International Great Southern International Colloquium on Biodiversity

Beyond species composition: a functional and ecological perspective on plant communities in inselbergs

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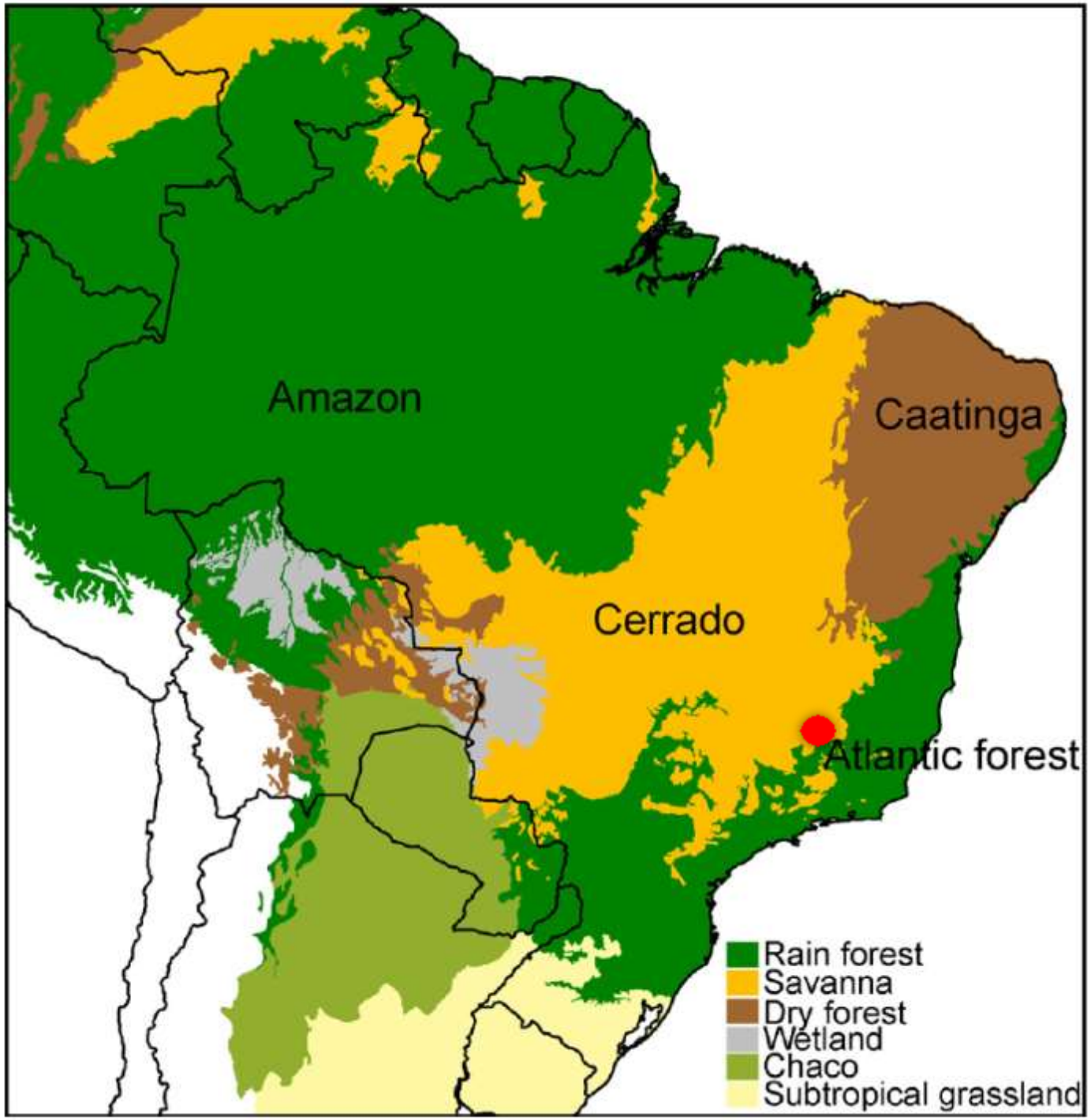
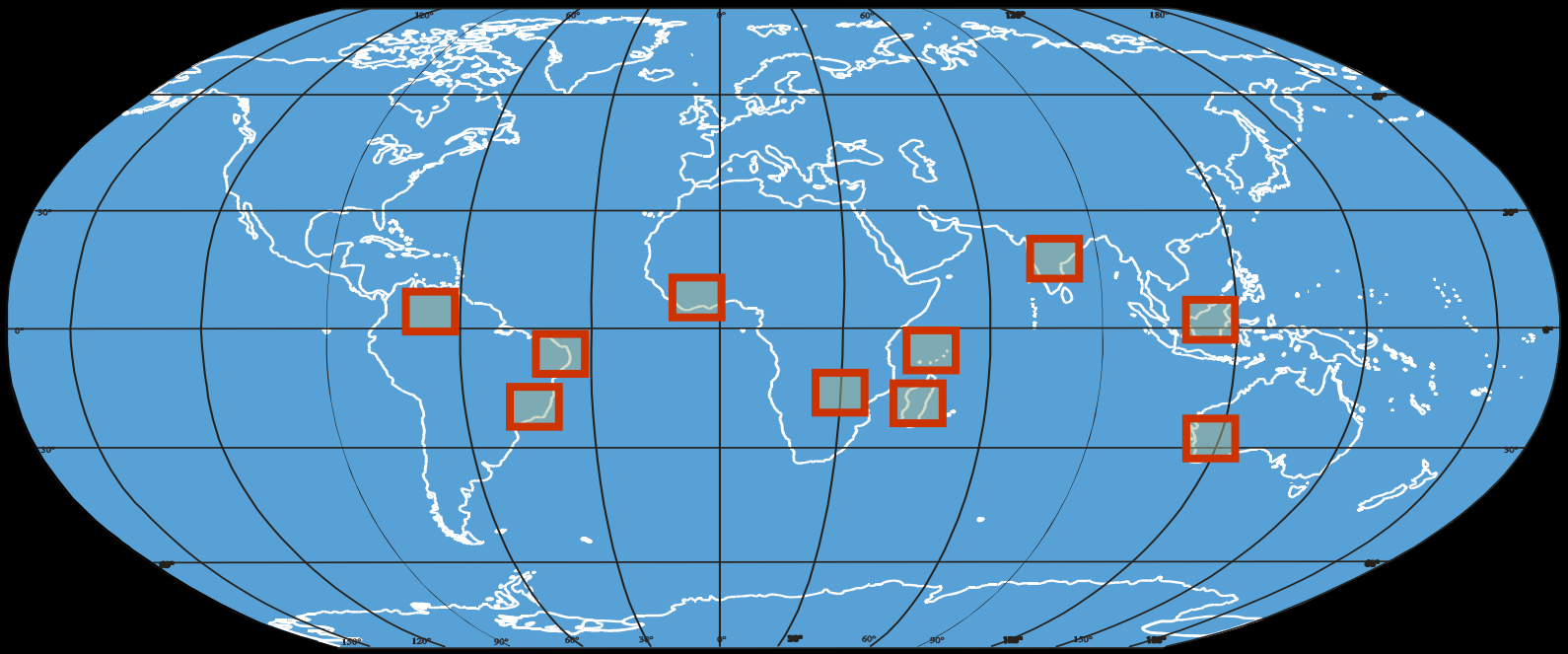
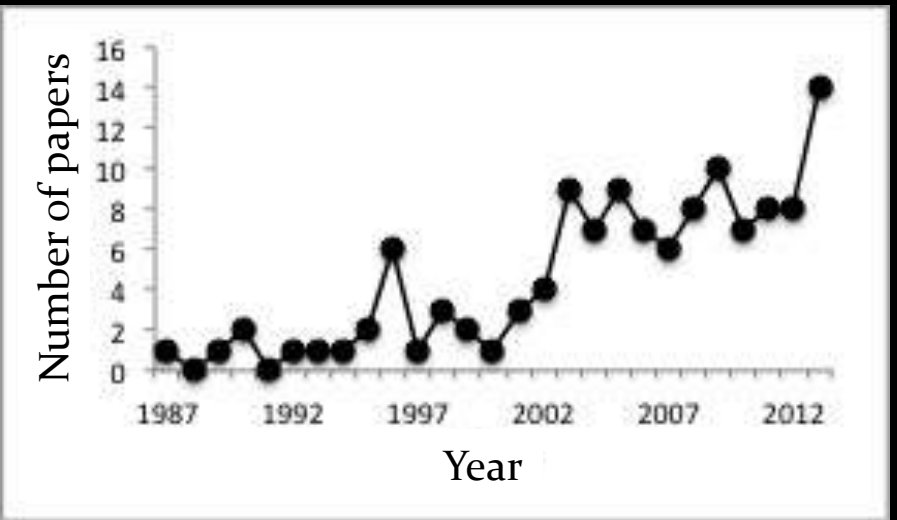

Amazon
Caatinga
Cerrado
Atlantic forest
Rain forest
Savanna
Dry forest
Wetland
Chaco
Subtropical grassland

