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Instituto Politécnico de Castelo Branco
Escola Superior Agrária

THE IMPORTANCE OF SOIL PARAMETERS AS PREDICTORS OF PLANT SPECIES AND COMMUNITIES' DISTRIBUTION AND BIODIVERSITY ALONG ERGES RIVER

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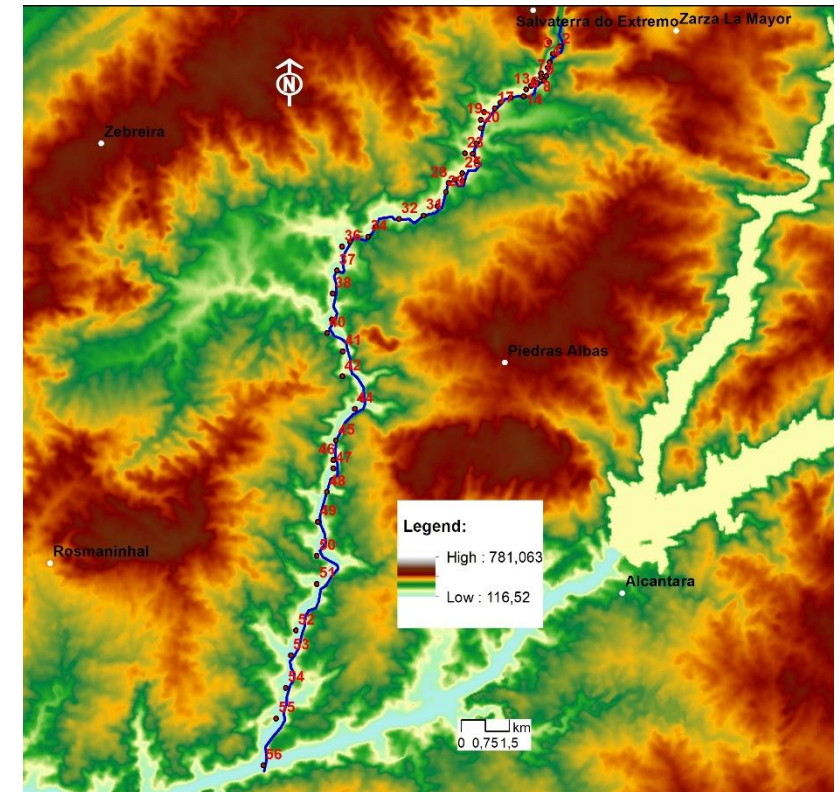
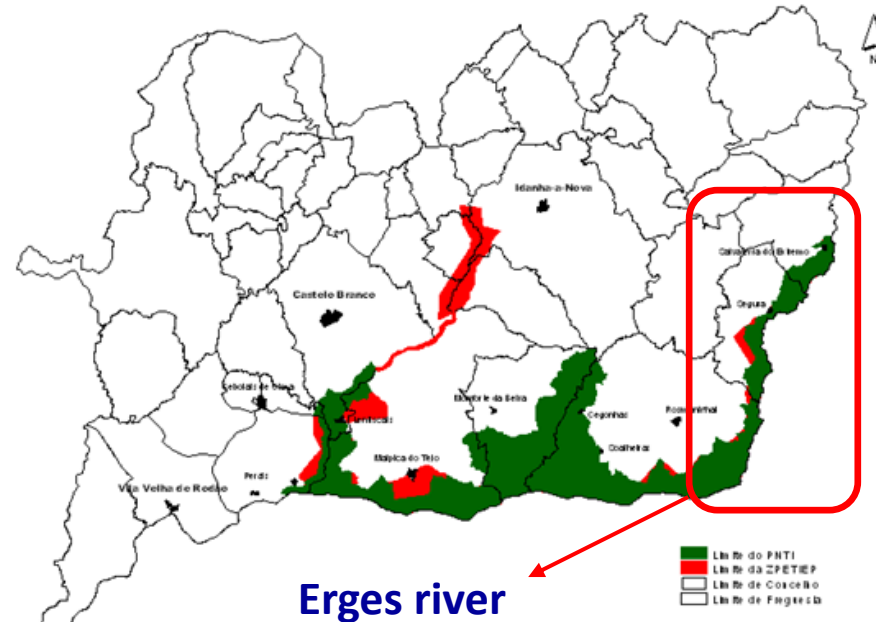
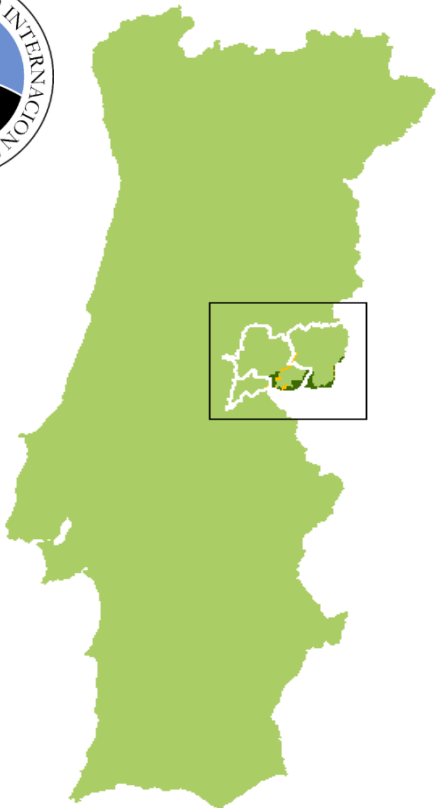
Objetives

