



Pyrodiversity and ant diversity in an Australian tropical savanna

**Alan Andersen, Brett Murphy, Simon Ferrier and
Francois Brassard**



Pyrodiversity = the diversity of fire



- Seasonality
- Frequency
- Intensity
- Patchiness
- Size



Different species have different fire preferences and so 'pyrodiversity begets biodiversity'

Martin & Sapsis (1992)



Fire-prone ecosystems as fire mosaics



Parr & Andersen (2006)

The pyrodiversity paradigm: such mosaics are needed to sustain biodiversity

Patch mosaic burning (PMB) for biodiversity conservation

A patch mosaic burning system for conservation areas in southern African savannas

B.H. Brockett, H.C. Biggs and B.W. van Wilgen

International Journal of Wildland Fire 10(2) 169 - 183

Patch-mosaic burning: a new paradigm for savanna fire management in protected areas?

C.L. PARR and B.H. BROCKETT

Parr, C.L. and B.H. Brockett. 1999. Patch-mosaic burning: a new paradigm for savanna fire management in protected areas? *Koedoe* 42(2): 117–130. Pretoria. ISSN 0075–6458.

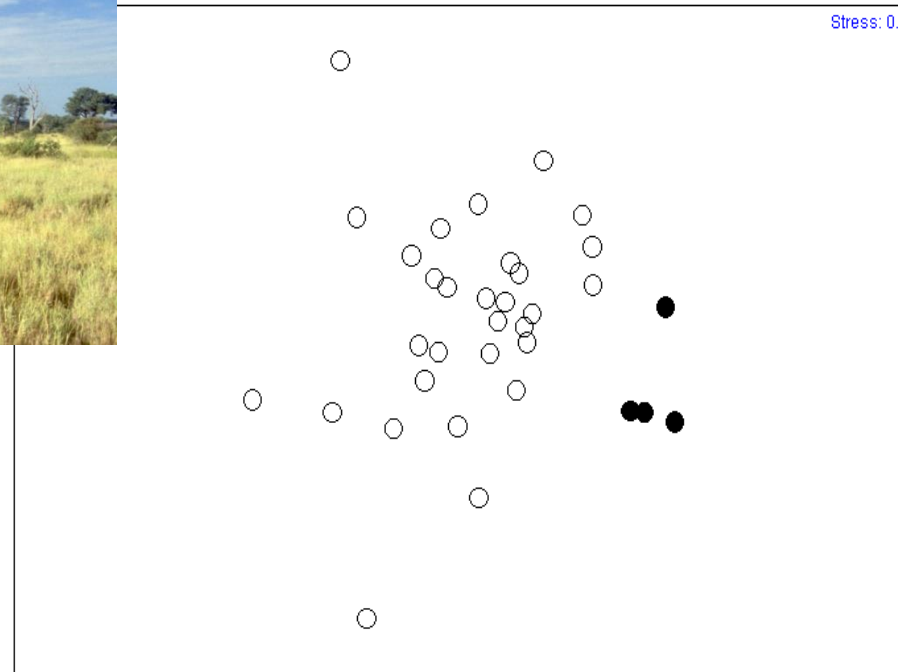
Nursery ground in southern African savannas!

Fire mosaics and conservation management

- Not all pyrodiversity is ecologically meaningful



Satara



Parr *et al.* (2010) *J Appl Ecol*

Fire mosaics and conservation management

- Not all pyrodiversity is ecologically meaningful
- Some is deleterious (e.g. fire exclusion in mesic savannas)

“biodiversity-needs-pyrodiversity advocacy needs to be replaced by a more critical consideration of the levels of pyrodiversity needed for biodiversity”

Parr & Andersen (2006)

Recent proliferation of pyrodiversity papers

SYNTHESIS



Current Landscape Ecology Reports (2022) 7:49–67
<https://doi.org/10.1007/s40823-022-00075-6>

INTERFACE OF LANDSCAPE ECOLOGY AND CLIMATE CHANGE (B ZUCKERBERG, SECTION EDITOR)