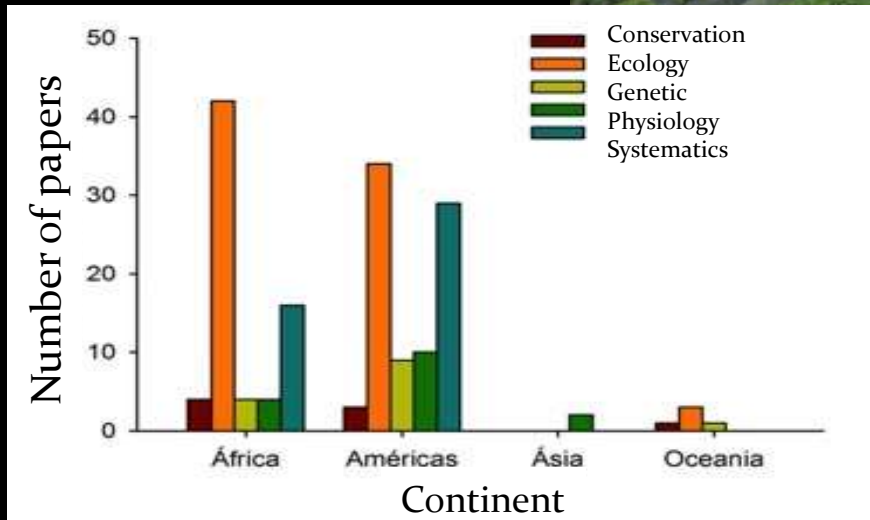
Inselbergs

Inselbergs are geologically-ancient, nutrient-impoverished granitic and gneiss monoliths that rise sharply above the lowland surrounding forests

Inselbergs are good models for testing ecological, biogeographical and evolutionary hypotheses







Main threats to inselberg flora

Contributed Paper

Predicting Extinction Risk of Brazilian Atlantic Forest Angiosperms

TARCISO C. C. LEÃO,*† CARLOS R. FONSECA,‡ CARLOS A. PERES,§ AND MARCELO TABARELLI*

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‡Departamento de Ecologia, Universidade Federal do Rio Grande do Norte, Natal, RN, 59072-970, Brazil
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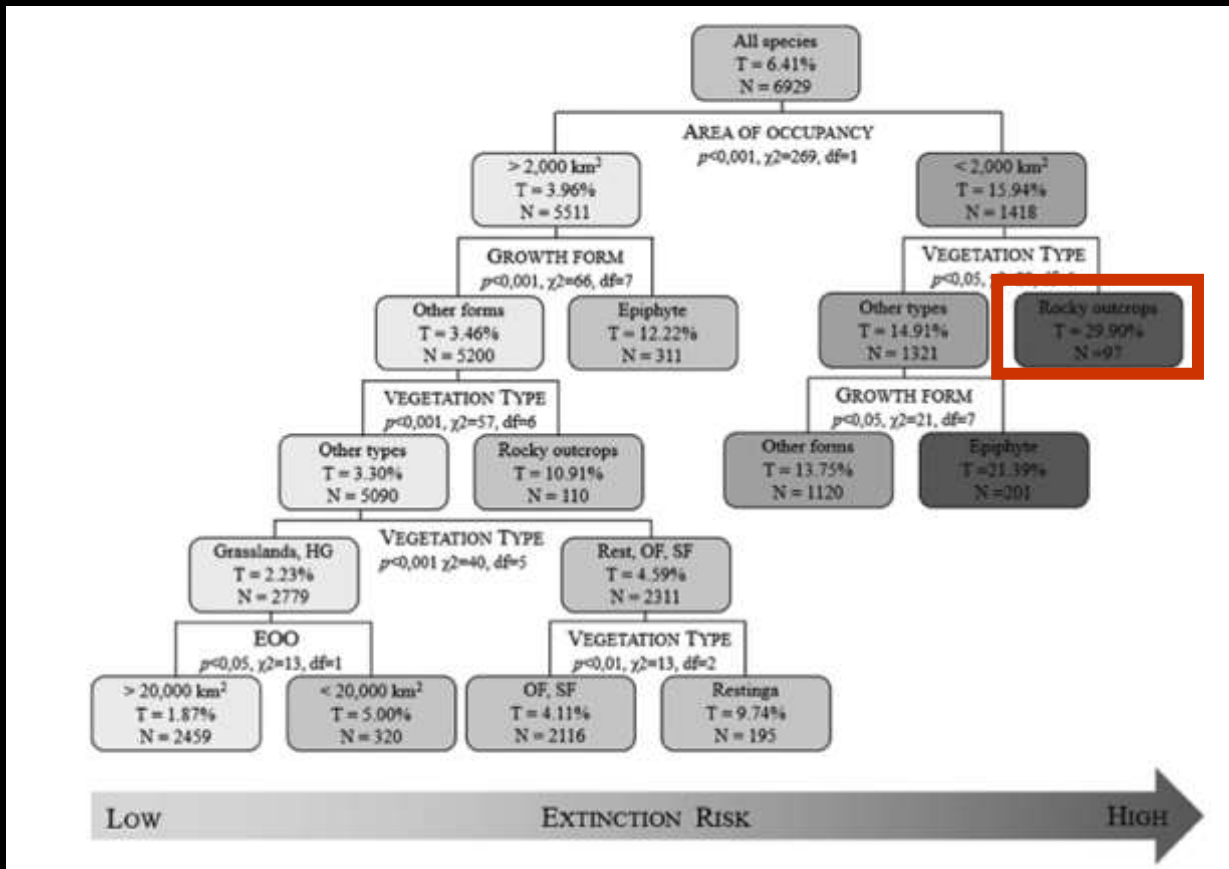
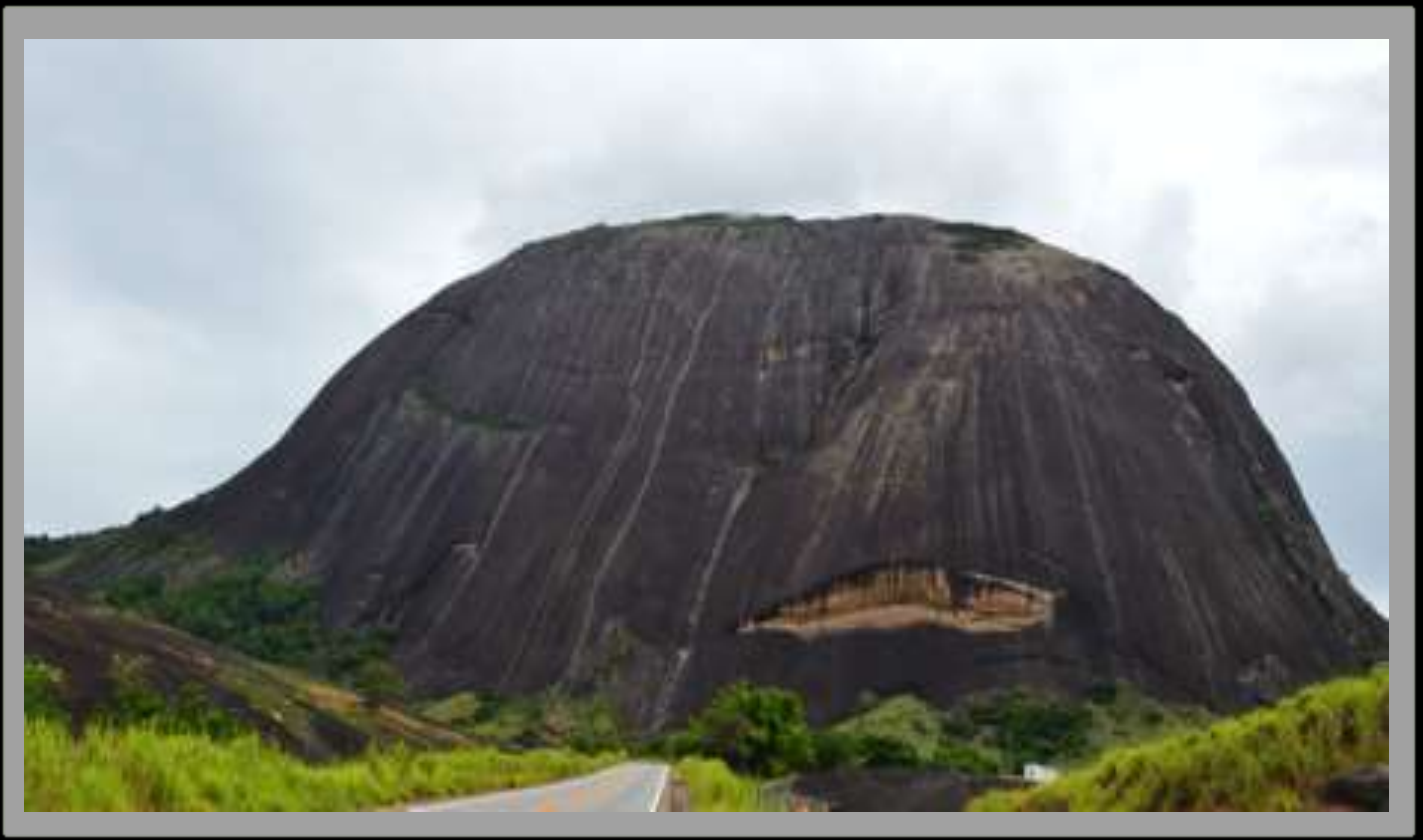


The harsh environmental conditions of inselbergs are markedly different from those of surrounding vegetation, and are thought to be key determinants of plant community structure in these rocky habitats.

