centre for ecology, evolution and environmental changes

Rocky outcrops: Small Natural Features to promote biodiversity in oak wood-pastures

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Introduction

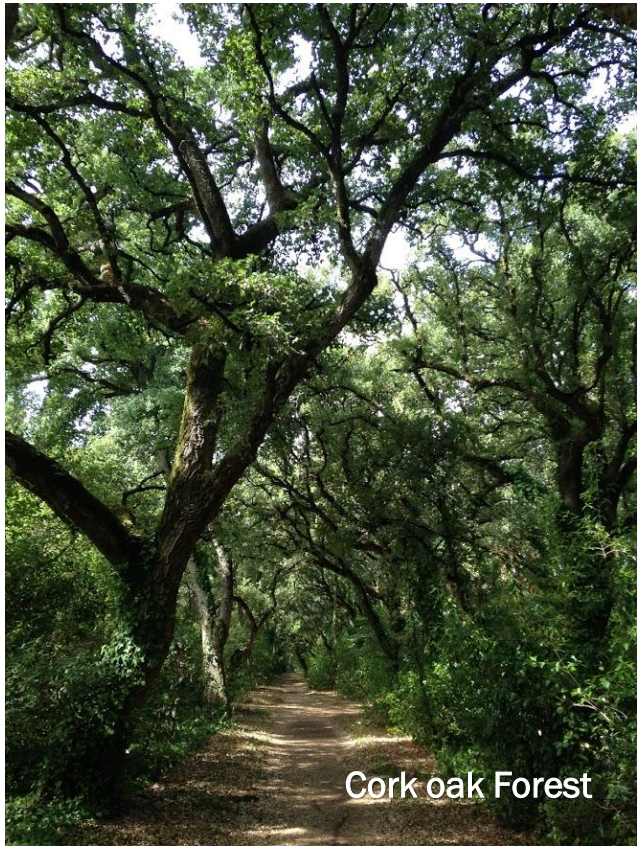
Montado/Dehesa

- Cork (*Quercus suber*) or/and holm (*Q. rotundifolia*) oak wood pastures
- Southern and central Iberian Peninsula

Introduction

Montado/Dehesa

- Result from the transformation of evergreen oak woodlands by human activity over hundred of years



Introduction

Wide range of Ecosystem Services

- Provisioning services
  (cork production, livestock),
- Regulation and maintenance services
  (climate regulation, carbon sequestration,
  hotspot of biodiversity) and
- Cultural and societal uses
  (bird watching, tourism)







Introduction

Rocky outcrops

- Rock island-like formations covering small but significant areas
- Grazing and farming activities are limited
- Plant community similar to original evergreen oak woodlands

Introduction

Nature-based solutions

- actions to protect, sustainably manage, and restore natural or modified ecosystems, addressing societal challenges while providing human well-being and biodiversity benefits (IUCN)
- constitute cost-effective means to safeguard biodiversity

Introduction

Rocky outcrops

- Natural
  (exposure of bedrock)
- Artificial

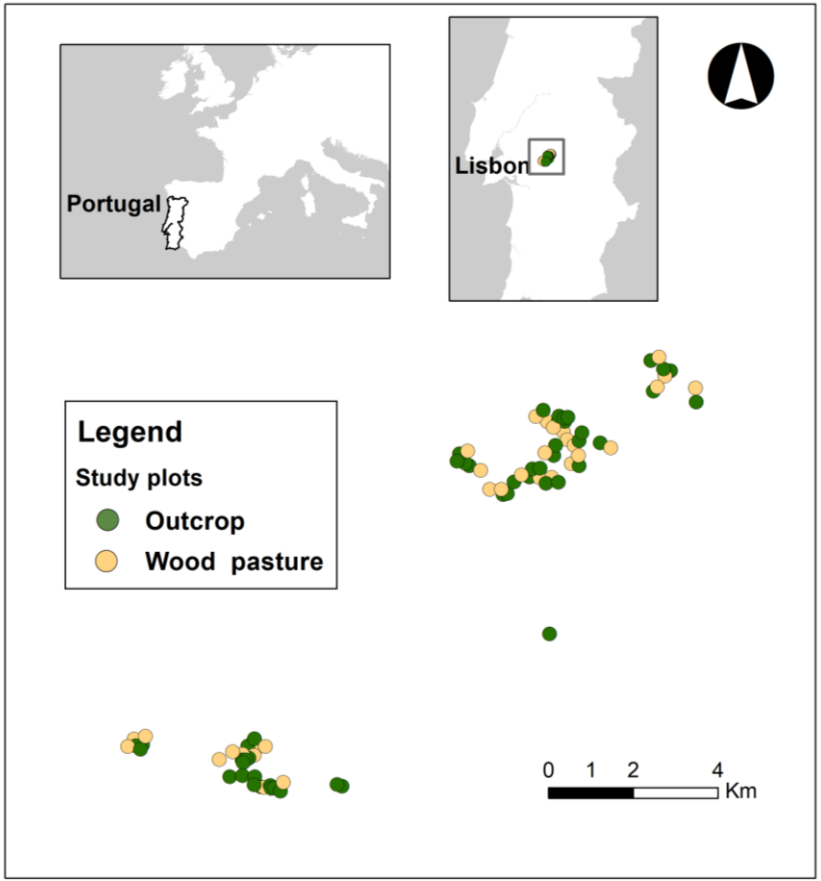
Objective

Analyse the effect of small rocky outcrops in overall plant species composition and functional diversity patterns in the *Montado* system



