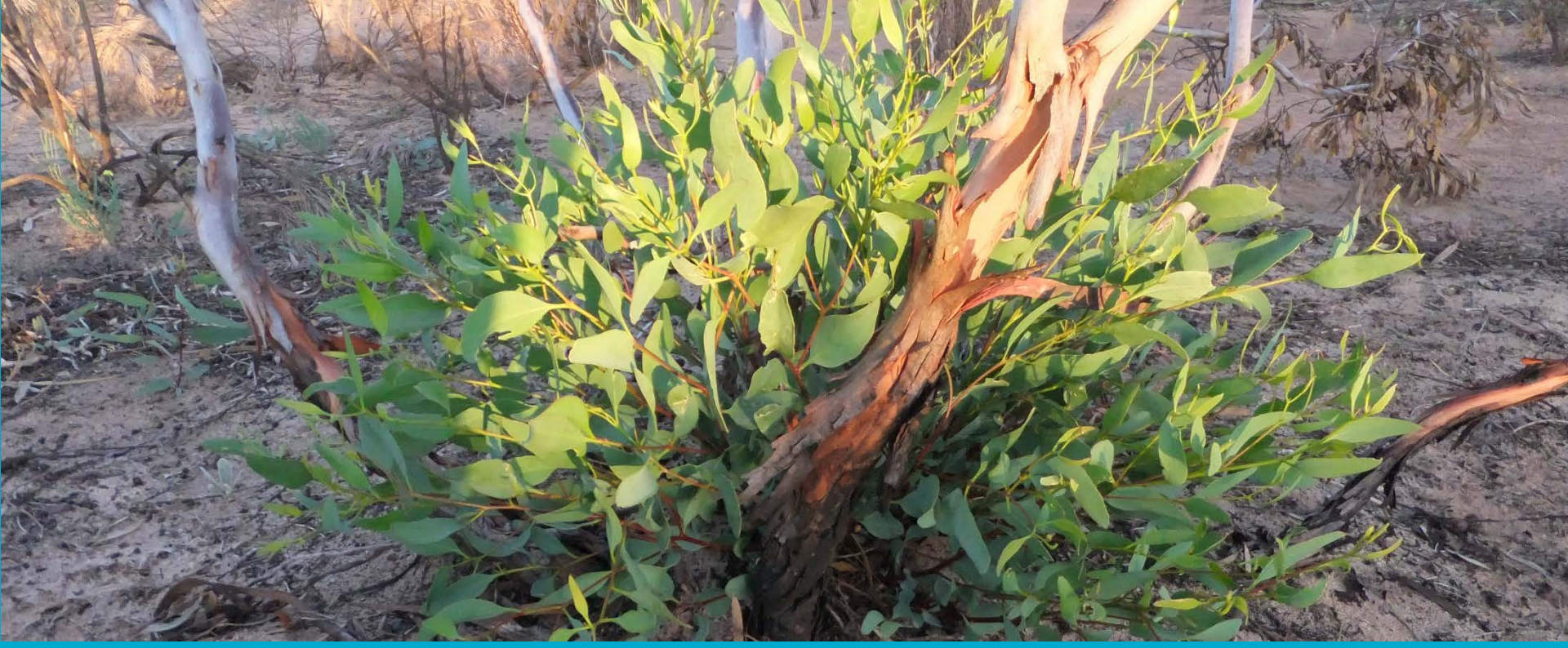


Biogeography and richness in non-resprouting and mallee post-fire response types in *Eucalyptus*

Carl Gosper, Colin Yates, Stephen Hopper, David Keith, Suzanne Prober and Mark Tozer