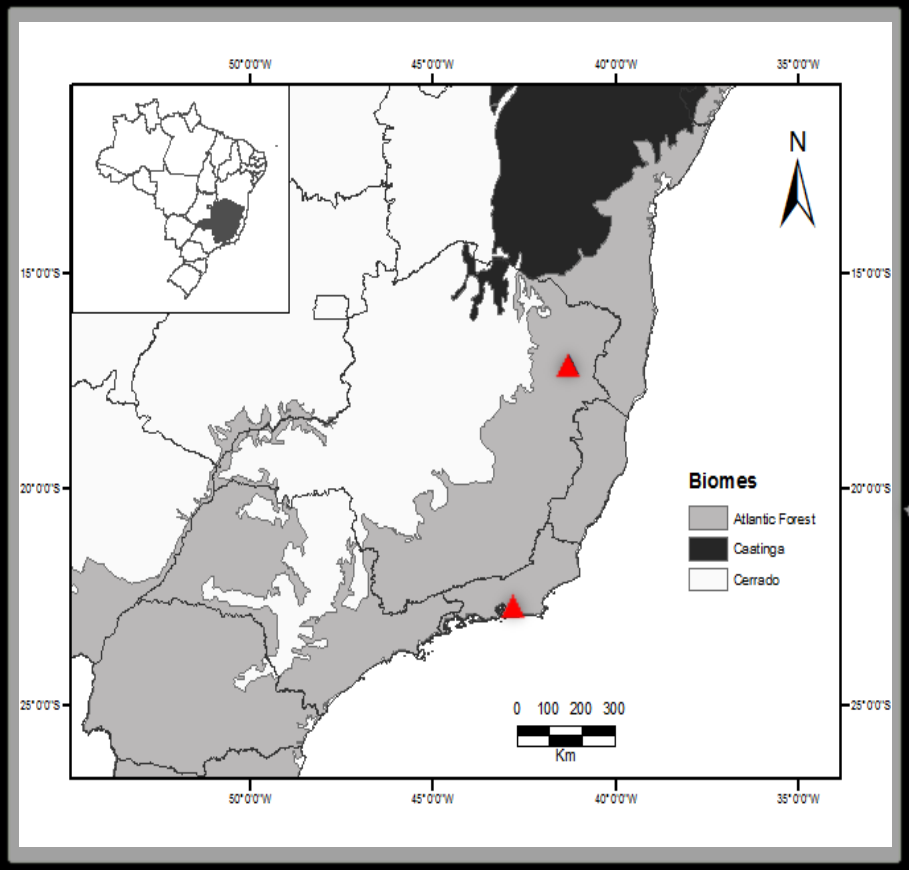


Functional traits

insights to understand how communities respond to changing environmental conditions

Study sites

Vale do Mucuri (MG) and Itacoatiara (RJ)



78 species in 93 patches

We evaluated the importance of ecological strategies in different vegetation patches on the inselberg

Particular environmental characteristics should filter distinct functional strategies in each patch type.

Habitats

Shallow depressions

Crevices

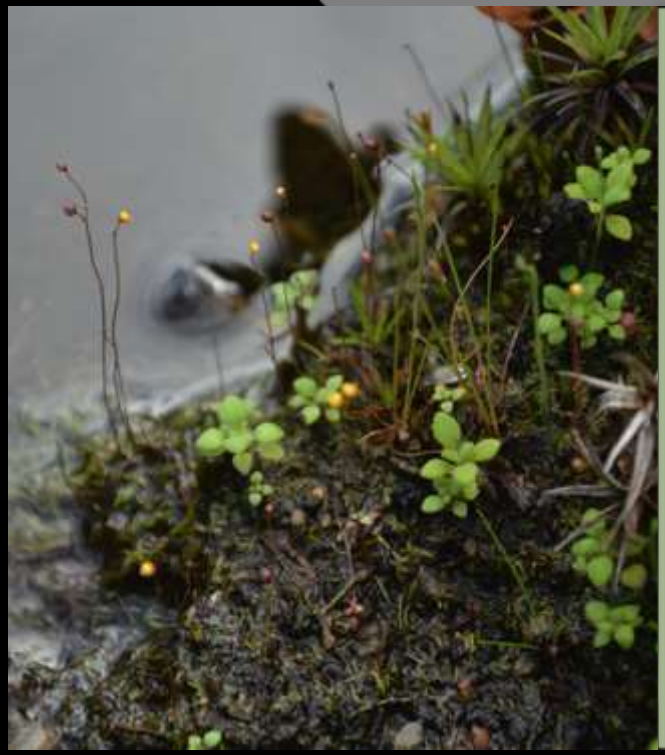
76 spp.

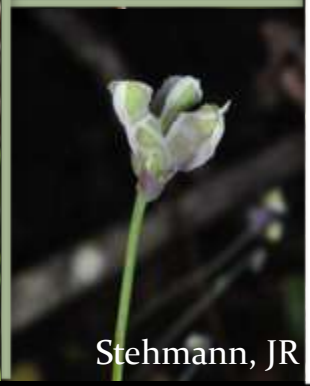
17 spp.

Monocot mats

14 spp.

Ephemeral humid vegetation





10 spp.

Epilithic

15 spp.

Trait sampling

CSIRO PUBLISHING
Australian Journal of Botany
http://dx.doi.org/10.1071/BT12225

New handbook for standardised measurement of plant functional traits worldwide

N. Pérez-Harguindeguy[A,Y], S. Díaz[A], E. Garnier[B], S. Lavorel[C], H. Poorter[D], P. Jaureguiberry[A], M. S. Bret-Harte[E], W. K. Cornwell[F], J. M. Craine[G], D. E. Gurvich[A], C. Urcelay[A], E. J. Veneklaas[H], P. B. Reich[I], L. Poorter[J], I. J. Wright[K], P. Ray[L], L. Enrico[A], J. G. Pausas[M], A. C. de Vos[F], N. Buchmann[N], G. Funes[A], F. Quétier[A,C], J. G. Hodgson[O], K. Thompson[P], H. D. Morgan[Q], H. ter Steege[R], M. G. A. van der Heijden[S], L. Sack[T], B. Blonder[U], P. Poschlod[V], M. V. Vaieretti[A], G. Conti[A], A. C. Staver[W], S. Aquino[X] and J. H. C. Cornelissen[F]

Seed mass

Leaf traits

Plant height

Leaf area LDMC
Toughness SLA
Leaf width

Grime's CSR Theory

Vol. 111, No. 982 The American Naturalist November–December 1977

EVIDENCE FOR THE EXISTENCE OF THREE PRIMARY STRATEGIES IN PLANTS AND ITS RELEVANCE TO ECOLOGICAL AND EVOLUTIONARY THEORY

J. P. GRIME

Unit of Comparative Plant Ecology (NERC), Department of Botany, The University, Sheffield S10 2TN, England