A roadmap for pyrodiversity science

Zachary L. Steel¹ | Jesse E. D. Miller² | Lauren C. Ponisio³ | Morgan W. Tingley
Kate Wilkin⁵ | Rachel Blakey⁶ | Kira M. Hoffman⁷ | Gavin Jones⁸

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Pyrodiversity in a Warming World: Research Challenges and Opportunities

G. M. Jones¹ · J. Ayars^{1,2} · S. A. Parks³ · H. E. Chmura⁴ · S. A. Cushman⁵ · J. S. Sanderlin⁵

REVIEW ARTICLE

Diversity and Distributions

Pyrodiversity and biodiversity: A history, synthesis, and outlook

Gavin M. Jones¹ | Morgan W. Tingley²

Indigenous pyrodiversity promotes plant diversity

L. Greenwood^a, R. Bliege Bird^b, C. McGuire^b, N. Jadai^c, J. Price^a, A. Skroblin^d,
S. van Leeuwen^e, D. Nimmo^{a,*}



Promoting Optimal Habitat Availability by Maintaining Fine-Grained Burn Mosaics: A Modelling Study in an Austral Semi-Arid Temperate Woodland

Ben J. French^{1,*}, Brett P. Murphy² and David M. J. S. Bowman^{1,*}



Diversity

Putting pyrodiversity to work for animal conservation

Luke T. Kelly,^{1*} Lluís Brotons,² and Michael A. McCarthy¹

What exactly is the pyrodiversity question?

Is there a positive relationship between pyrodiversity and biodiversity?

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How much pyrodiversity is needed to sustain biodiversity?

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Is there a positive relationship between pyrodiversity and biodiversity?

How much pyrodiversity is needed to sustain biodiversity?

To what extent does pyrodiversity need to be managed to sustain biodiversity?

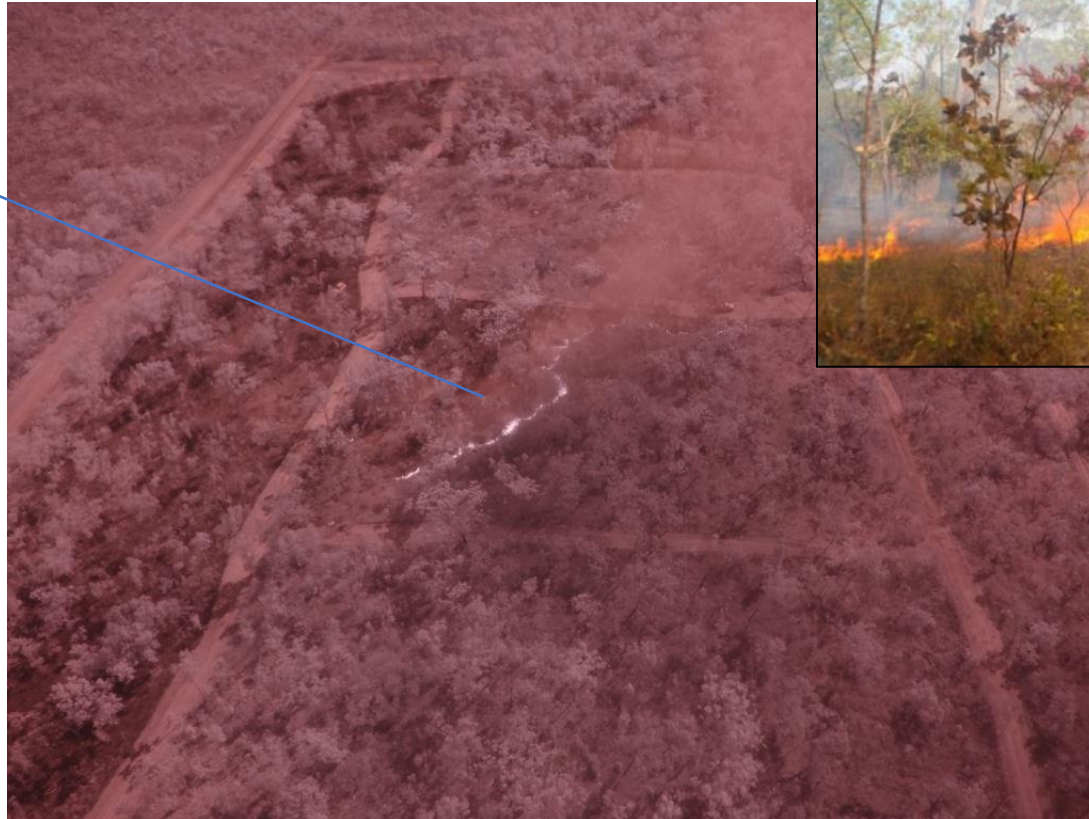
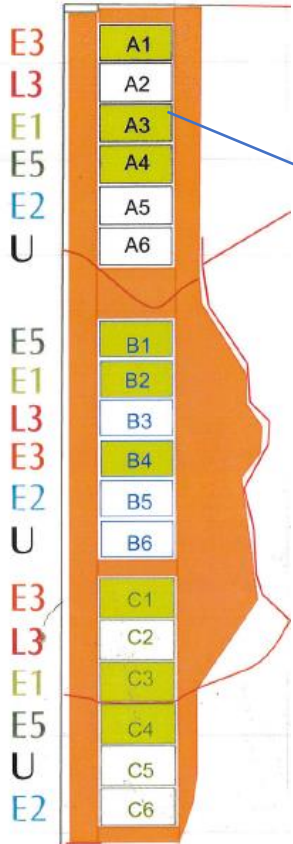
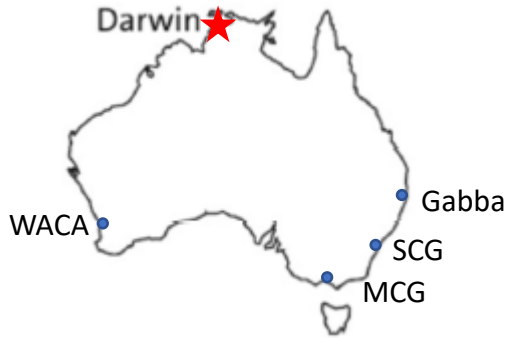
Fire-prone ecosystems as fire mosaics