LAND AND WATER
www.csiro.au

12 May 2016

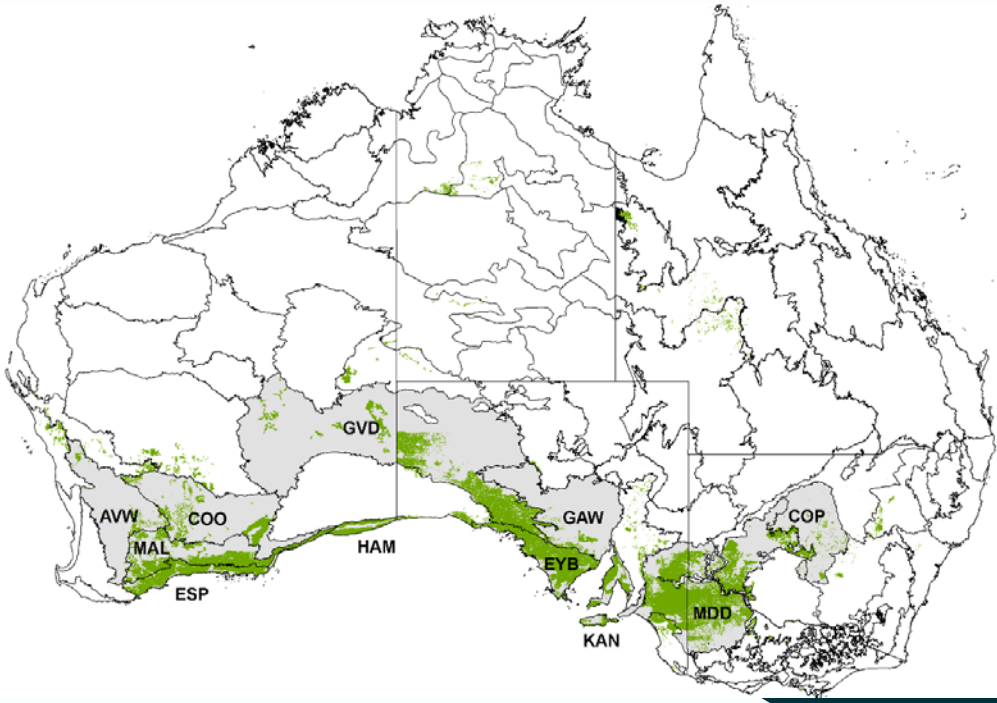
Department of Parks and Wildlife

CSIRO

Aims

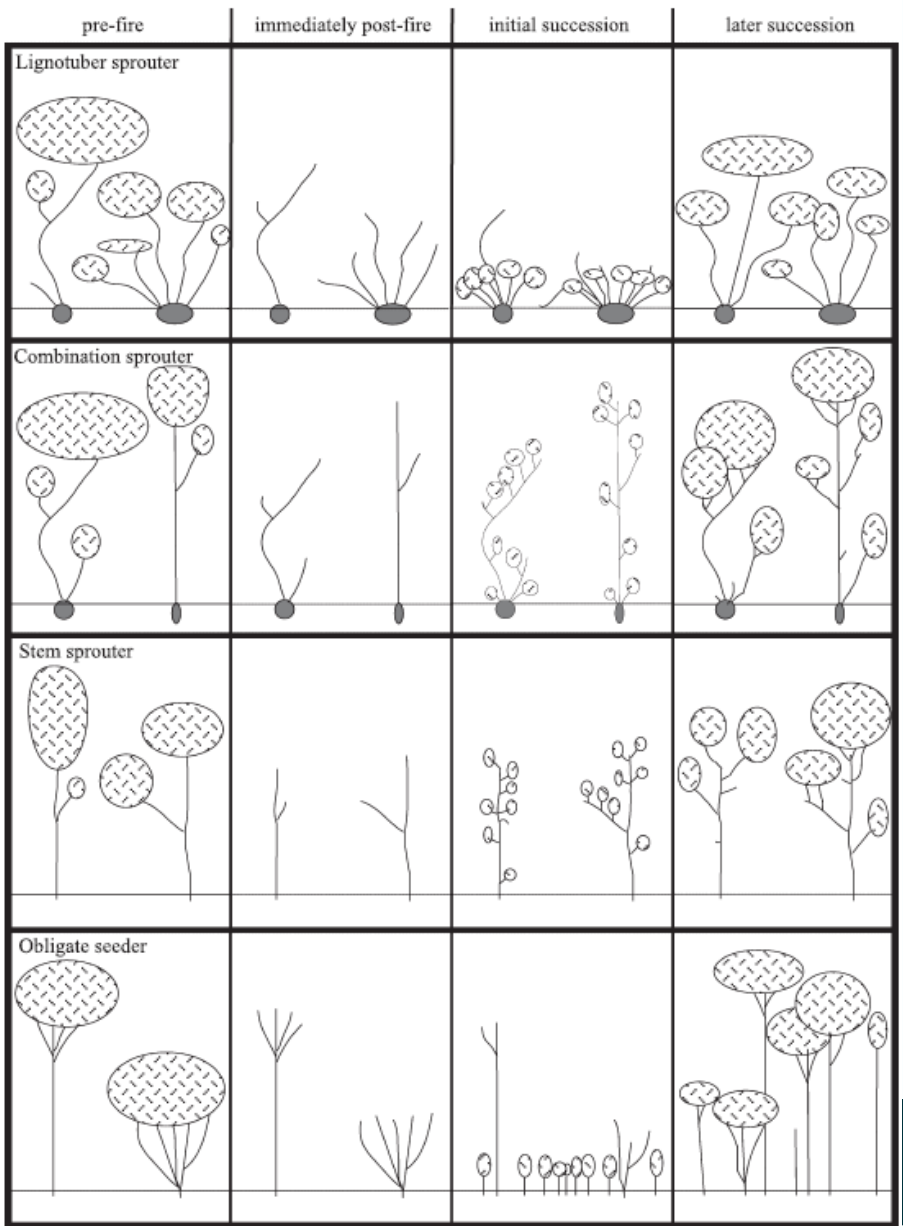
- Explore continental-scale patterns in richness and biogeography of post-disturbance response types in *Eucalyptus*
- Focus on lignotuber resprouting and non-resprouting response types
- Form distinctive shrublands to low forests in landscape mosaics
- Dry to arid Mediterranean to non-seasonal climate