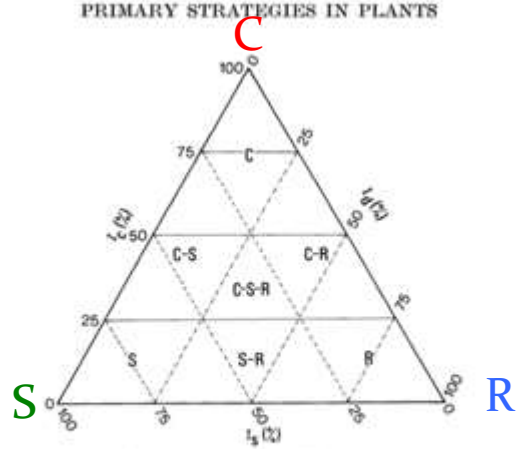


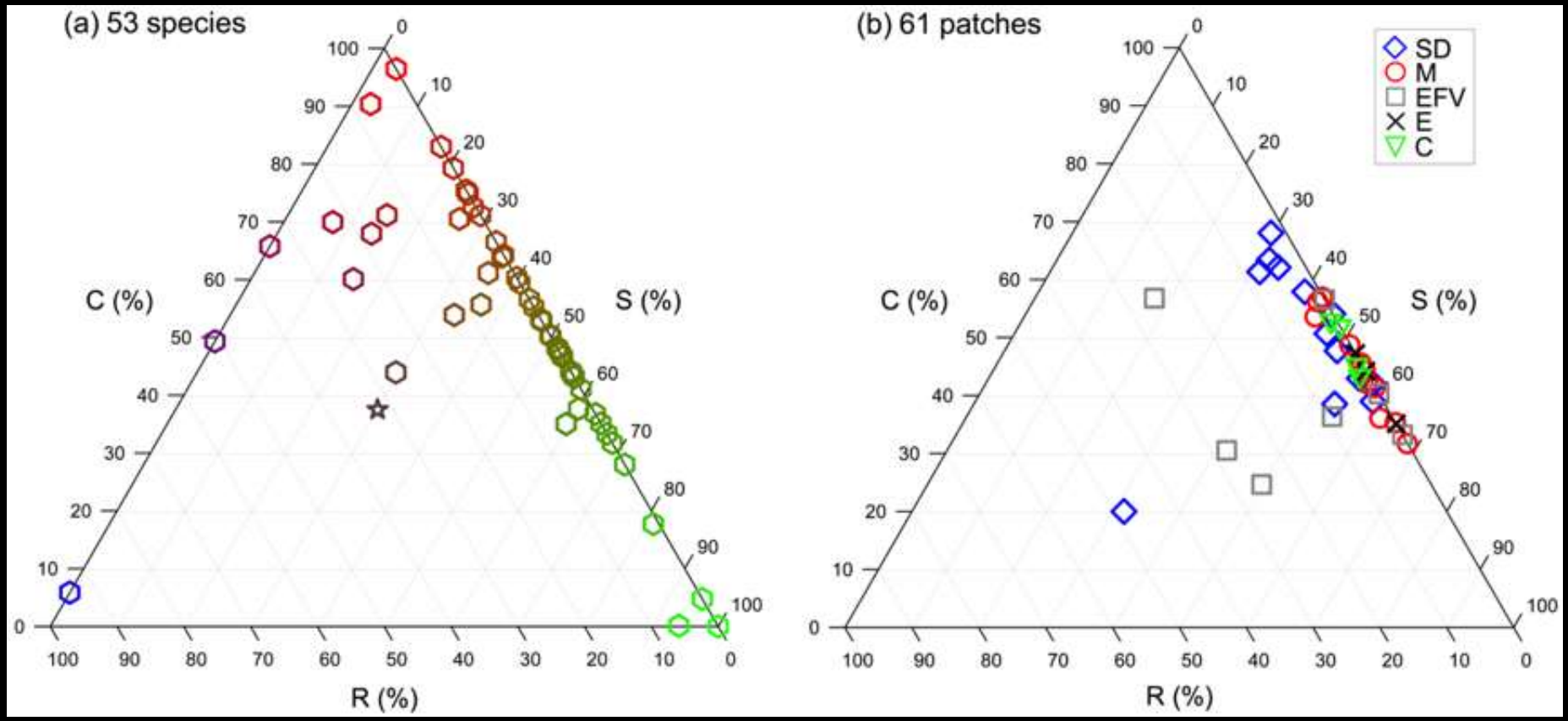
FIG. 2.—Model describing the various equilibria between competition, stress, and disturbance in vegetation and the location of primary and secondary strategies. I_c—relative importance of competition (———), I_s—relative importance of stress (– – –), I_d—relative importance of disturbance (·—·—). A key to the symbols for the strategies is included in the text.

TABLE 1

SUGGESTED BASIS FOR THE EVOLUTION OF THREE STRATEGIES IN VASCULAR PLANTS

INTENSITY OF DISTURBANCE	INTENSITY OF STRESS	
	Low	High
Low	Competitive strategy	Stress-tolerant strategy
High	Ruderal strategy	No viable strategy

CSR classification



Analyses at species-and patch-level indicated a dominance of stress-tolerance and competitive strategies

M. repens funcionally distinct from the resident community

We tested for a connection between the patch structure and plant functional traits

If filters structure the community, than a strong trait-environment relationship should be expected

Environmental drivers

- Slope
- Area (ellipse)
-Soil depth
- Invaded or not

Ecology, 95(1), 2014, pp. 14–21

Combining the fourth-corner and the RLQ methods for assessing trait responses to environmental variation

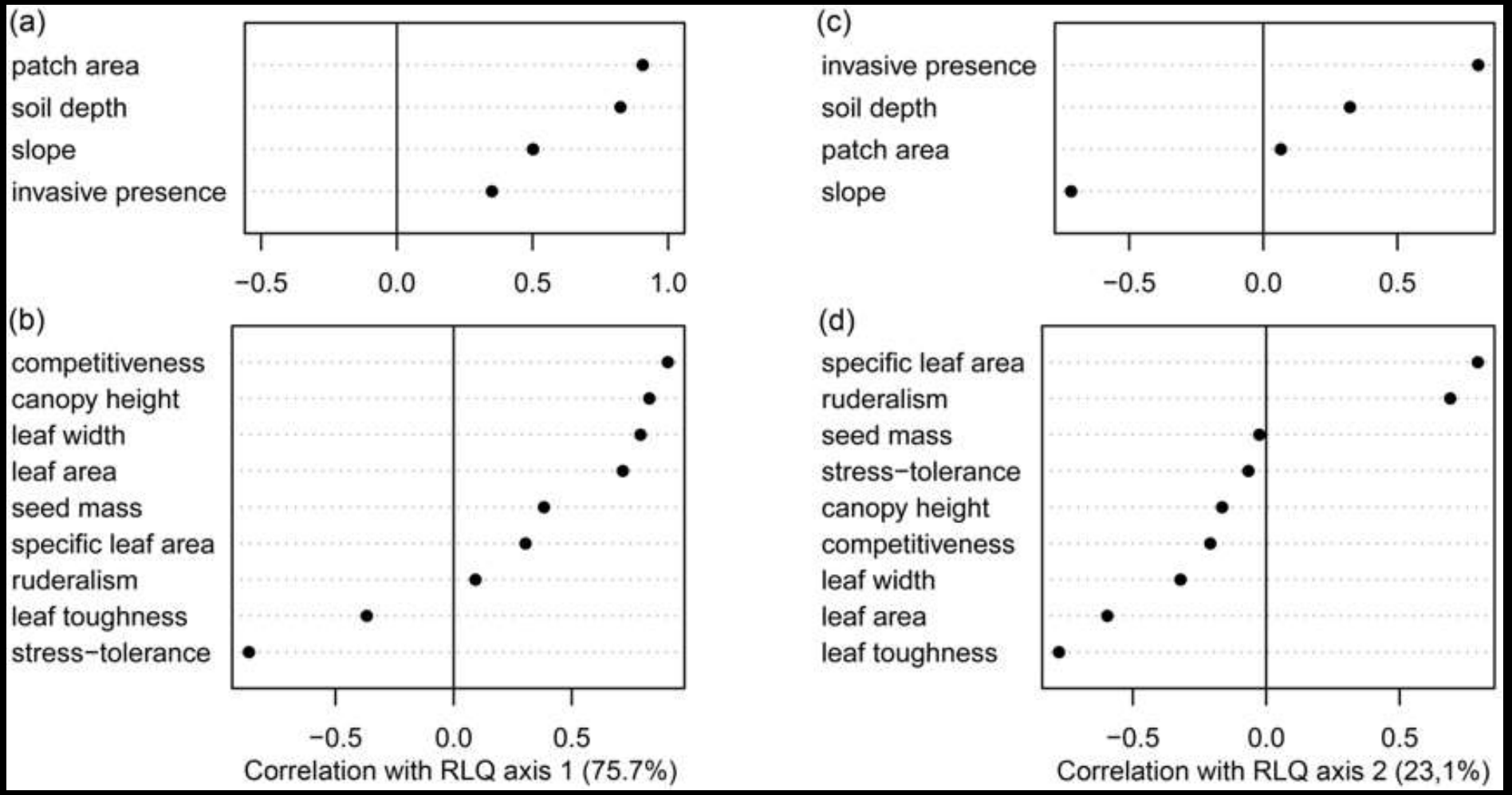
Stéphane Dray,[1,9] Philippe Choler,[2,3] Sylvain Dolédec,[4] Pedro R. Peres-Neto,[5] Wilfried Thuiller,[2] Sandrine Pavoine,[6,7] and Cajo J. F. ter Braak[8]

1. Matrix L – species per sample
2. Matrix R – environmental drivers per sample
3. Matriz Q – species traits

→ **RLQ** : summarizes the multivariate association among the three matrices

→ **Fourth corner**: tests pairwise relationships between functional traits and environmental drivers