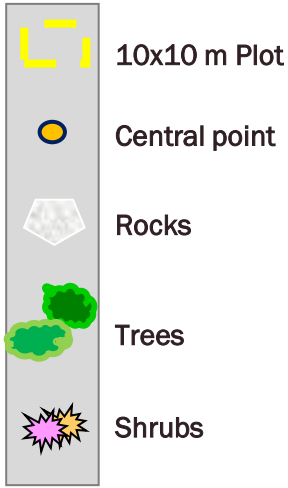


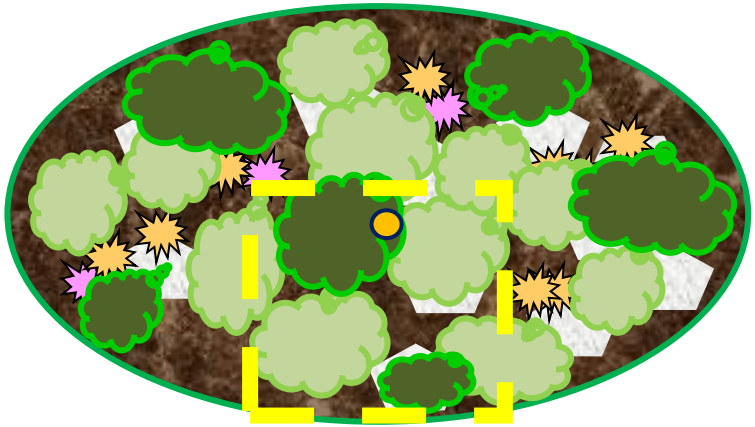
Studied area

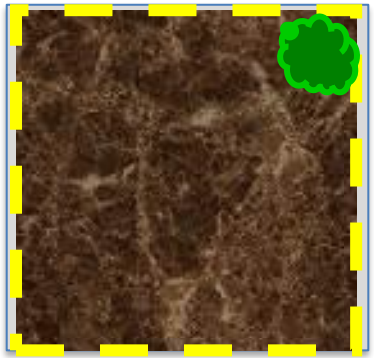


- 83 sites in 9 properties
- holm oak-dominated Montados but with an important cork-oak presence

Methods – Species composition



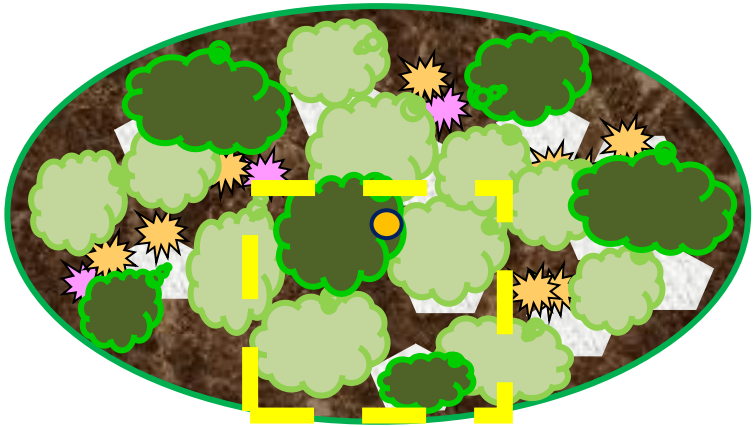


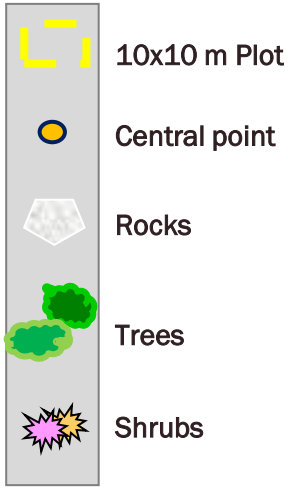


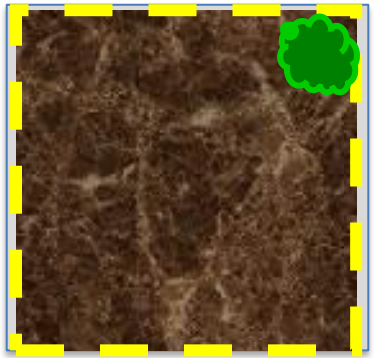
Outcrops (32 plots)

Matrix (32 plots)