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

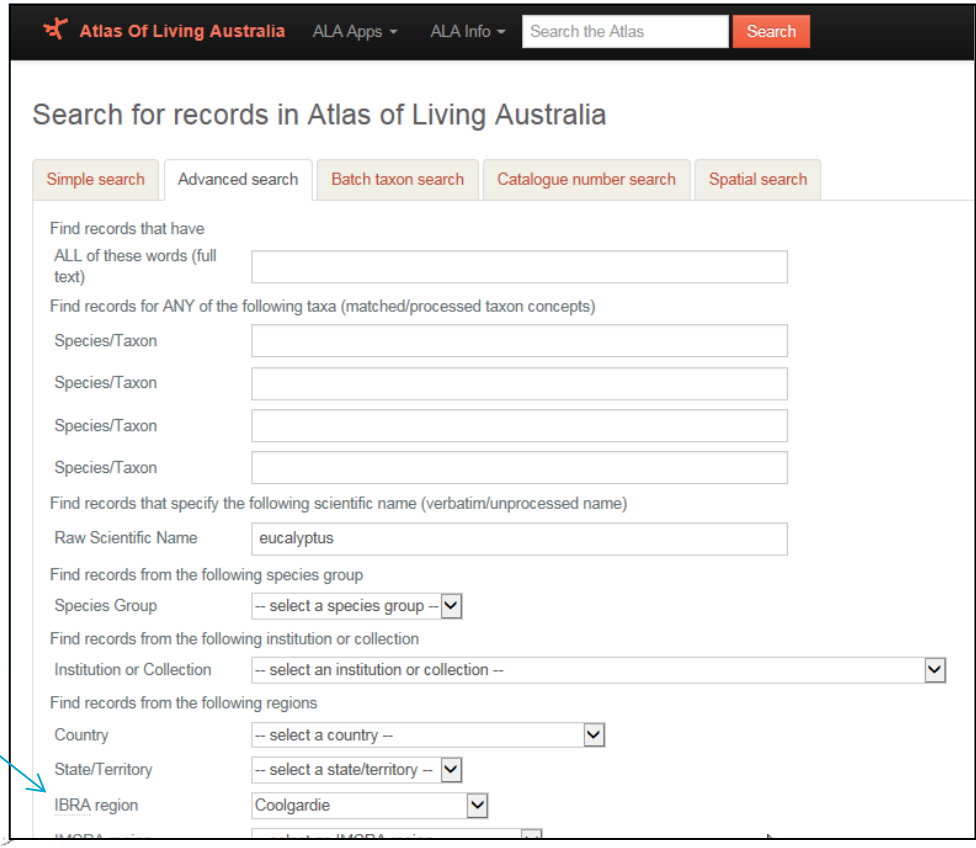
Response to fire:

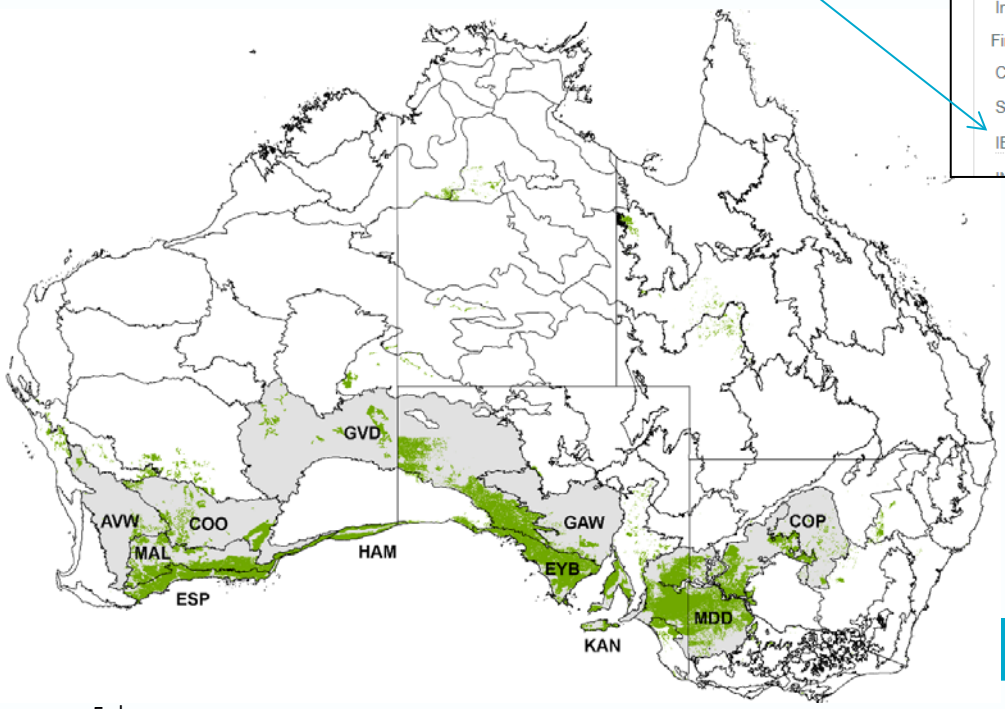
Maalok

Mallee

Data source

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



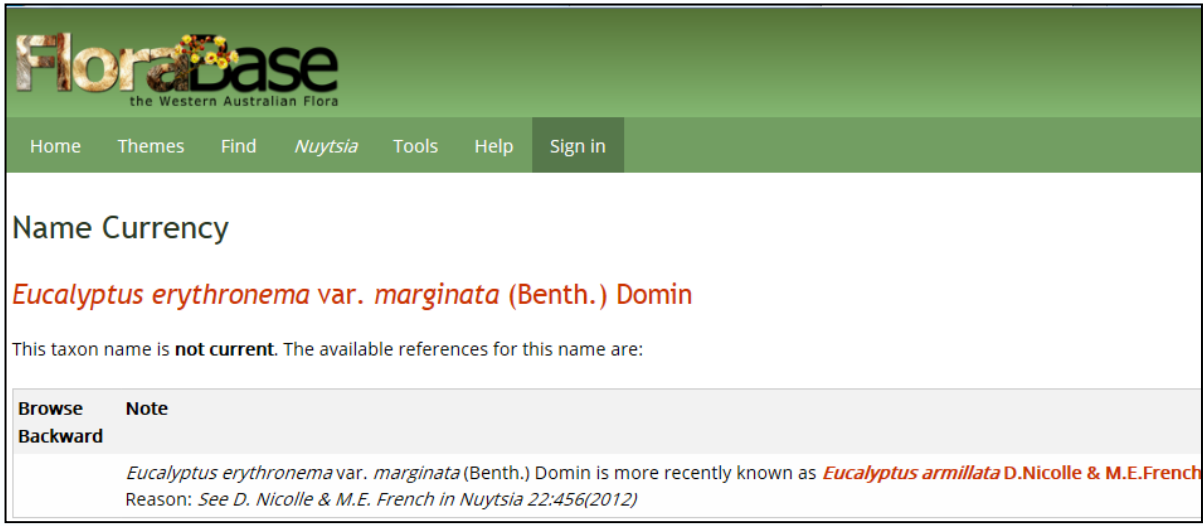


Data verification

- 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



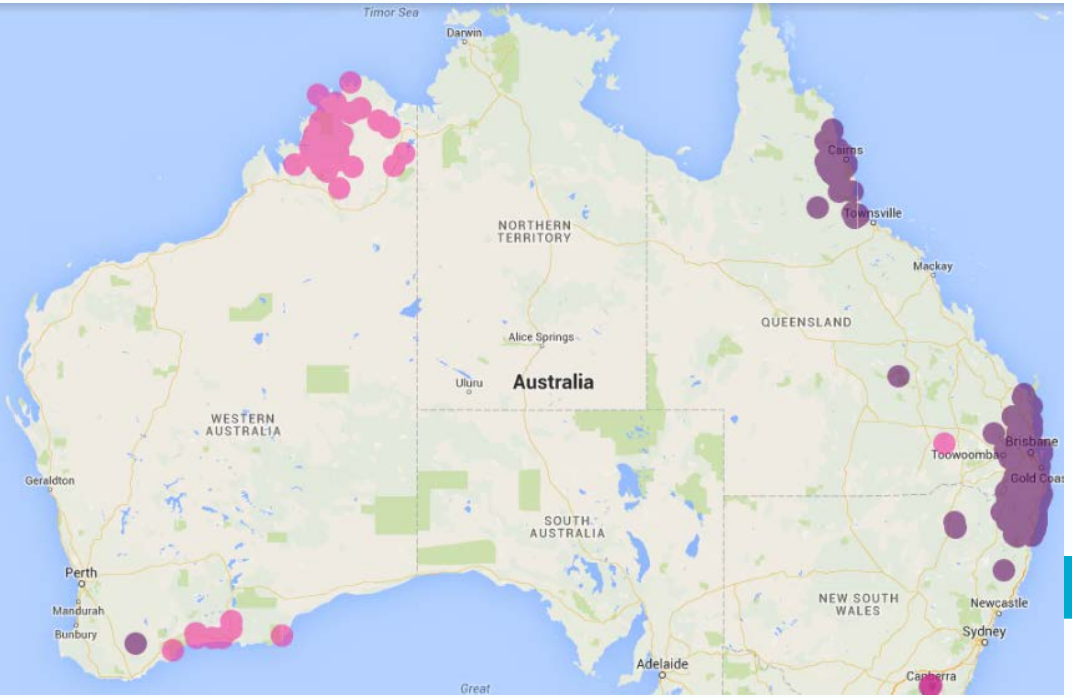
ALA_name	Count(records)	Data check	Reason/notes	Sprouter type
Eucalyptus arachnaea	10	Exclude	Insufficient taxonomic resolution c.f. Subsp.	INDETERMINATE
Eucalyptus arachnaea subsp. arachnaea	88	No issues		Lignotuber
Eucalyptus arachnaea subsp. arrecta	14	No issues		Non-resprouting
Eucalyptus armillata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