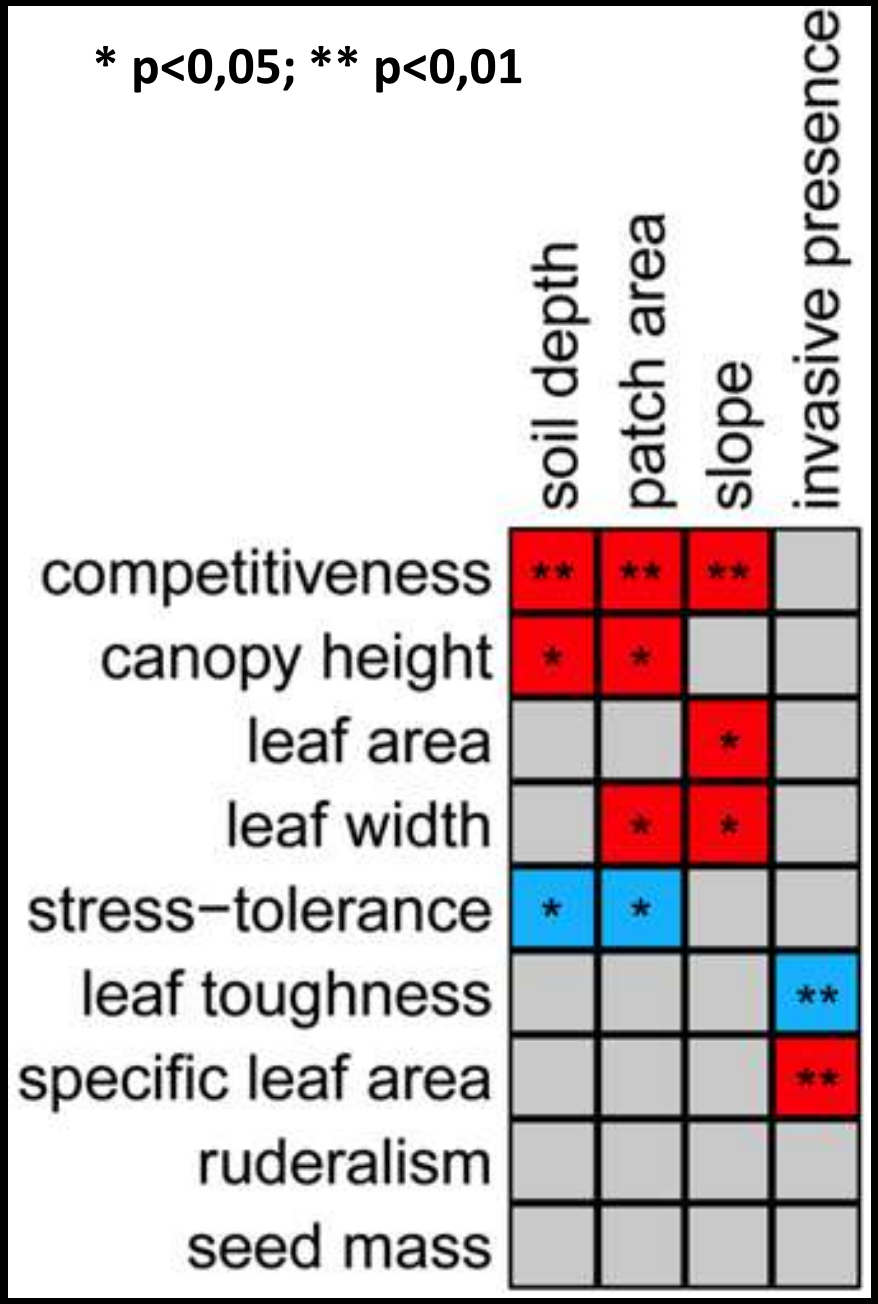
RLQ



Most functional traits significantly correlated with at least one environmental driver, highlighting their role in structuring plant communities in this heterogeneous environment

Fourth corner

Fourth-corner analysis was consistent with RLQ analysis



We compared the variation in functional traits between native and an exotic invasive species to check whether they show converging or diverging functional traits.

We expected invasive species to have particular ecological strategies, which could give them some advantage over native species.

Biological invasion by the african grass *Melinis repens*

- Ephemeral humid vegetation: 14.3% invaded
- Shallow depressions: 30% invaded

Given the spatially heterogeneity in resources, some patch types were more invasive-prone than others

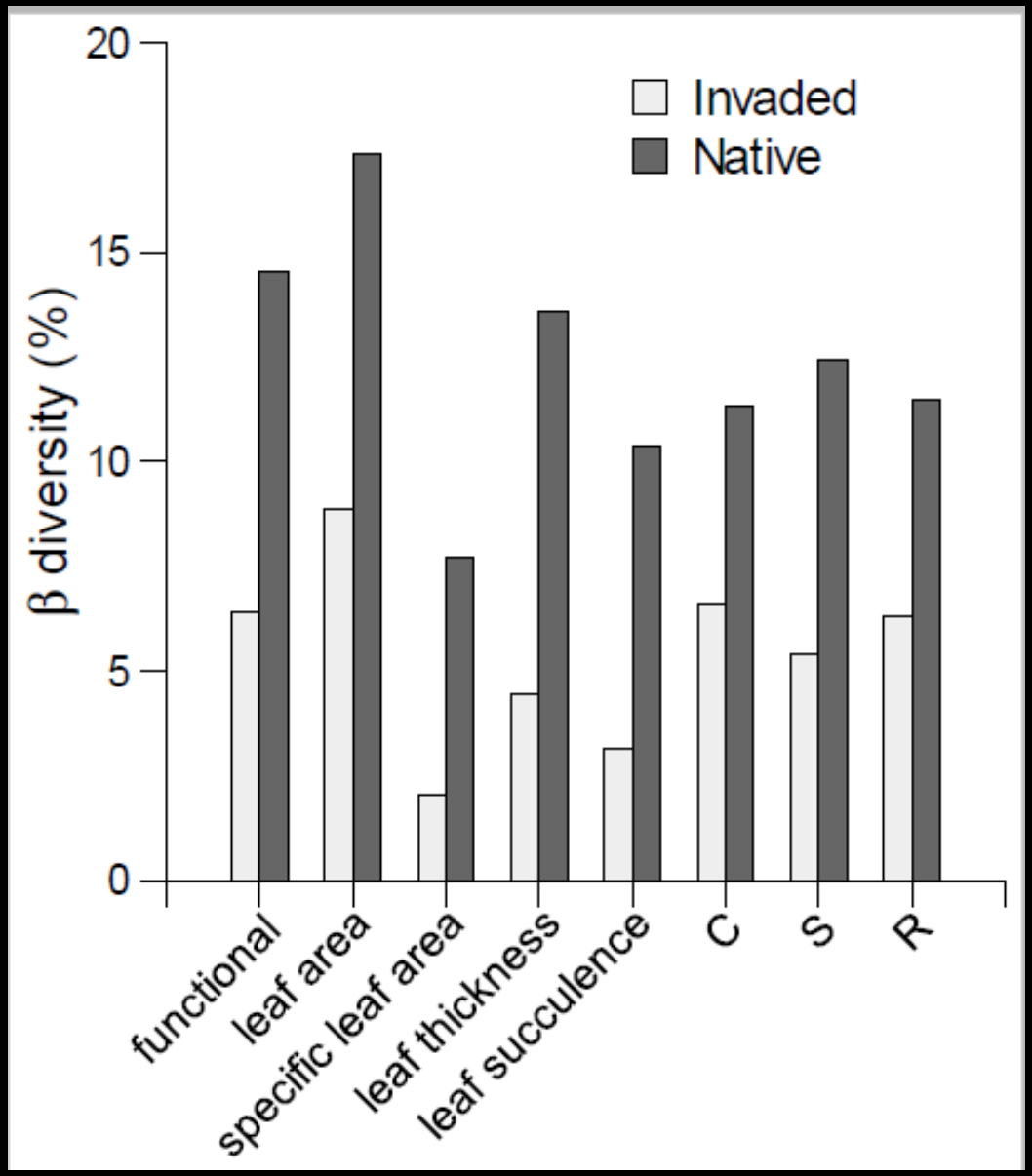
Melinis repens show traits related to ruderality…

Table 1 Comparison between native plant community of invaded patches (mean ± SE; n = 36 species) and *Melinis repens* trait values, both native and the invasive species occurred in inselberg vegetation at Minas Gerais, south-eastern Brazil