Methods – Species composition

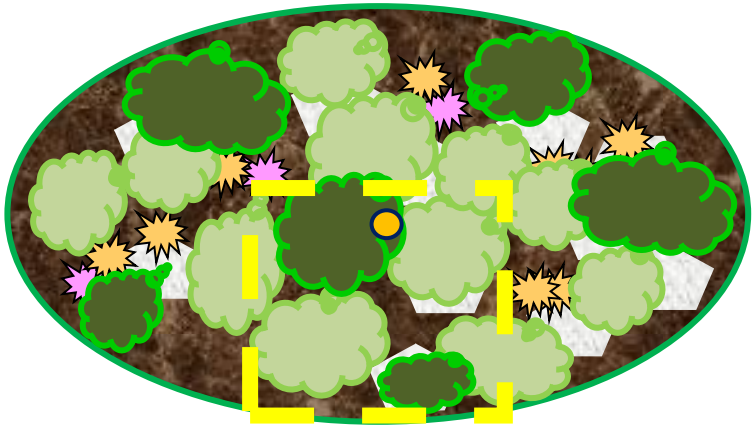


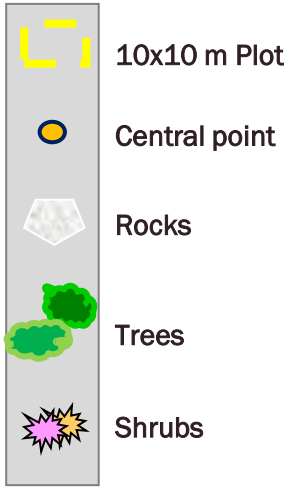


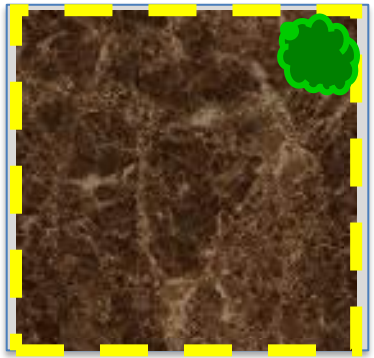


- Composition and structure of vegetation (tree, shrub and herb covers and plant height).
- Plot characterization (rock height and cover of rocks, litter and bare soil).

Methods – Functional diversity



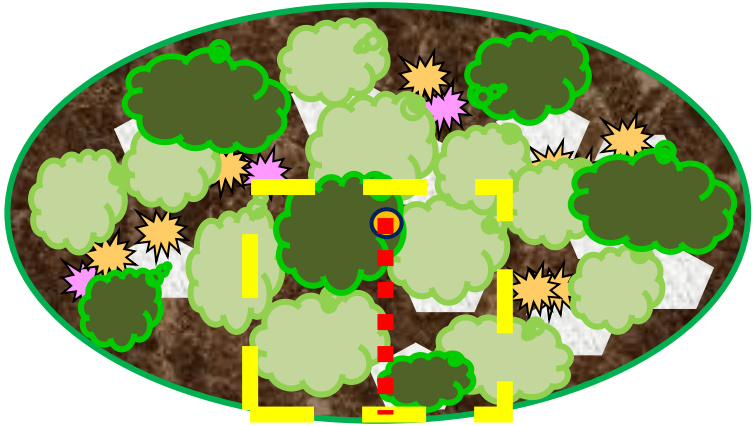


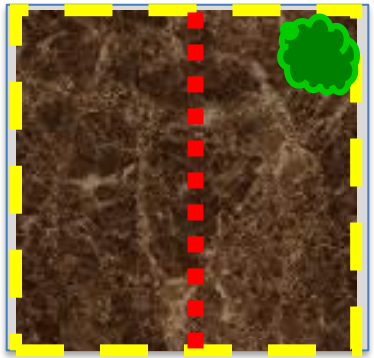


- 10 functional traits: associated to environmental filters, competition and defense (life and growth forms, dispersal strategy, and responses to herbivory, edaphic conditions, light and nutrients)

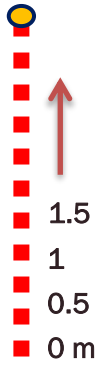
- Functional groups

Methods – Size effect





Point-intercept method

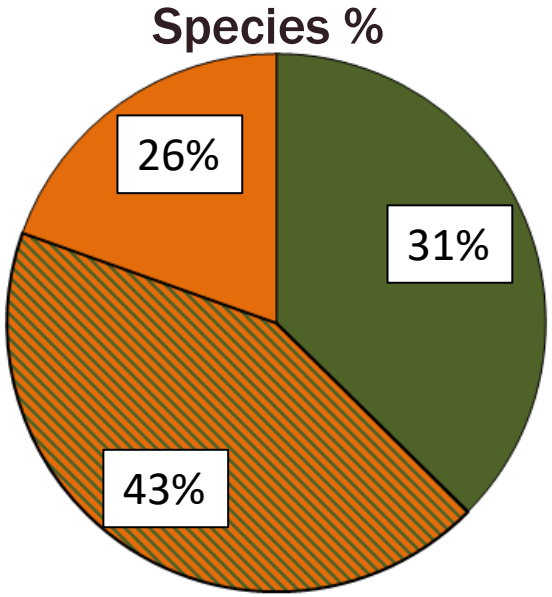


Interception points

- Plant species, rock, litter and bare soil
- Outcrop area and perimeter

(+ 19 outcrops)