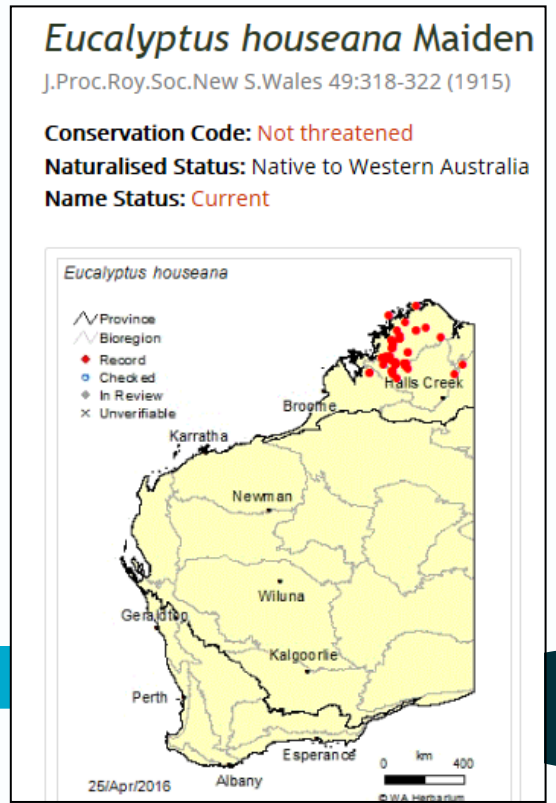
Data verification

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

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

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





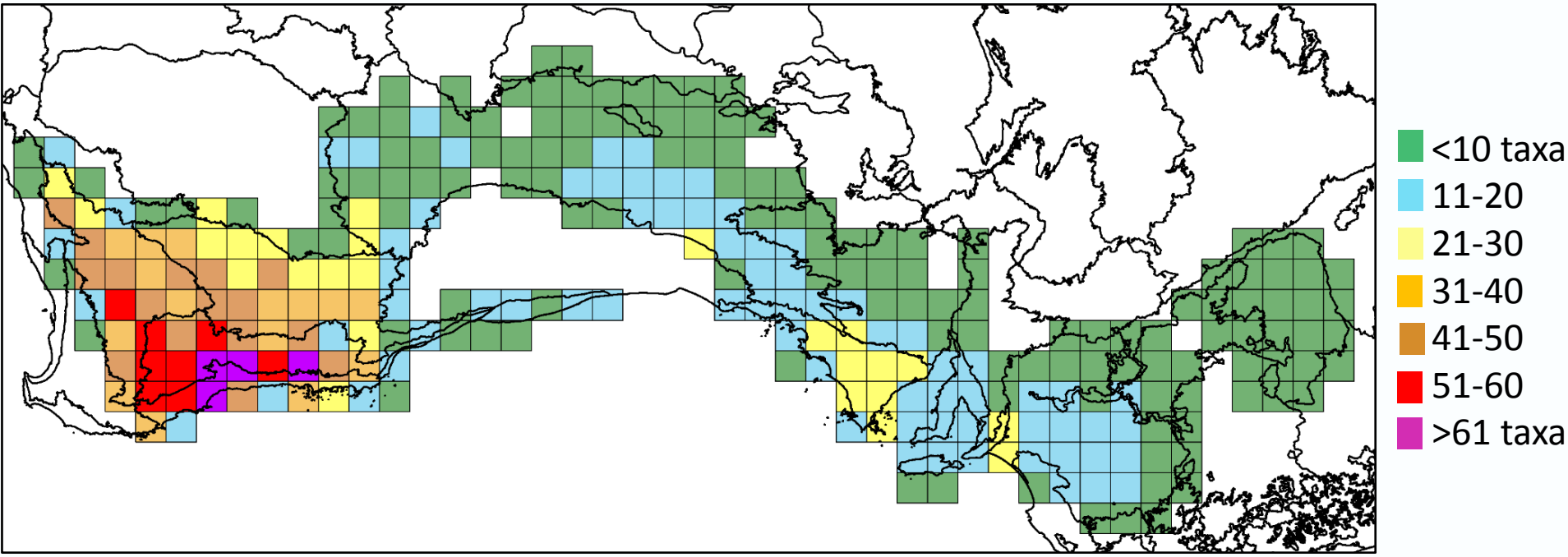
Analyses

- 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

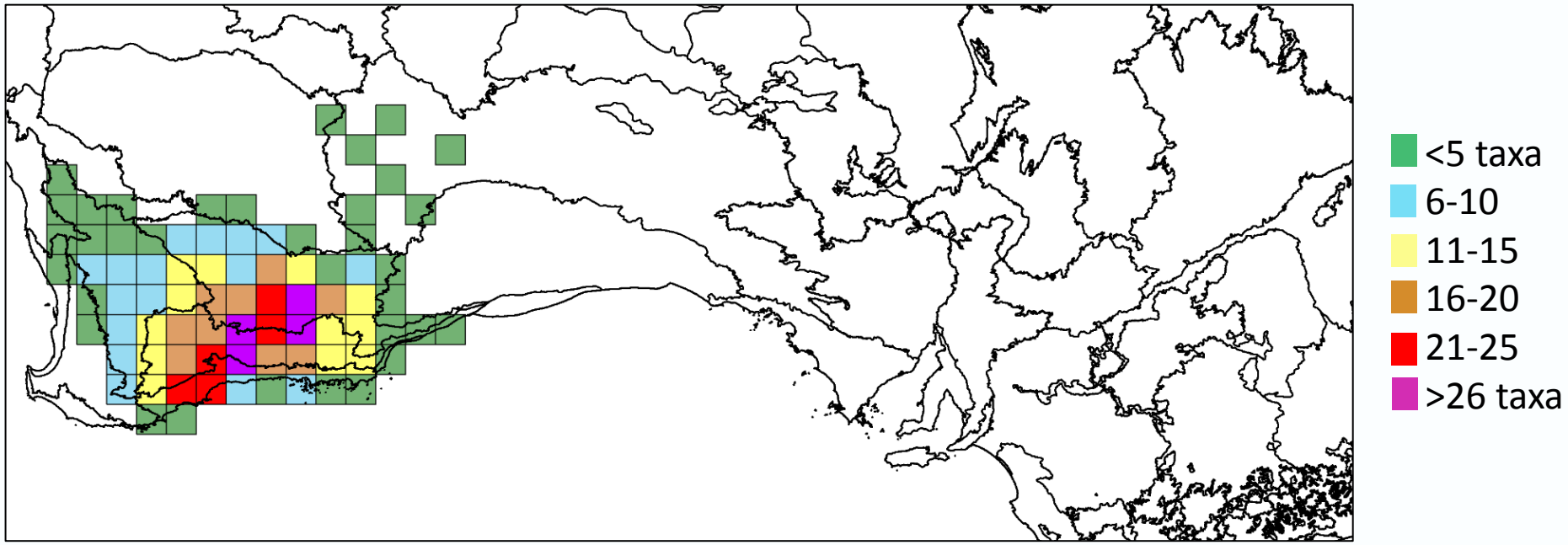
- 0.75° x 0.75° cells
- Biodiverse software (Laffan et al. 2010 *Ecography* 33, 643-47)