- (1) To implement a field characterization of 56 plant communities evenly distributed along the Erges river banks / collect and analyze soil samples;
- (2) To identify the main soil parameters that influence the distribution of plant species and communities;
- (3) To give useful information to stakeholders in order to manage the riparian vegetation in the Natural Park of Tejo Internacional (PNTI).



Framework

Straddling the frontiers of two neighboring countries around the Tagus River, Portugal and Spain, the International Natural Park of Tejo Internacional (PNTI) extends over an area of 26,484 hectares in the district of Castelo Branco, Portugal.





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Framework

The vegetation of the Natural Park of Tejo Internacional is mainly typical of Mediterranean ecosystems, such as evergreen scrubland dominated by holm oaks and wild olive trees, with a mosaic of thermophilic formations, bush formations, and riparian vegetation. In this territory 726 taxa distributed by 98 botanical families have been identified to date, emphasizing the 51 endemic species detected.





Material and methods

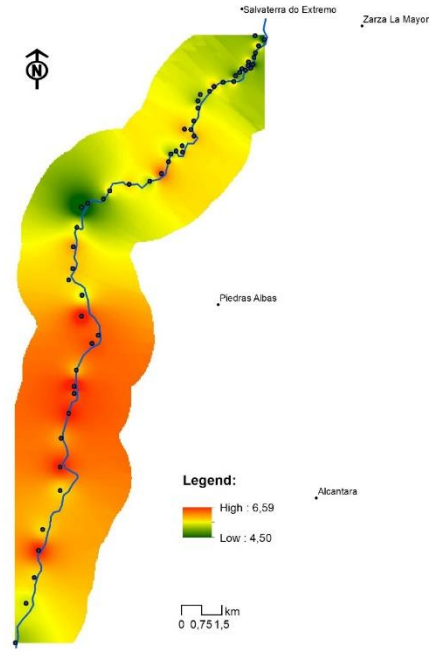
- **Field survey:** Vegetation data were collected at each site. 56 sites were established. All vascular plant species were surveyed, and species identification was carried out. The information recorded at each site included plant species, abundance and coverage of each species, and physical attributes of the site (slope, aspect, soil properties).
- **GIS modeling:** GIS Geostatistical tools were used to interpolate the soil parameters spatial variation and species distribution.
- **Cluster analysis:** was used in order to aggregate the main vegetation communities based in its species composition.
- **Ordination analysis:** The role of the selected soil parameters in the explanation the spatial variation on vegetation was assessed using Redundance Detrended Analysis (RDA). The sites were ecologically characterized, at a local scale, using pH, Organic Matter, P, K, Soil texture, Slope and Aspect.