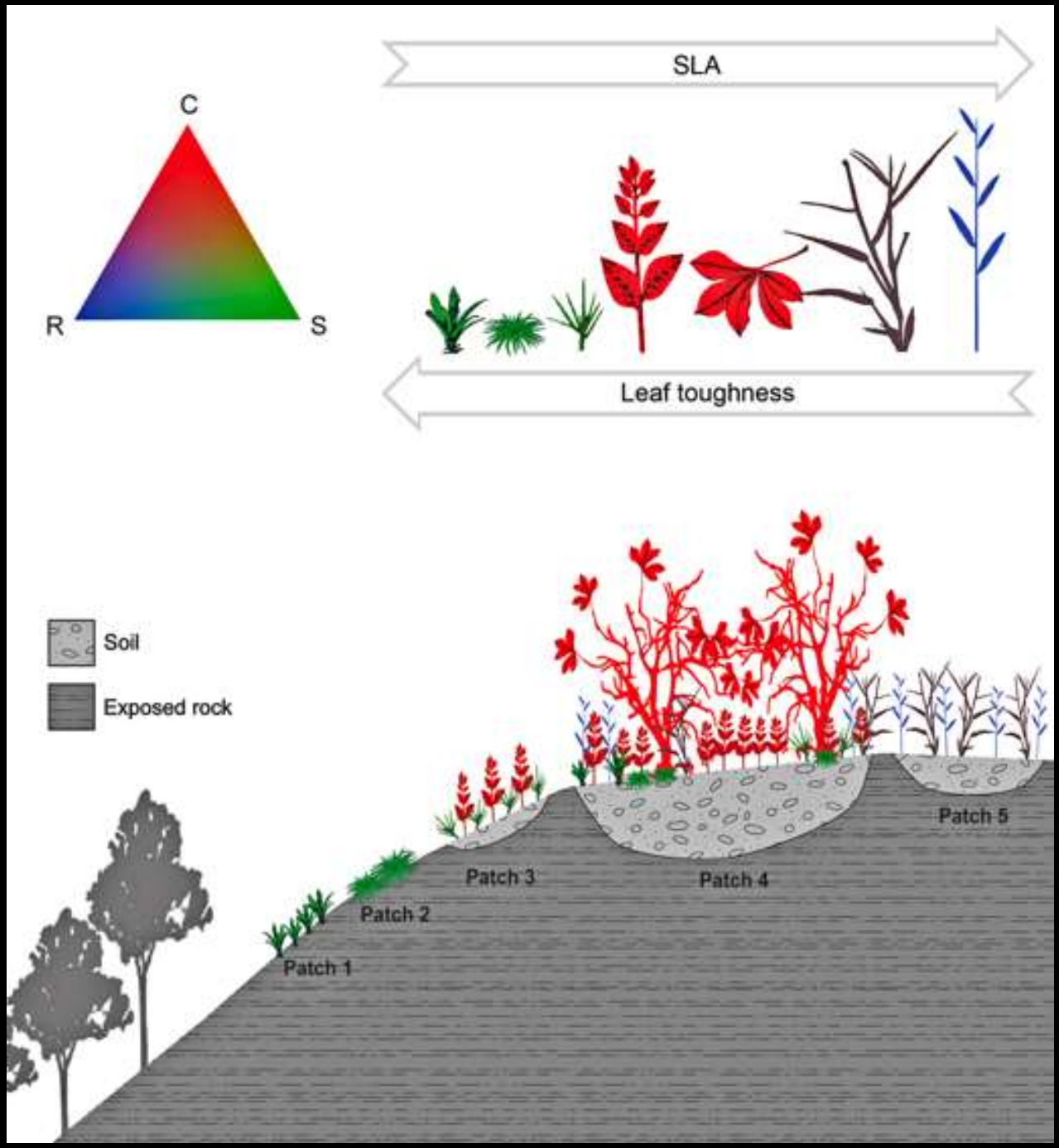
	Invaded patches	*M. repens*	One-sample *t* test
Ruderalism (%)	4.4 ± 1.7	32.2	−13.792**
Specific leaf area ($mm^2\ mg^{-1}$)	11.9 ± 0.7	23.1	−10.512**
Leaf width (mm)	38.7 ± 6.3	4.6	8.052**
Leaf area (cm^2)	110.7 ± 25.3	7.3	5.835**
Competitiveness (%)	51.6 ± 3.8	37.5	3.744*
Stress-tolerance (%)	44.0 ± 4.2	30.3	3.291*
Seed mass (mg)	5.2 ± 2.0	0.2	3.170*
Canopy height (mm)	824.3 ± 111.8	441.5	2.368
Leaf toughness (KgF)	5.8 ± 0.8	5.1	−1.043

Significantly different at * $p < 0.01$; ** $p < 0.001$

…and decreased B-diversity in invaded patches



Synthesis


C
R
S
SLA
Leaf toughness
Soil
Exposed rock
Patch 1
Patch 2
Patch 3
Patch 4
Patch 5

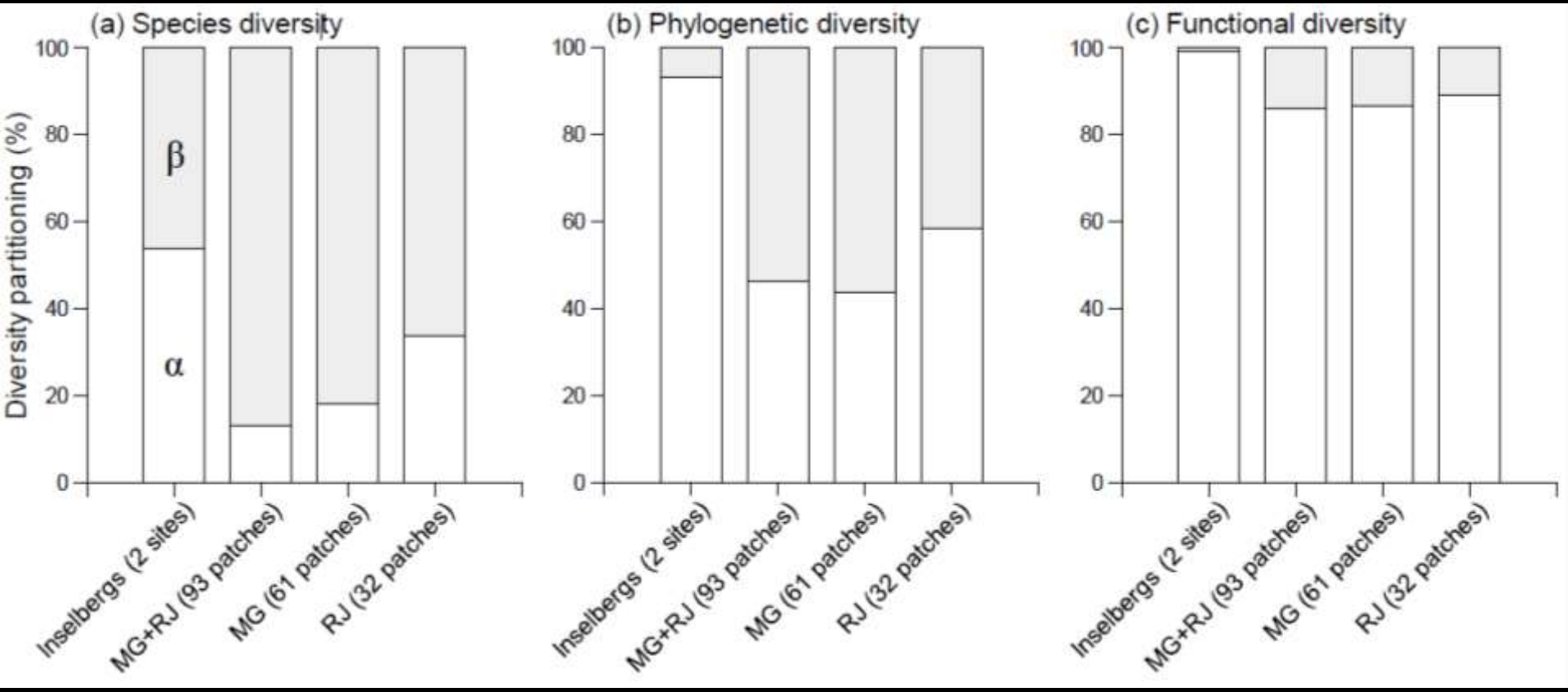
Biodivers Conserv (2015) 24:2239–2253
DOI 10.1007/s10531-015-0904-x

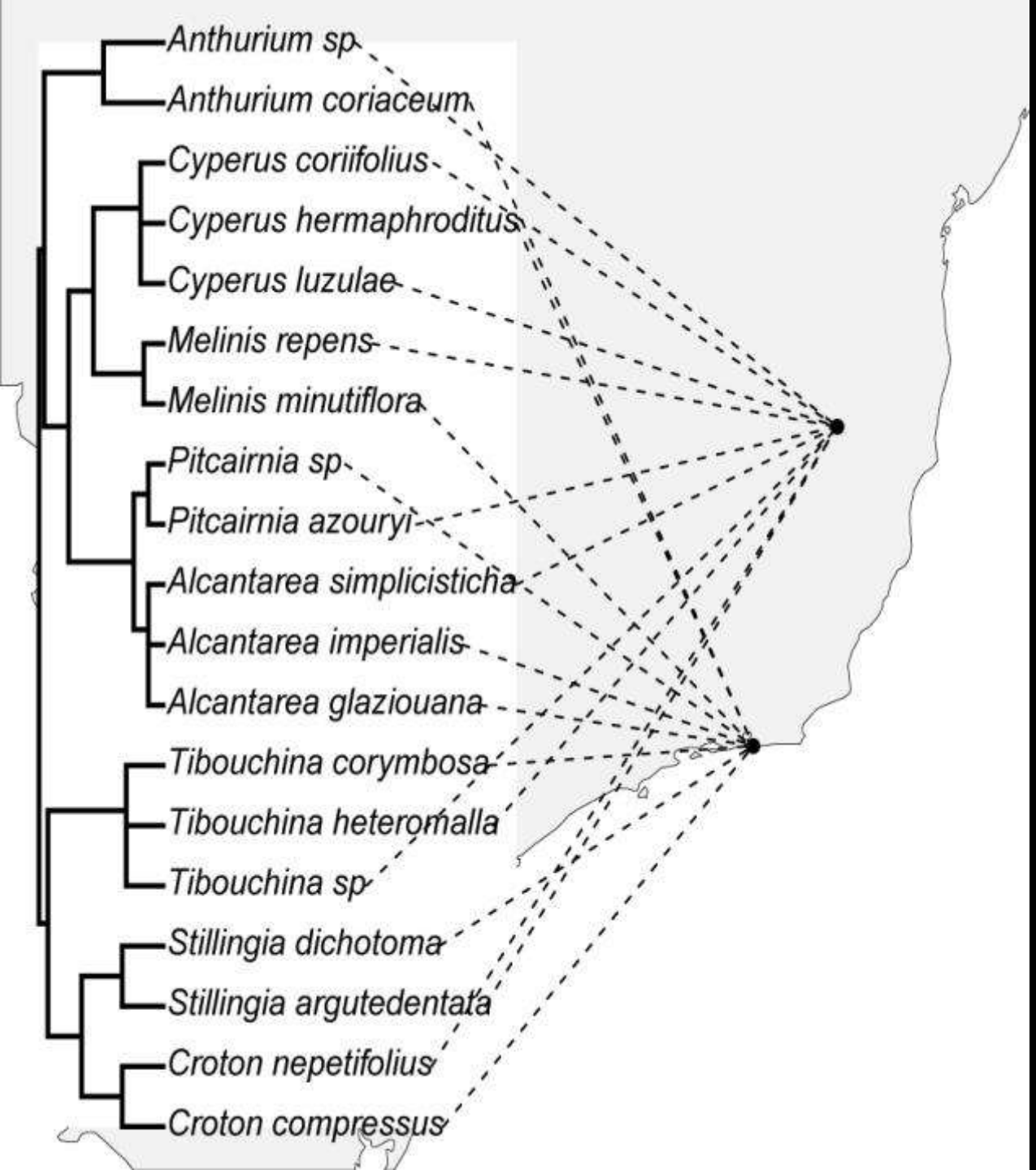
ORIGINAL PAPER

Functional ecology as a missing link for conservation of a resource-limited flora in the Atlantic forest