- Taxa richness

Mallee richness



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

Maalok richness

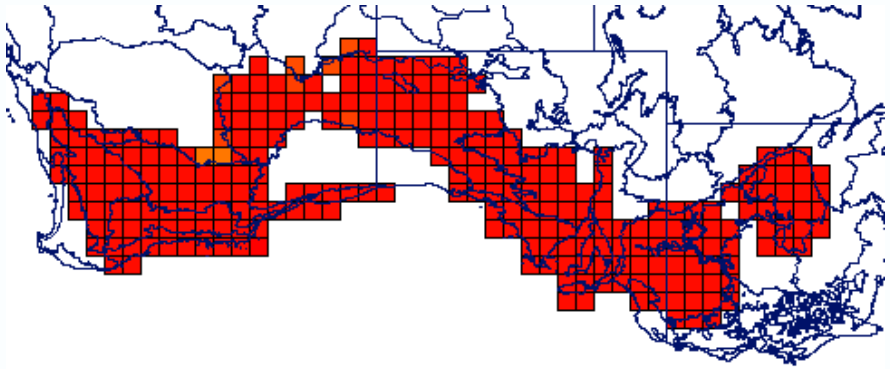


- Only found in south-western Australia
- Occur in diverse range of habitats

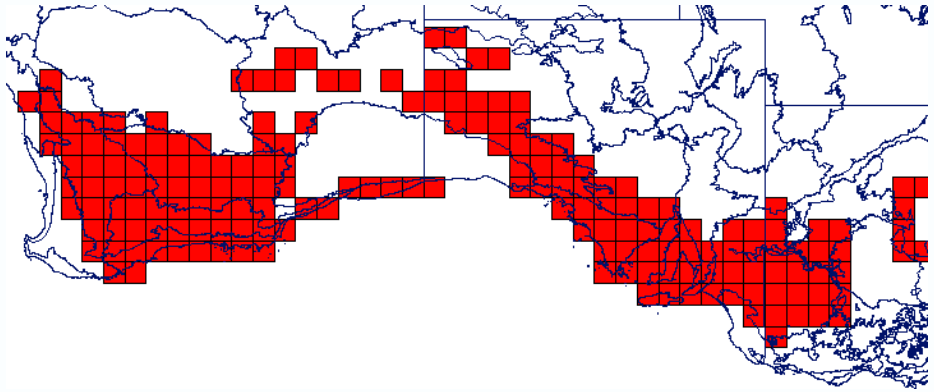
Mallee biogeography

- Mallee post-disturbance response type
- 0.75° x 0.75° 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