Results – Species composition

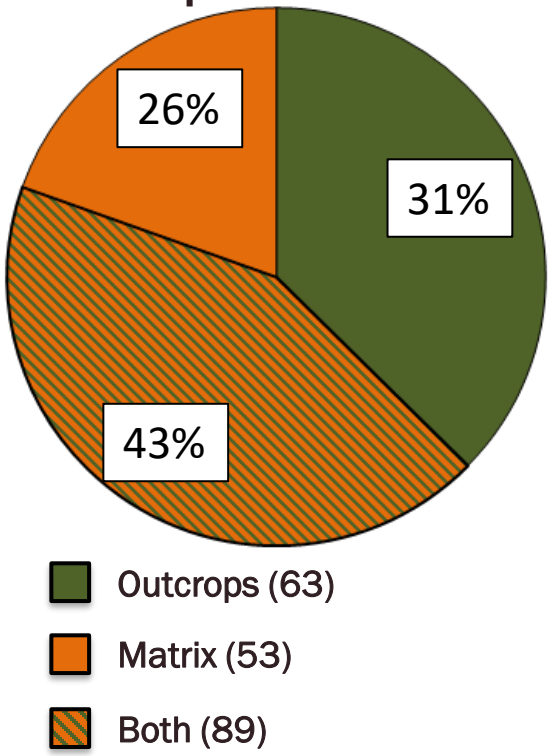


26.2 spp / plot

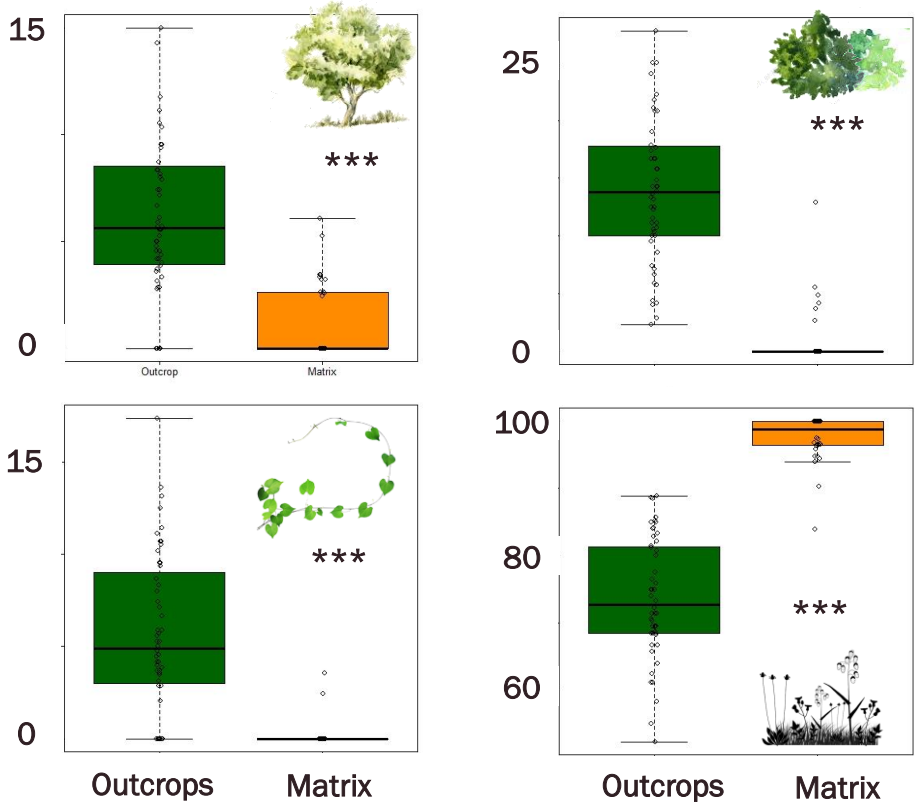
28.5 spp / plot

Results – Species composition

Species %

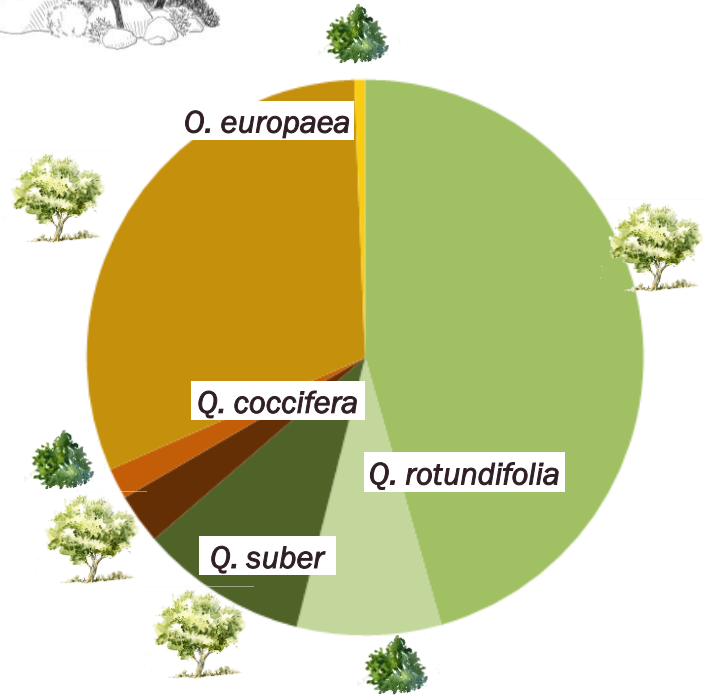


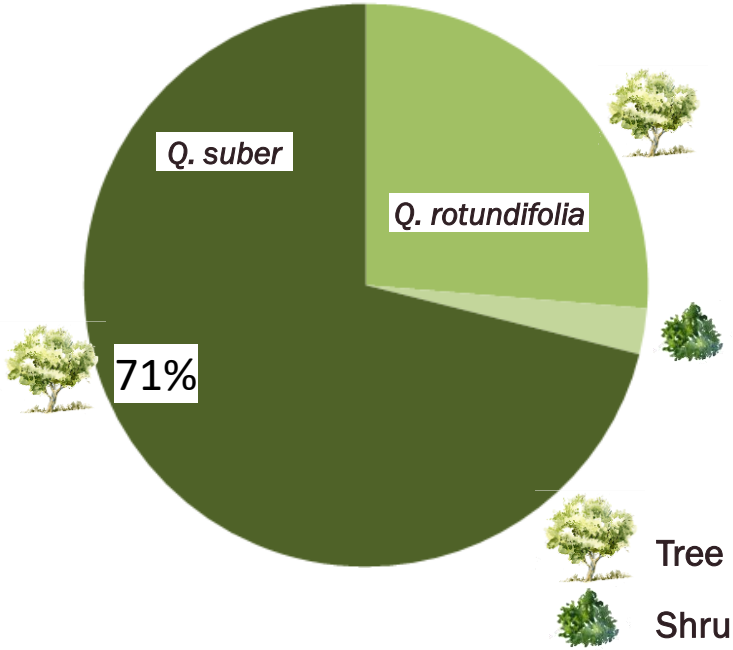
Species number



Results – Species composition

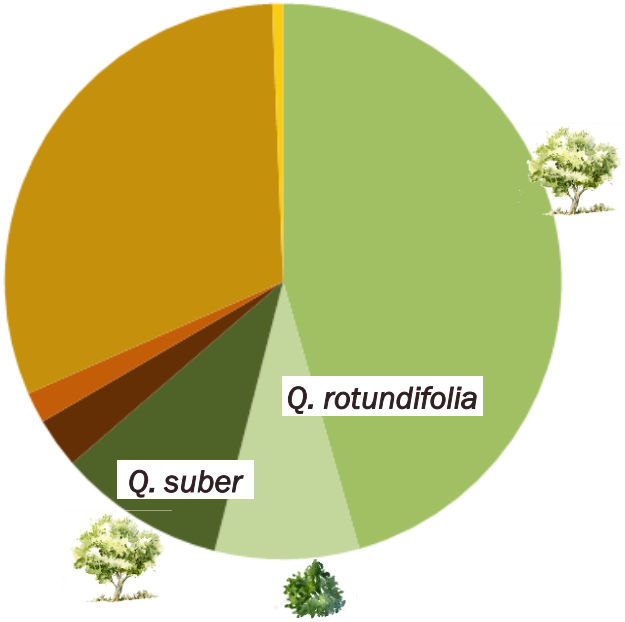