Luiza F. A. de Paula[1] · Daniel Negreiros[2] · Luísa O. Azevedo[1] · Renato L. Fernandes[1] · João Renato Stehmann[1] · Fernando A. O. Silveira[1]

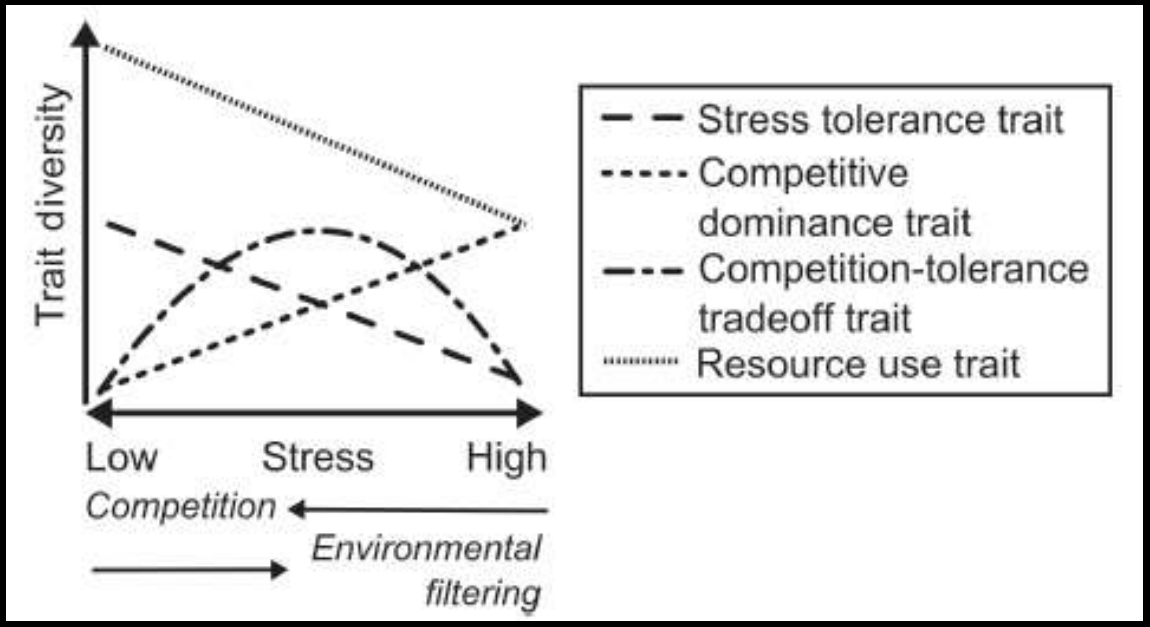
Different inselbergs harbour different species, but share the same traits

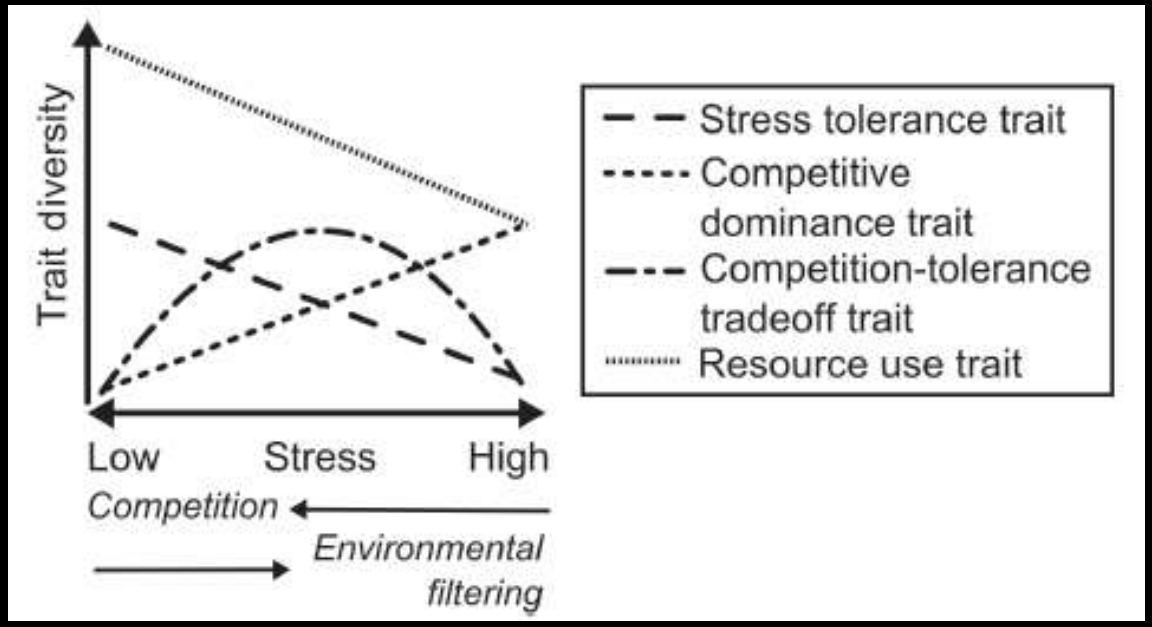


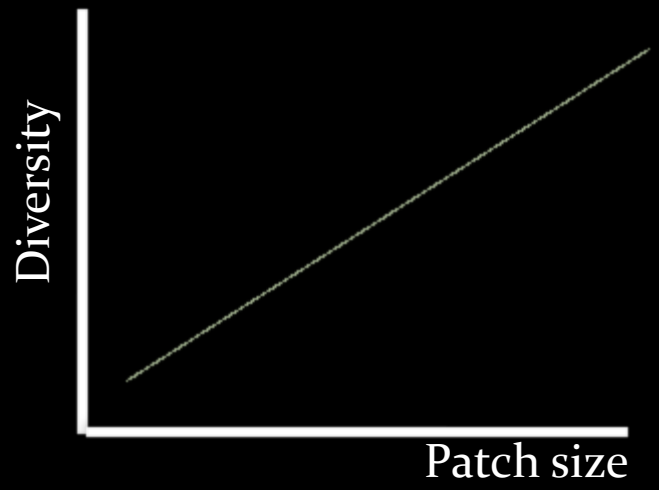

Anthurium sp
Anthurium coriaceum
Cyperus coriifolius
Cyperus hermaphroditus
Cyperus luzulae
Melinis repens
Melinis minutiflora
Pitcairnia sp
Pitcairnia azouryi
Alcantarea simplicisticha
Alcantarea imperialis
Alcantarea glaziouana
Tibouchina corymbosa
Tibouchina heteromalla
Tibouchina sp
Stillingia dichotoma
Stillingia argutedentata
Croton nepetifolius
Croton compressus