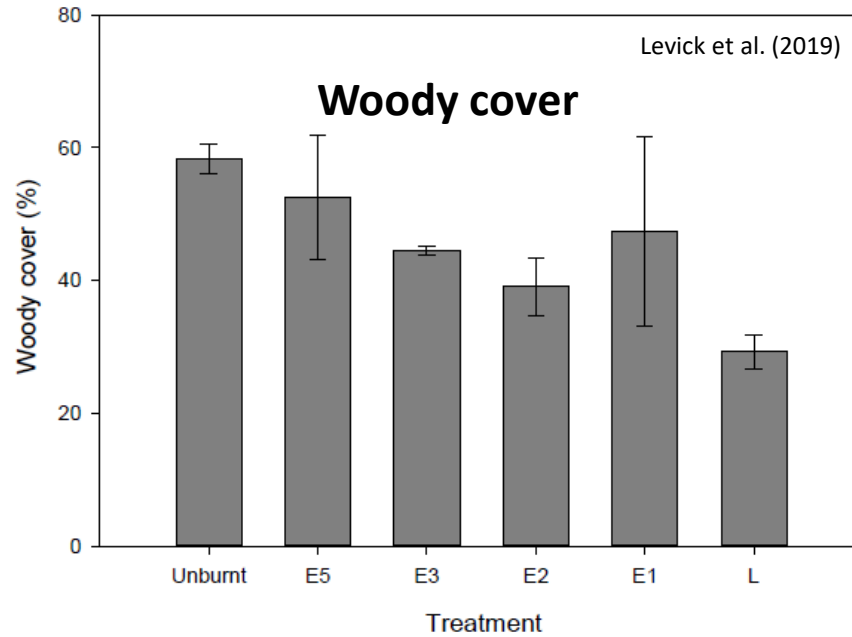
Are all these mosaics needed, are more needed, and does the mosaic need active management?