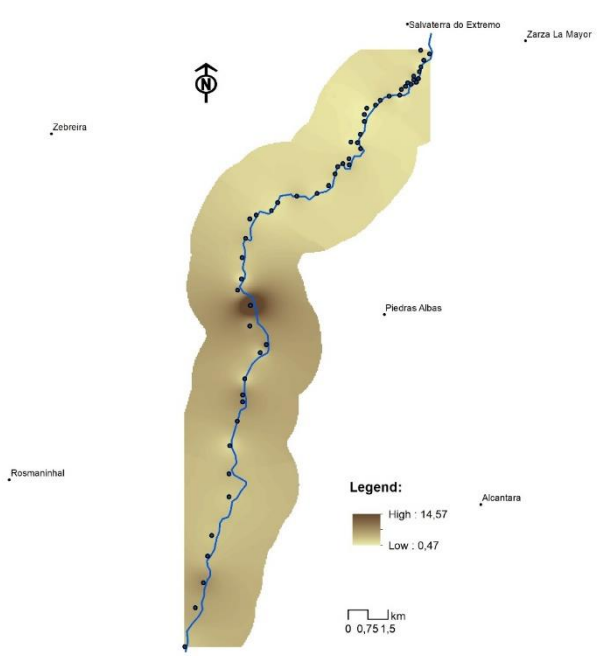
Results and discussion

Soil parameters spatial variation - Erges river

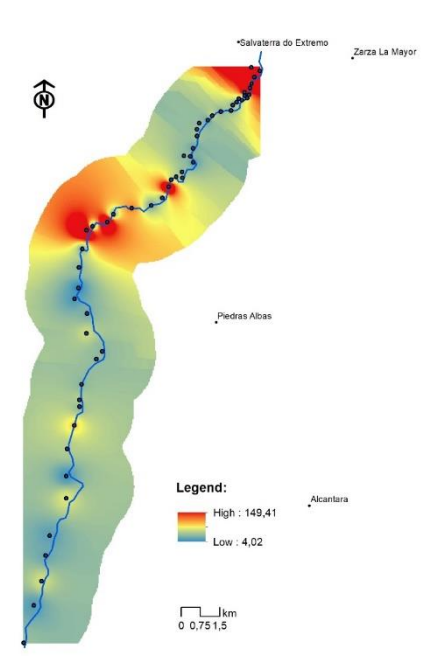
pH



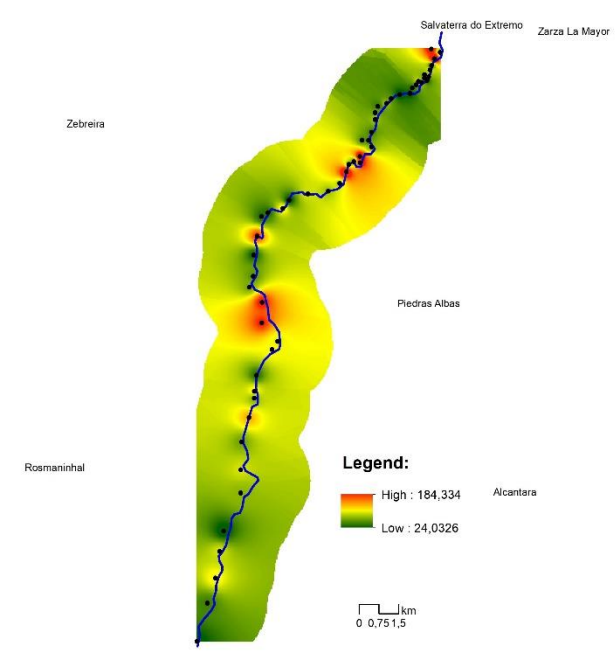
OM (%)



P (ppm)



K (ppm)