% Trees and shrubby stages

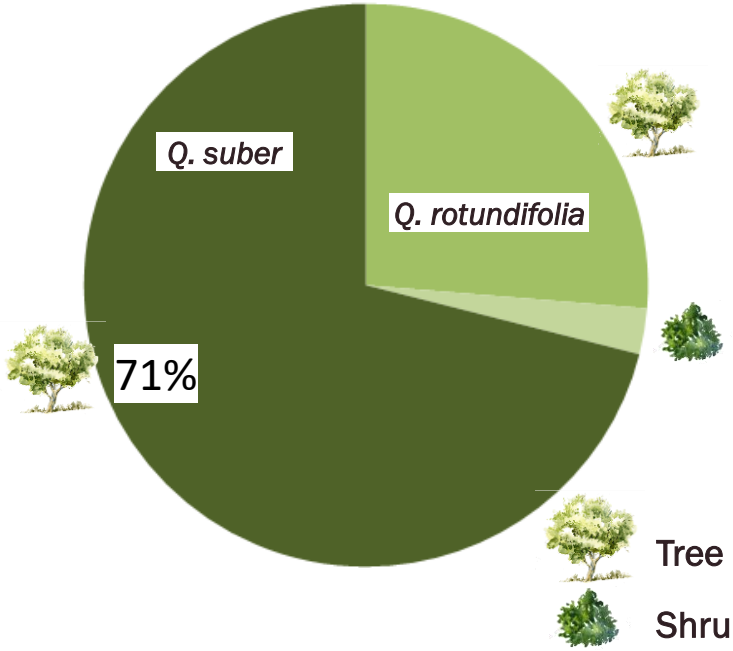




Results – Species composition

No *Q. suber* regeneration

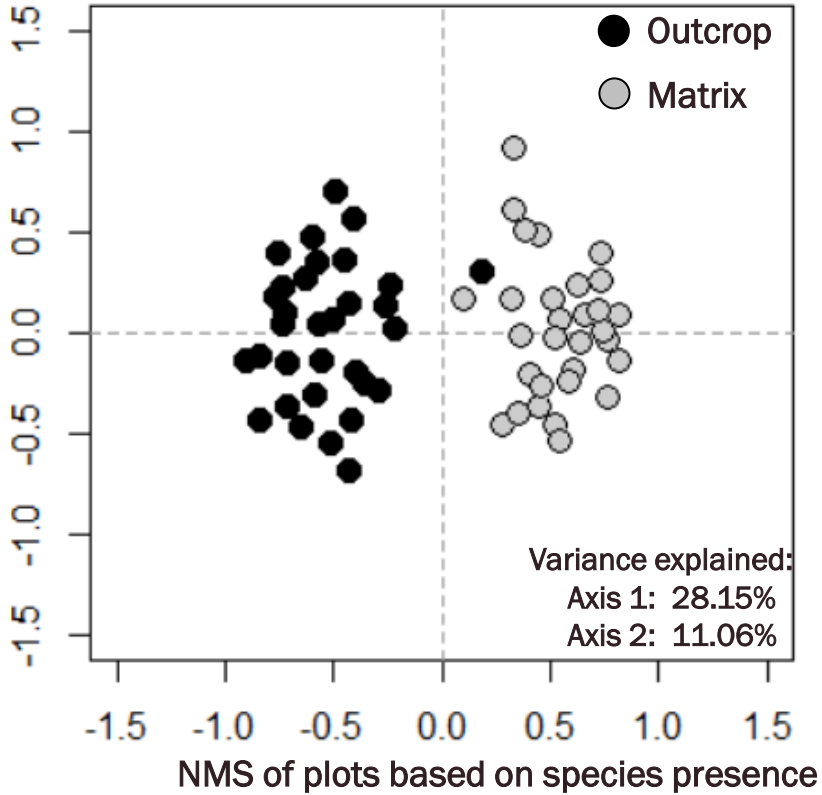




Results – Species composition

	Indval
Geranium robertianum	0.92
Umbilicus rupestris	0.74
Quercus rotundifolia	0.64
Pistacia lentiscus	0.60
Parietaria mauritanica	0.58