Territory Wildlife Park fire experiment

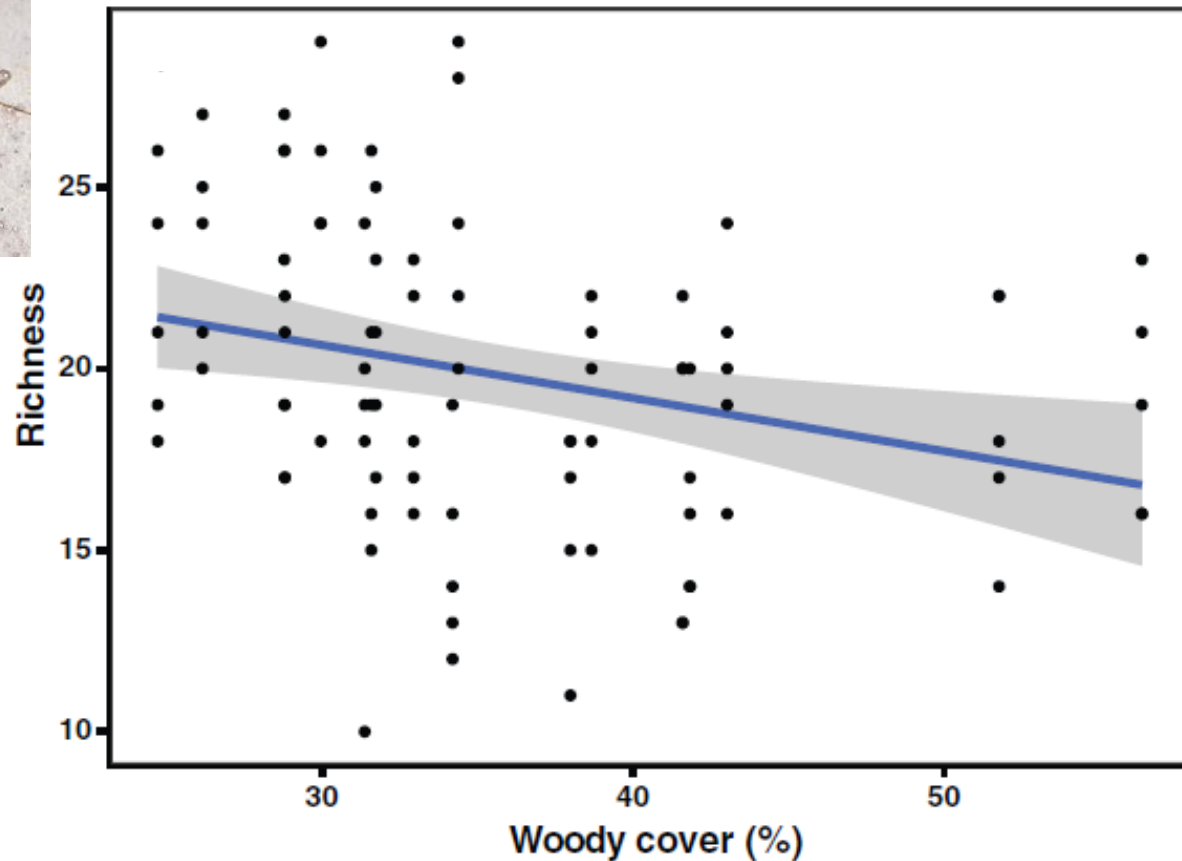
2004 - ongoing



Fire effects on vegetation



Vegetation cover is the strongest predictor of ant diversity



Optimisation approach in conservation planning

What number and combination of conservation reserves is needed to represent biodiversity?

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Optimisation approach in pyrodiversity management

What number and combination of fire treatments is needed to represent ant diversity?