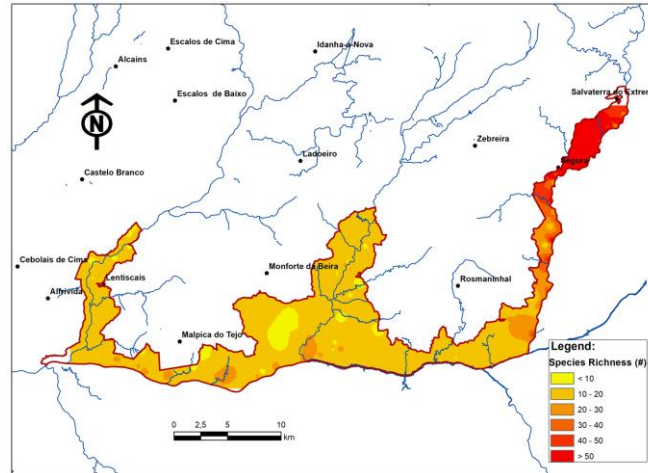




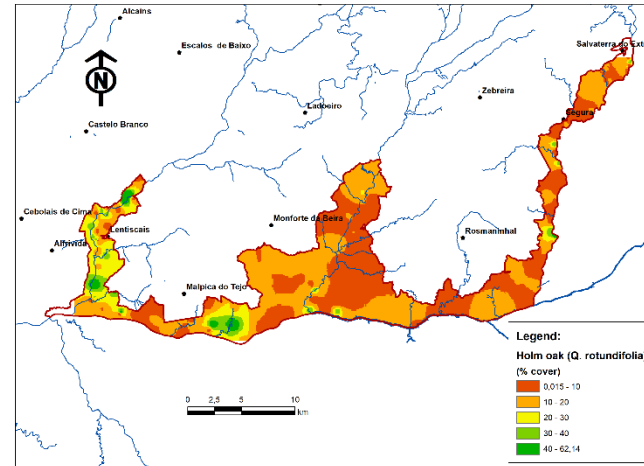
Results and discussion

Wooden species distribution and species richness - PNTI

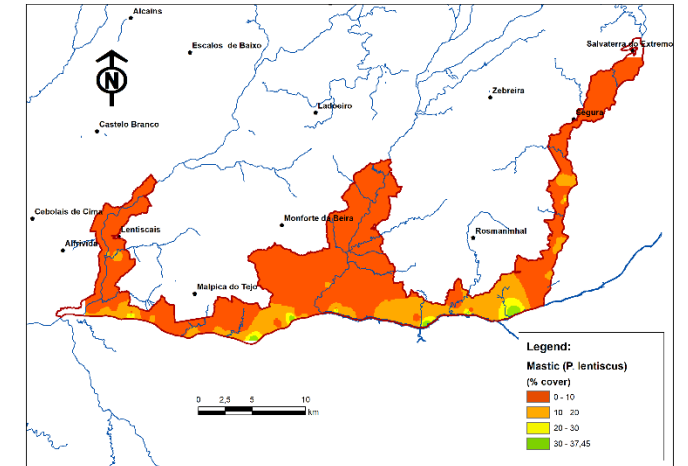
Species Richness



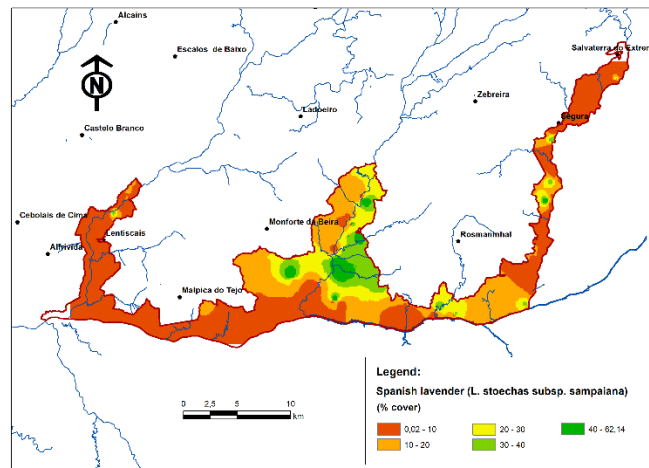
Holm Oak (*Quercus rotundifolia*)