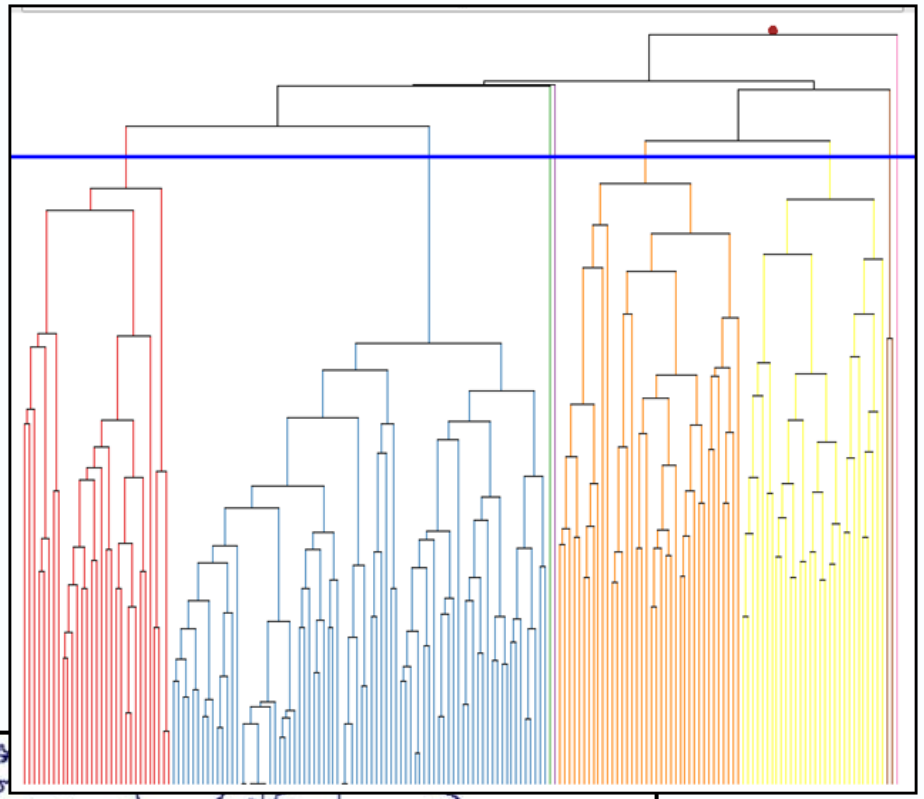
Cells with >20 records and >5 taxa



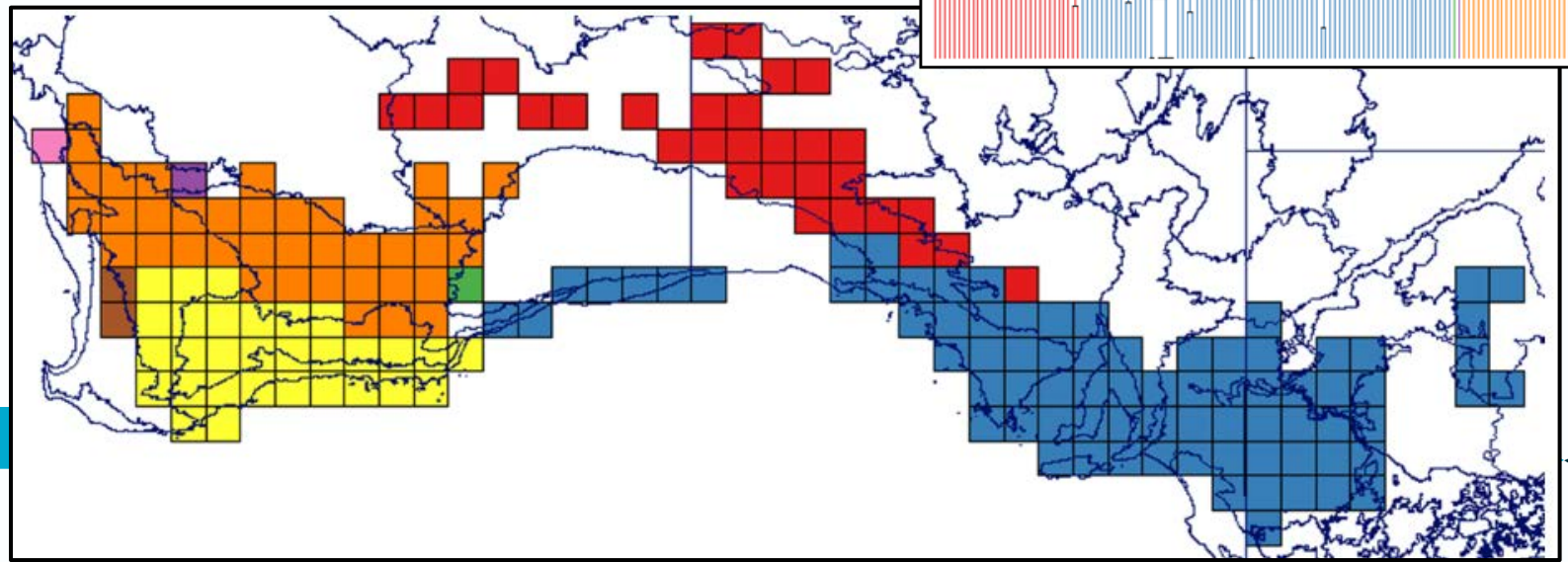
Mallee biogeography

- 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

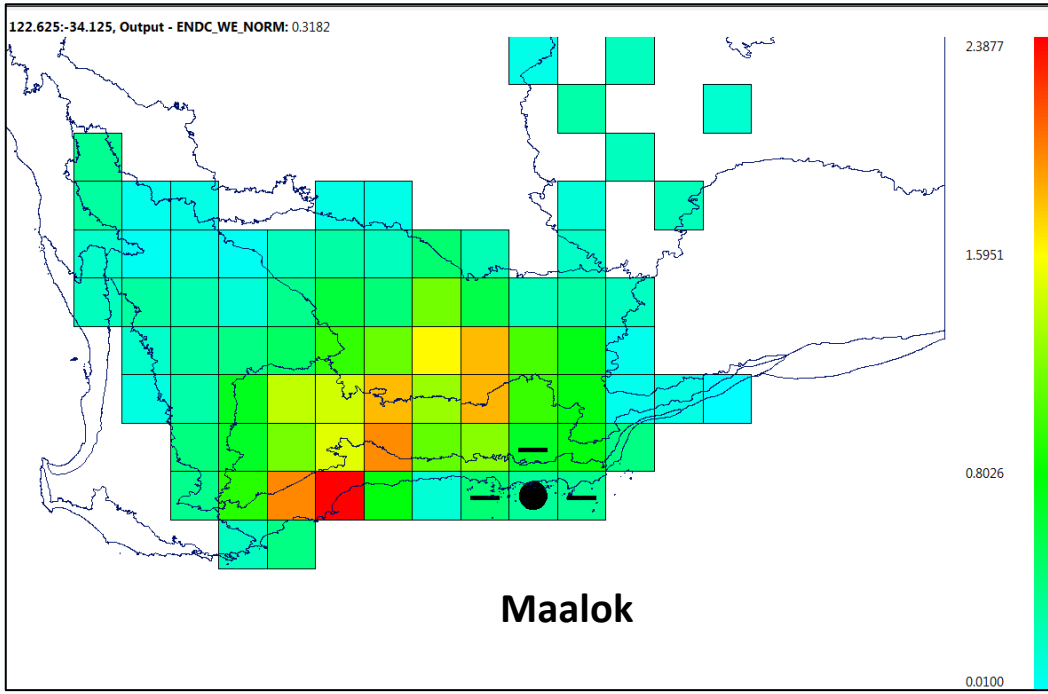
- Why has the maalok growth form only evolved in SW WA?
- Do sister pairs of mallee and maalok taxa represent a gain or loss of a lignotuber?