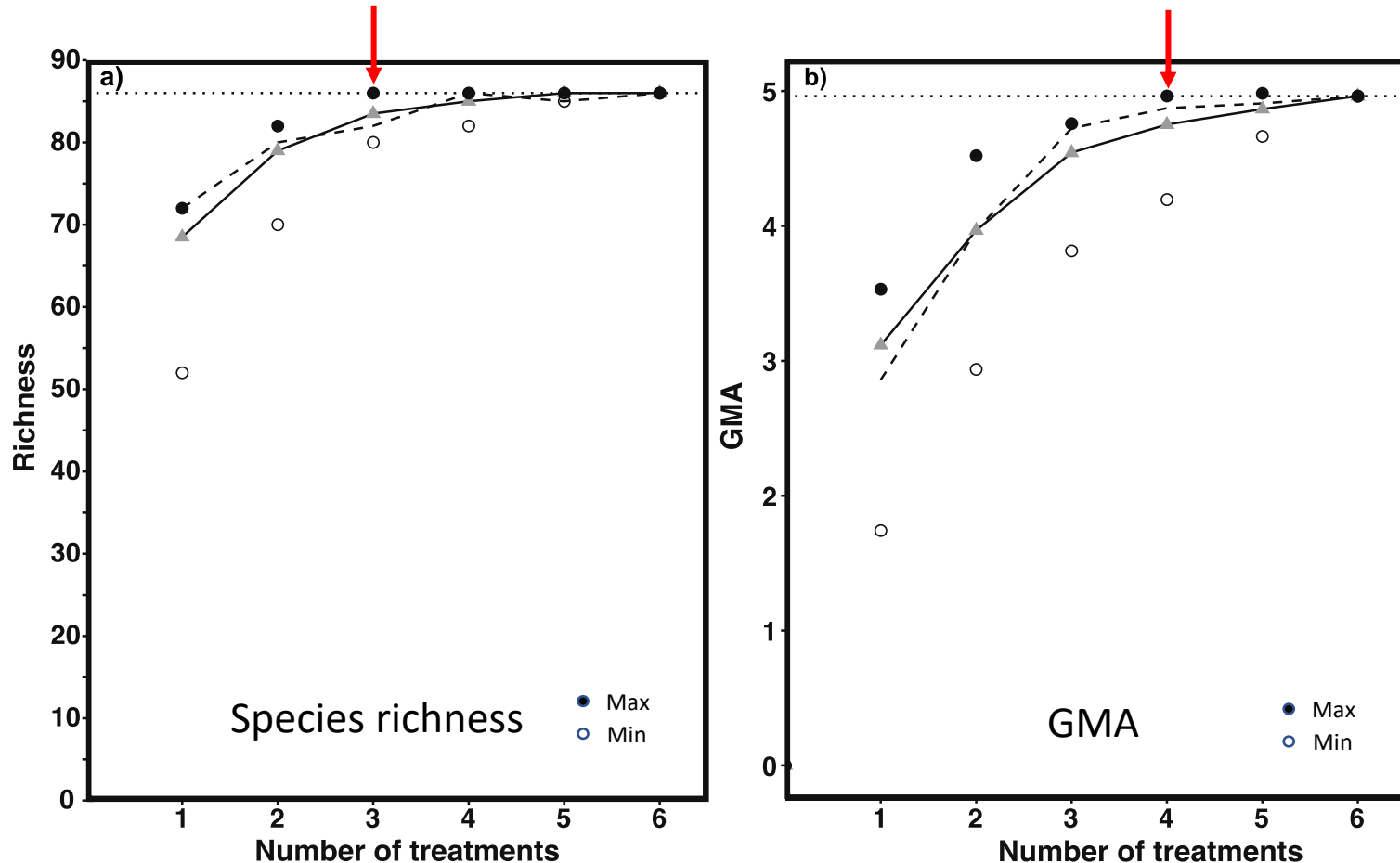
What number and combination of fire treatments is needed to represent ant diversity?