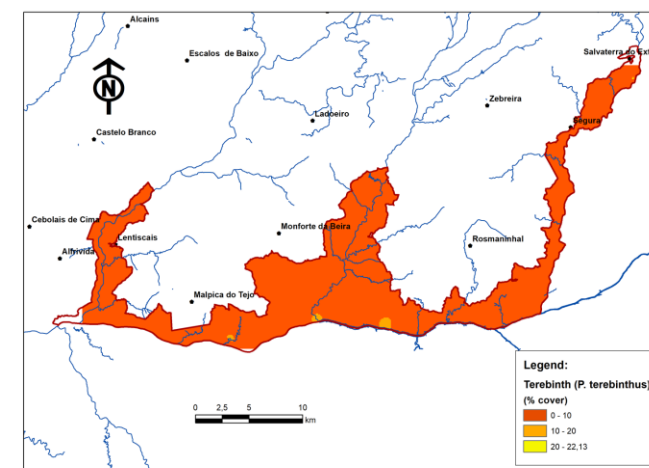
Mastic (*Pistacia lentiscus*)



Spanish lavender (*Lavandula stoechas* subsp. *sampaiana*)



Terebinth (*Pistacia terebinthus*)



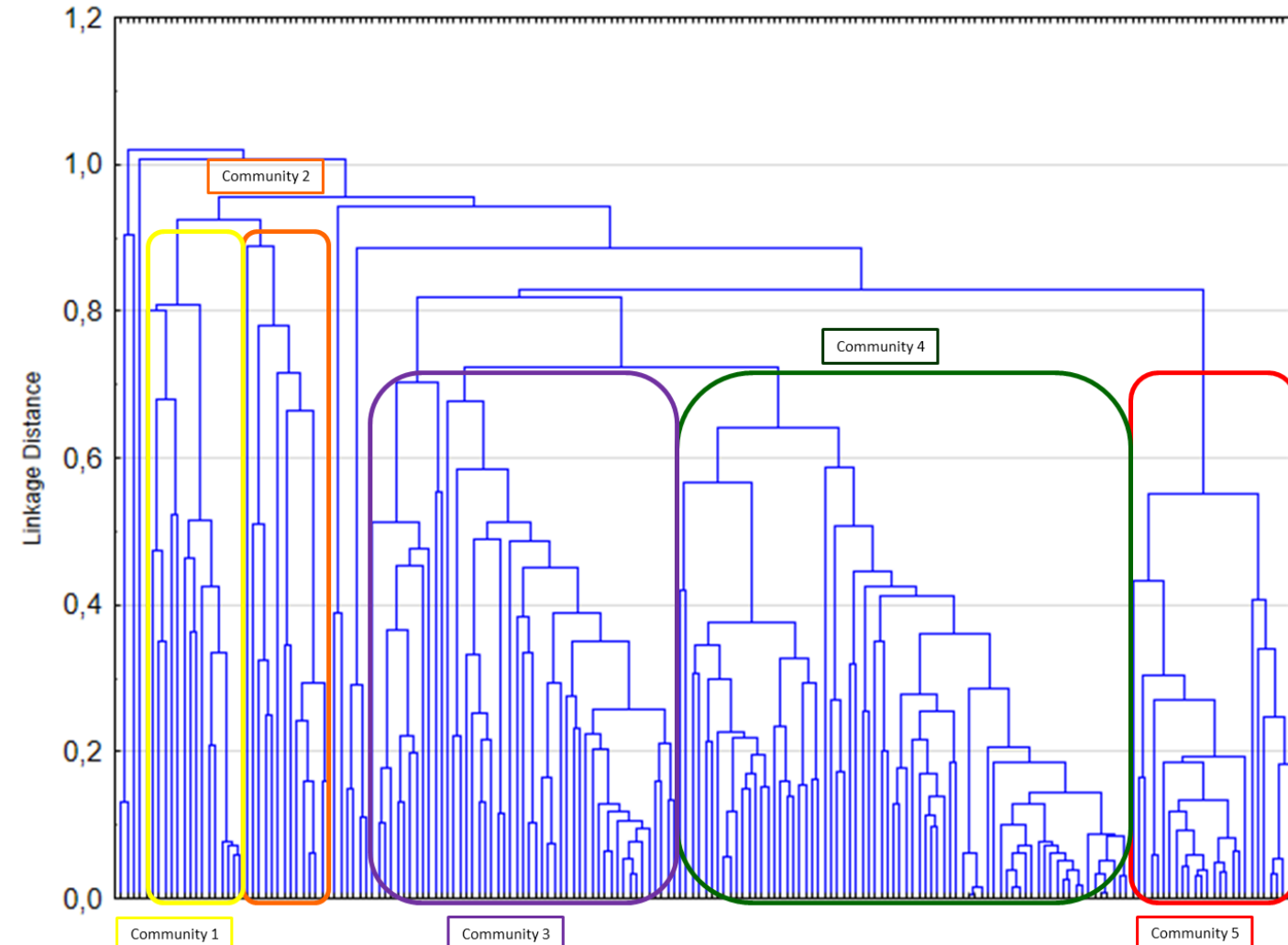


Results and discussion

Vegetation communities identified to PNTI (based in 188 floristic inventories)