Urtica membranacea	0.54
Ruscus aculeatus L.	0.54
Rhamnus alaternus L.	0.50

Sensitive species

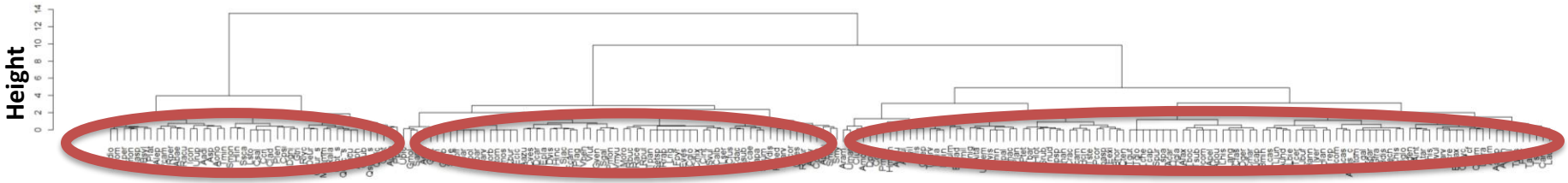


Indval	
0.95	*Agrostis pourretii*
0.85	*Echium plantagineum*
0.75	*Tolpis barbata*
0.74	*Chamaemelum mixtum*
0.73	*Leontodon taraxacoides*
0.64	*Vulpia geniculata*
0.60	*Silene gallica*
0.59	*Vulpia myuros*