- Species richness
- Geometric mean abundance (GMA)



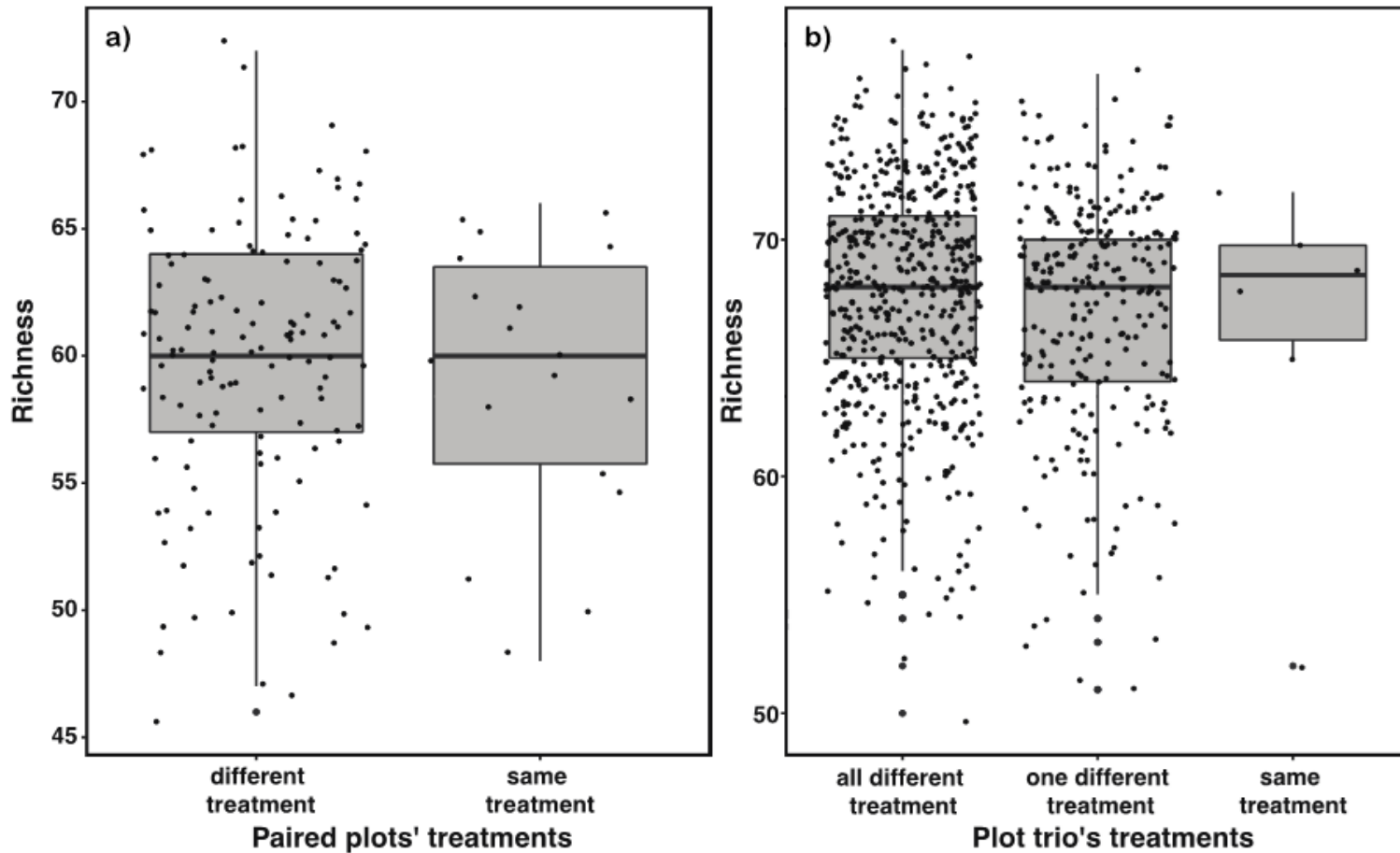
Accumulation curves: only three treatments required to represent all 86 species, and four for attaining maximum GMA

L2 + E3 + E5 (each with 3 plots)