- Have mallee eucalypts colonised eastern Australia from SW WA?

Carl Gosper
Research Scientist

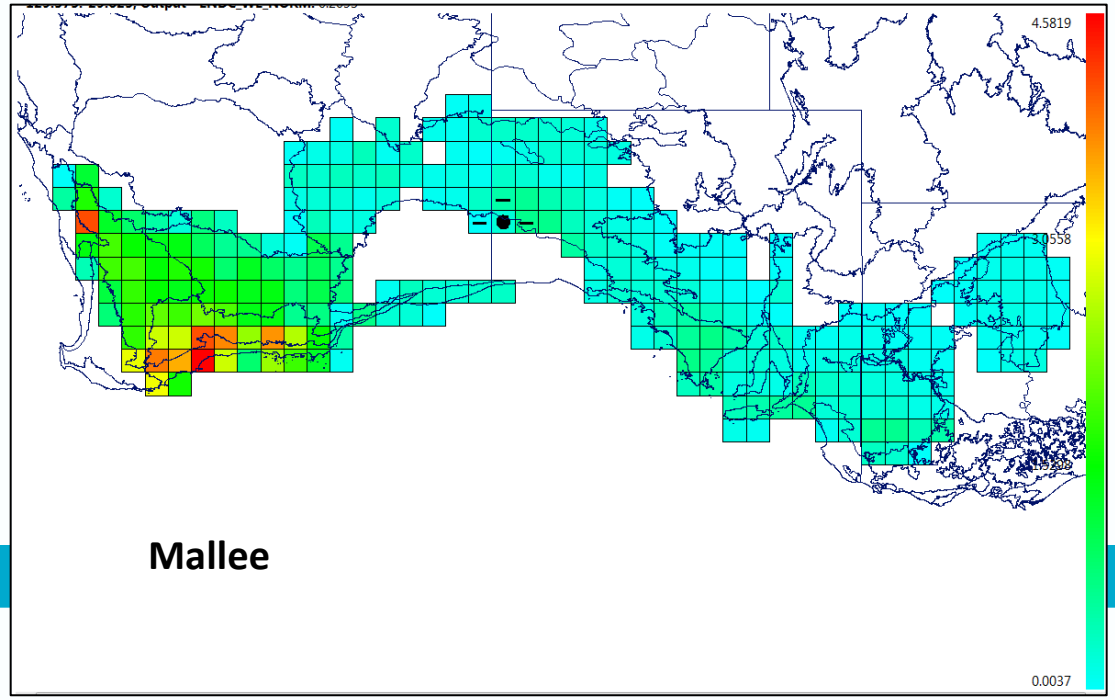
t +61 2 9123 4567
e carl.gosper@csiro.au
w http://people.csiro.au/G/C/Carl-Gosper

Endemism

- Index: Weighted endemism central, normalised by groups



Maalok



Mallee