Perturbation and stress-tolerant herbs

Results – Functional diversity

Cluster dendrogram of species based on functional traits



Sensitive species

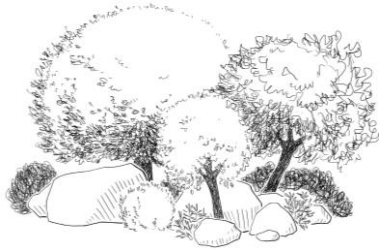



Weedy herbs

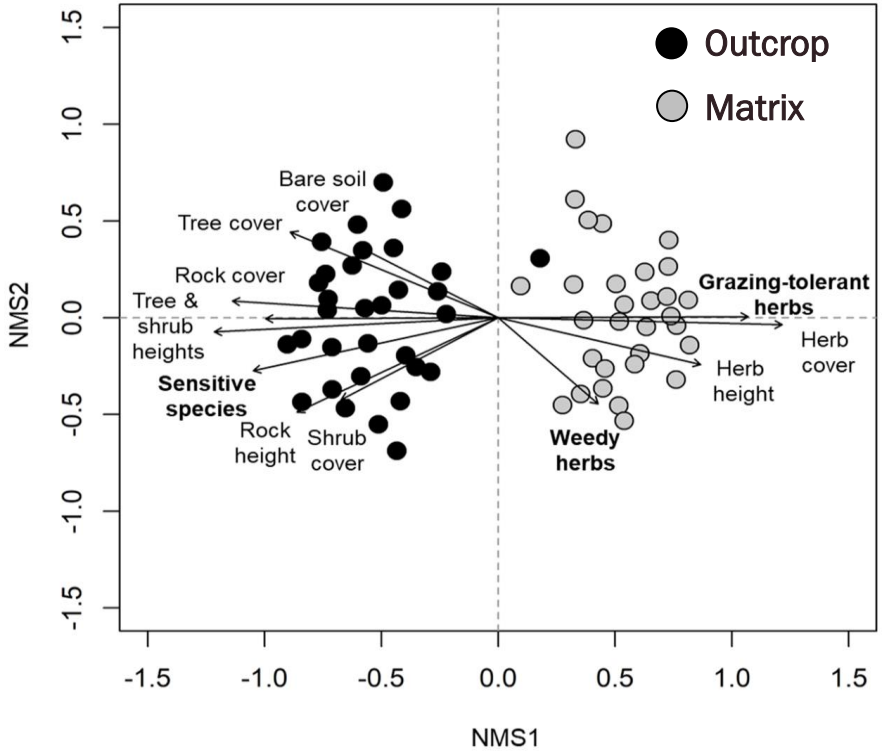

Grazing-tolerant herbs




Results – Functional diversity and environmental factors



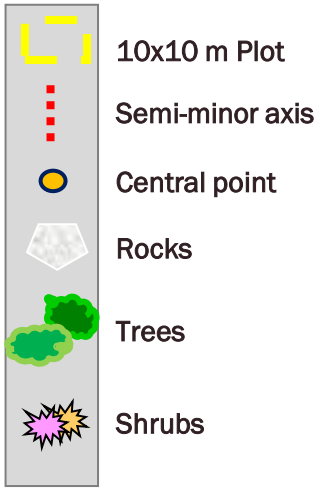
Evergreen oak woodlands

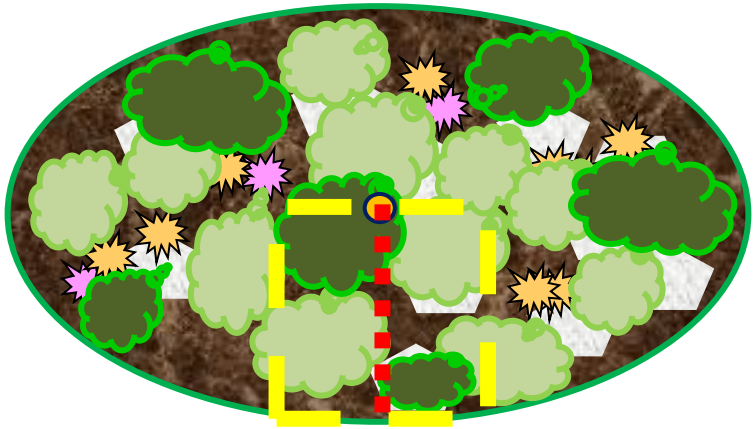


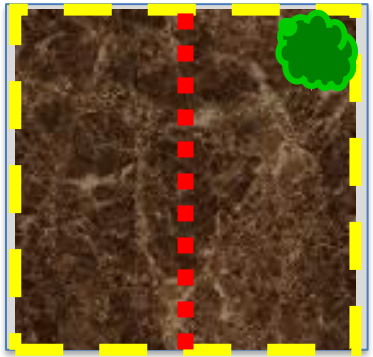
NMS of plots based on species presence

Grasslands

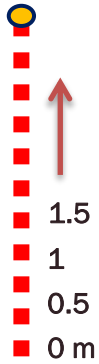
Methods – Size effect







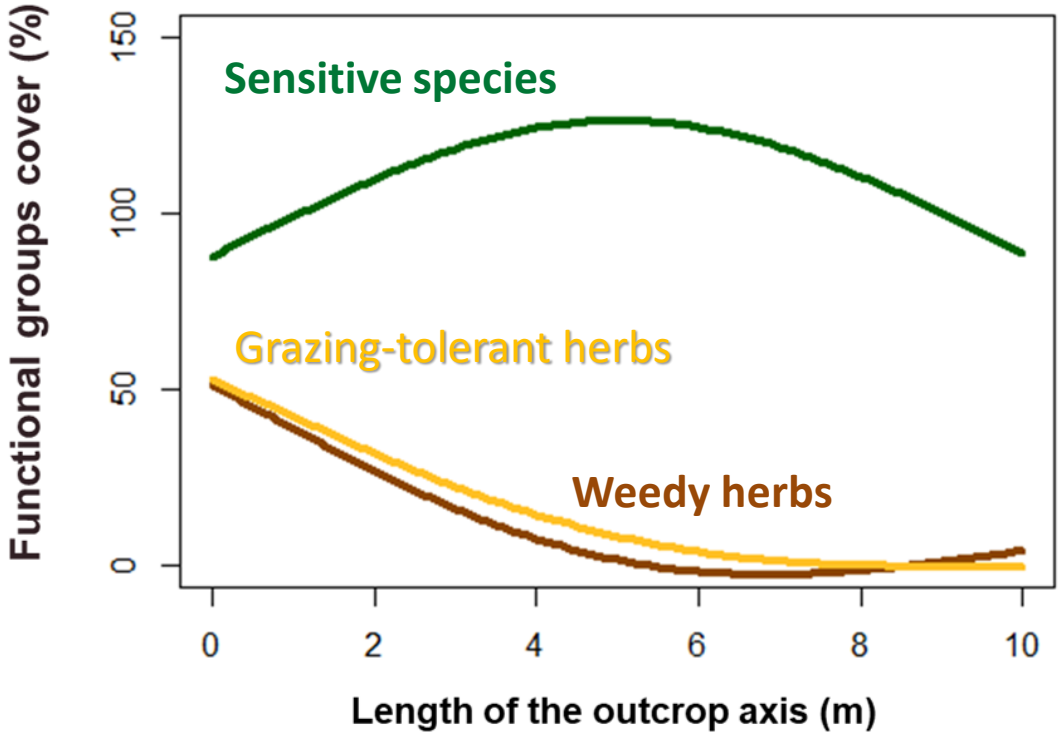
Point-intercept method



Interception points

Area: 75 – 5000 m²