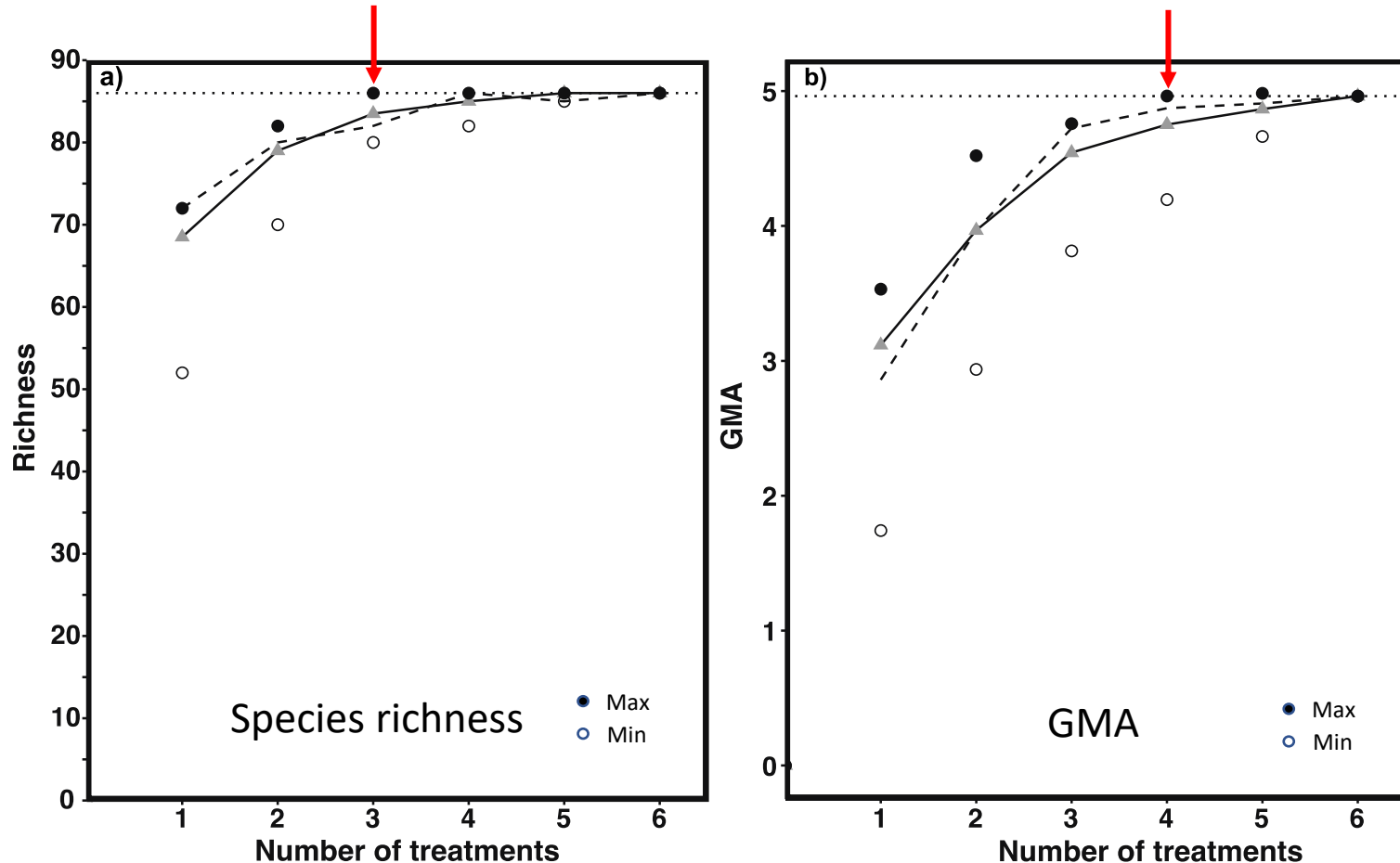
Accumulation driven by increasing number of plots rather than by increasing pyrodiversity