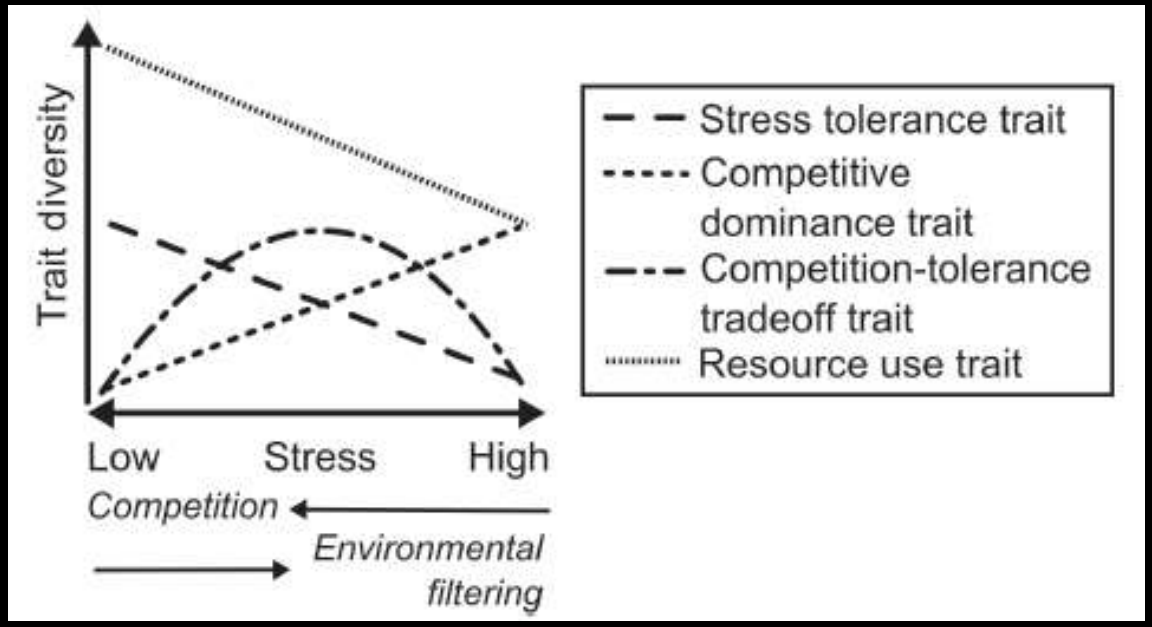
We tested the stress-dominance hypothesis:

a model of community assembly predicting that the relative importance of environmental filtering increases and competition decreases along a gradient of increasing environmental stress


Trait diversity
Low
Stress
High
Competition
Environmental filtering
Stress tolerance trait
Competitive dominance trait
Competition-tolerance tradeoff trait
Resource use trait


Trait diversity
Stress tolerance trait
Competitive dominance trait
Competition-tolerance tradeoff trait
Resource use trait
Low
Stress
High
Competition
Environmental filtering


Diversity
Patch size


Trait diversity
Stress tolerance trait
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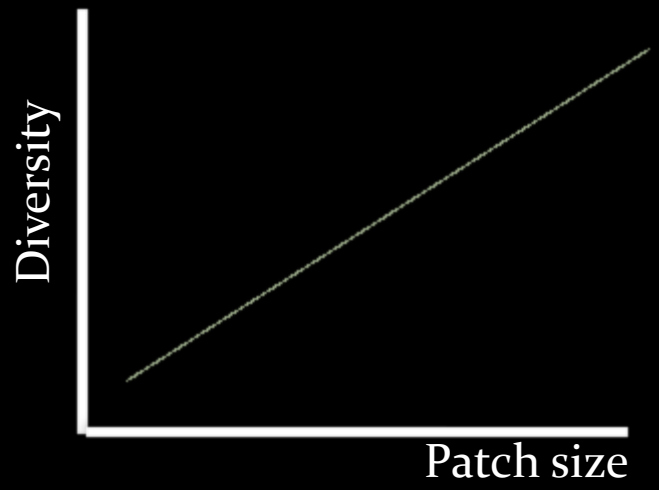
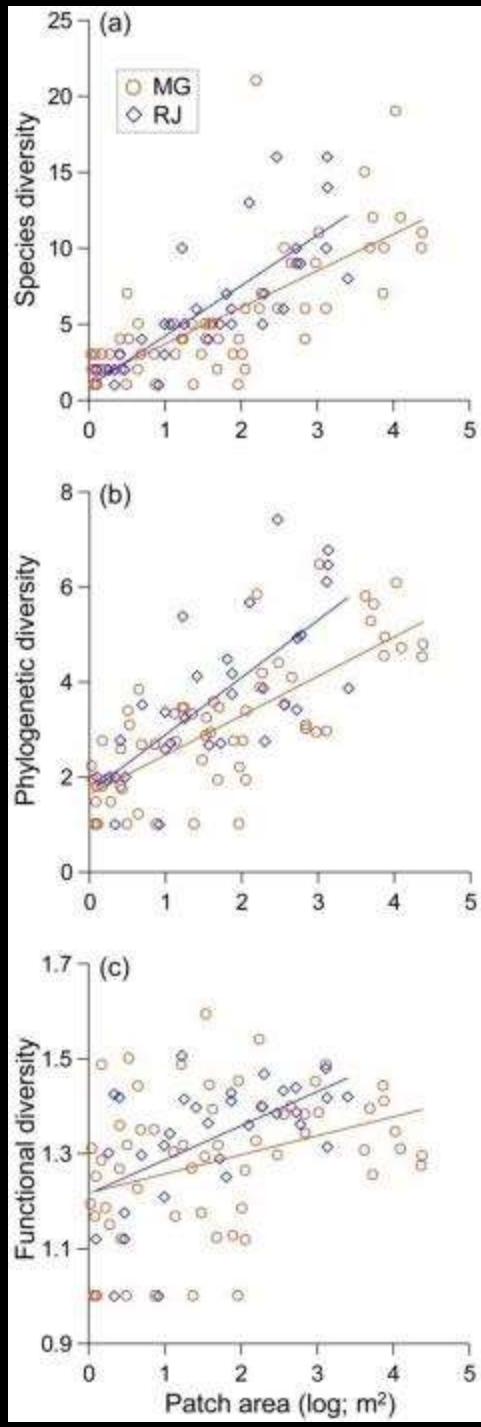
Competition-tolerance tradeoff trait
Resource use trait
Low
Stress
High
Competition
Environmental filtering


Diversity
Patch size

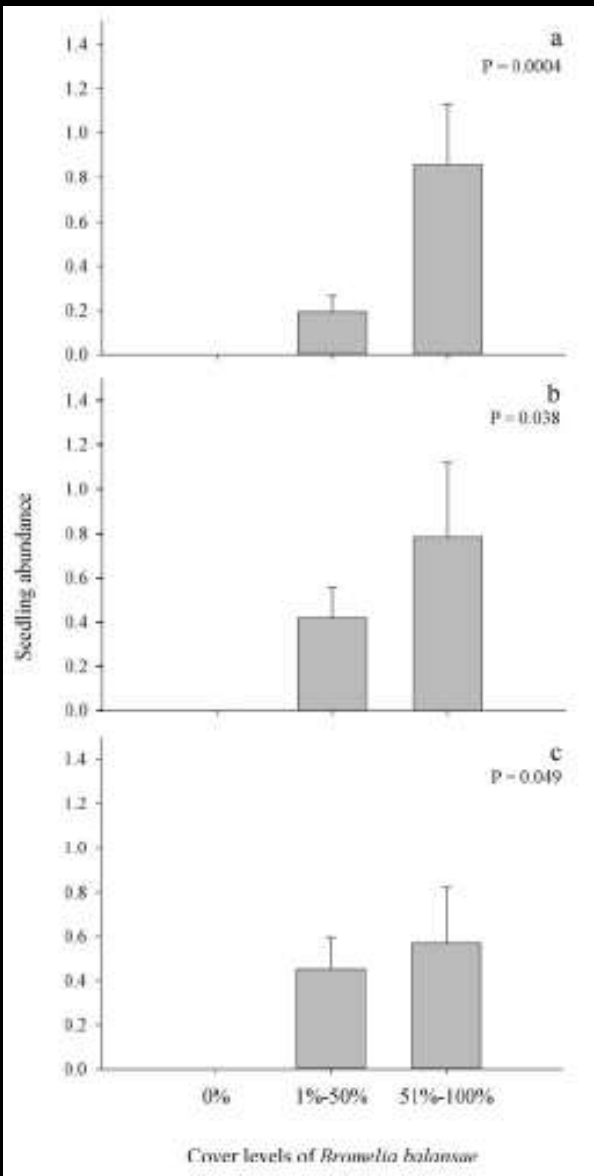

(a)
MG
RJ
Species diversity
(b)
Phylogenetic diversity
(c)
Functional diversity
Patch area (log; m²)

Journal of Tropical Ecology (2015) **31**:195–198. © Cambridge University Press 2014
doi:10.1017/S0266467414000728

SHORT COMMUNICATION

Positive association between *Bromelia balansae* (Bromeliaceae) and tree seedlings on rocky outcrops of Atlantic forest

Fernando Souza Rocha*,[1], Leandro da Silva Duarte† and Jorge Luiz Waechter‡



Conclusions

Inselbergs are heterogeneous environments → islands within islands

Functional traits play a key role in structuring plant communities in inselbergs

Our data contribute to the understanding of historical and contemporary factors that shape plant communities in inselbergs and will be helpful to predict how resource-limited environments will respond to future global change drivers

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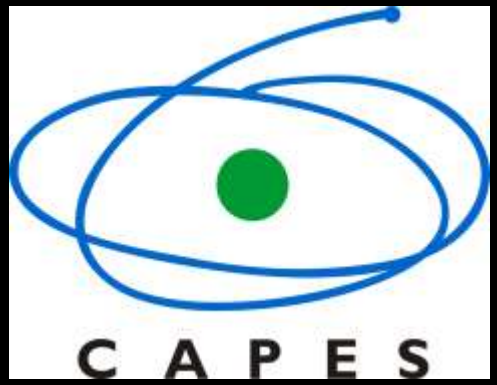
- Daniel Negreiros
- Sara Colmenares
- Bruno Rosado
- Eduardo Arcoverde
- Francesco de Bello




Thank you
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