Perimeter: 40 – 300 m
Radius: 2.5 – 10 m

Results – Size effect



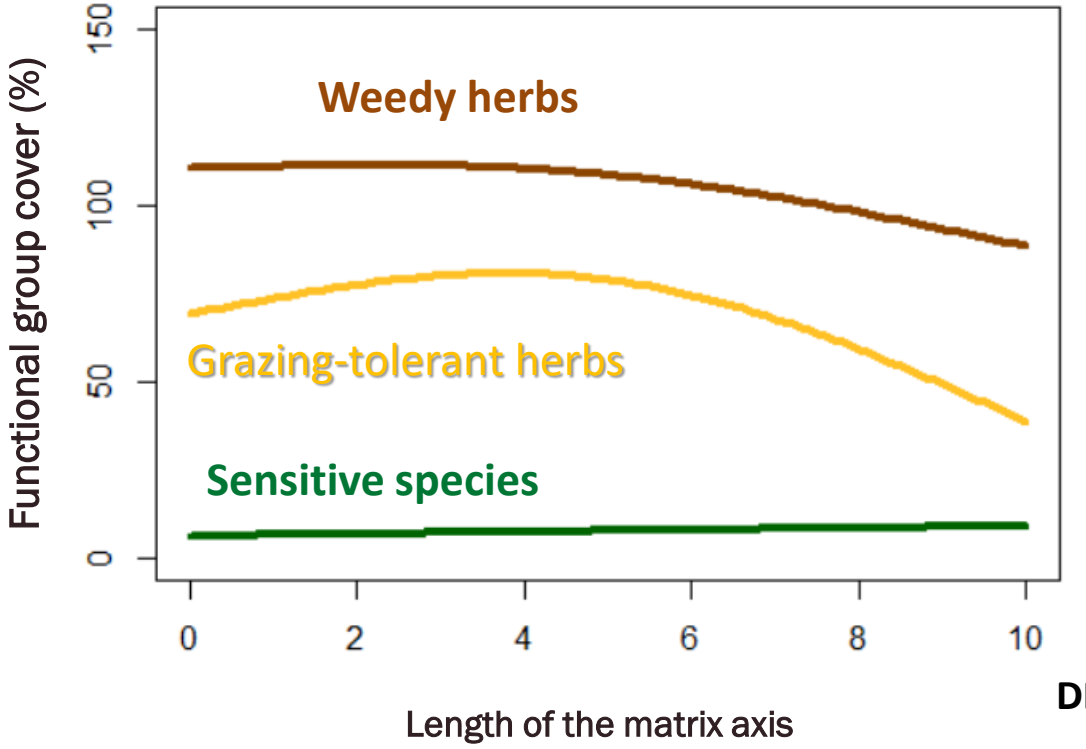
DE= 59.4%***

DE= 80.3%***

DE= 97.6%***

DE: Deviance explained

Results – Size effect



ns

ns

DE= 63%***

DE: Deviance explained

Take home message

Small rocky outcrops increase both compositional and functional diversities in *Montado*





Take home message

- Minor changes, e.g., outcrop protection, may have a significant impact in biodiversity of agroforestry landscapes

- Creating “artificial outcrops” and enlarging pre-existing ones may constitute a valuable **Nature-Based Solution** to increase heterogeneity in *Montado*:





FCT
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