Species richness



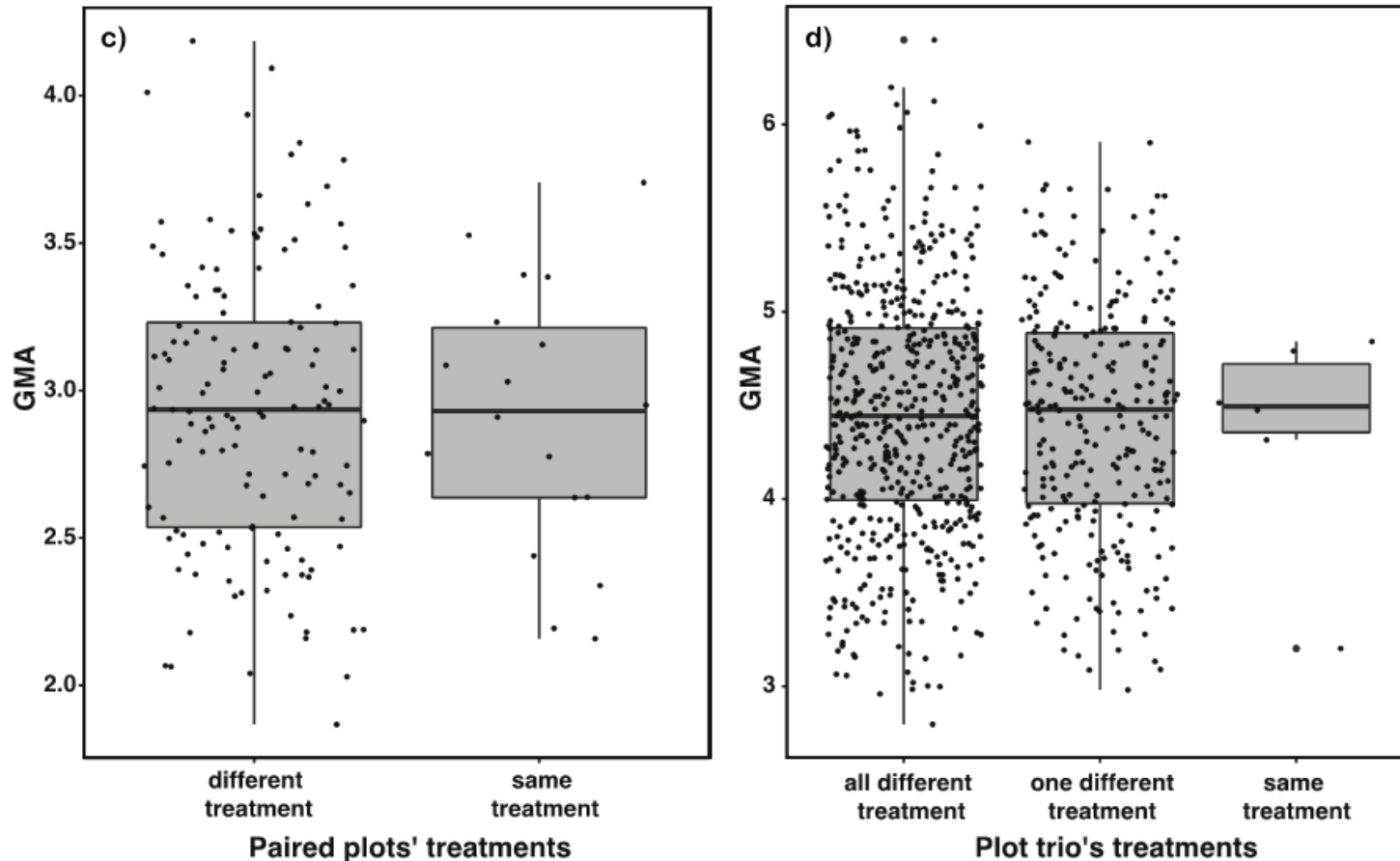
Accumulation curves: only three treatments required to represent all 86 species, and four for attaining maximum GMA

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GMA



Conclusion

To what extent does pyrodiversity need to be managed to sustain biodiversity?

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- Australian savanna ants do not require pyrodiversity management

Due to high within-plot heterogeneity



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- Australian savanna ants do not require pyrodiversity management
- Value of an optimisation approach for assessing pyrodiversity needs