Cluster analysis

Unweighted pair-group average - 1-Pearson r

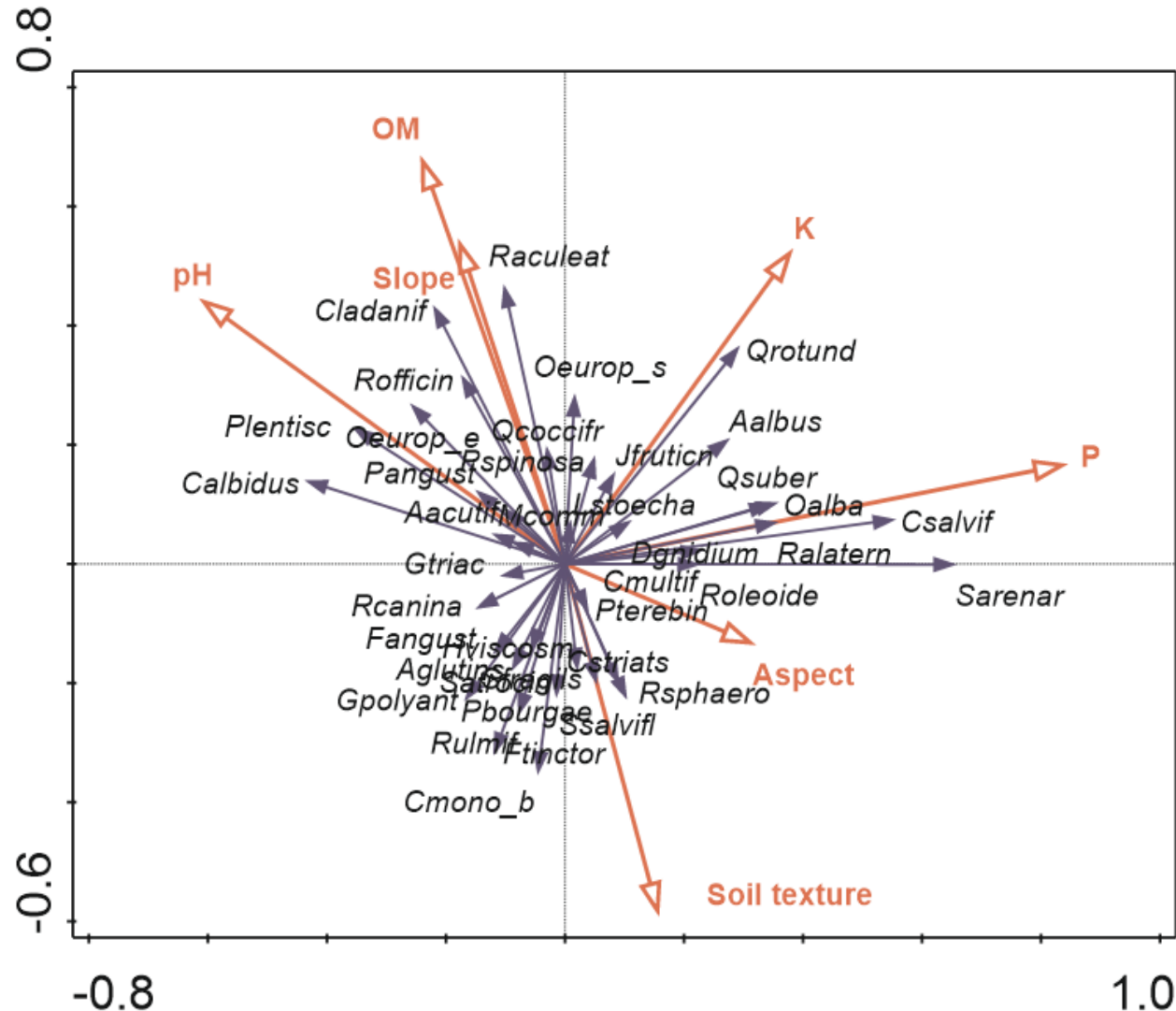


- **Community 1:** Different riparian vegetation types - (type 1) dominated by bushweed (*Fluggea tinctoria*), belonging to the community *Pyro bourgaeanae-Securinegetum tinctoriae*; (type 2) dominated by sage-leaved willow (*Salix slavifolia*), belonging to the community *Salicetum lambertiano-salvifoliae*.
- **Community 2:** Natural grassland communities with a high diversity of herbaceous species, belonging to different communities like *Trifolio cherleri-Plantaginetum bellardii*, *Bromo tectorum-Stipetum capensis* and *Phagnalo saxatilis-Rumicetum indurati*.
- **Community 3:** Low density holm oak forest (*Quercus rotundifolia*), belonging to the community *Pyro bourgaeanae-Quercetum rotundifoliae*.
- **Community 4:** Scrubs frequently associated to low density holm oak areas, dominated by gum rockrose (*Cistus ladanifer*), belonging to the community *Genisto hirsutae-Cistetum ladaniferi*.
- **Community 5:** Tall scrubs dominated by species like retama broom (*Lygos sphaerocarpa*) and Portuguese broom (*Cytisus striatus*), belonging to the community *Cytiso multiflori-Retametum sphaerocarphae*.



Results and discussion

Redundance Detrended Analysis (RDA) - Erges river



- The Monte Carlo permutation test showed that there was a significant correlation ($P=0.002$) between the five variables and the ordination axes.
- The most important soil factors affecting the presence of wooden plant species are Phosphorus (P) and Organic matter (OM).
- The total of the variance explained with the first two axes is **50,24%**.

Summary Table:

Statistic	Axis 1	Axis 2	Axis 3	Axis 4
Eigenvalues	0.0504	0.0415	0.0259	0.0219
Explained variation (cumulative)	5.04	9.19	11.78	13.97
Pseudo-canonical correlation	0.8204	0.8048	0.7215	0.7700
Explained fitted variation (cumulative)	27.53	50.24	64.41	76.36



Conclusions

- The average pH values per plant community do not have significant differences, being between 5.75 and 5.90.
- Organic matter in the soil is higher in shrub communities - 4 and 5 (4,98%).
- In rupicolous (rock) communities, Potassium values are the highest (129 ppm).
- Plant species associated with high OM contents: *Lonicera etrusca*, *Trifolium angustifolium*, *Rubia peregrina* and *Ruscus aculeatus*.
- Plant species associated with high P contents: *Malva hispanica*, *Adenocarpus complicatus* and *Veronica anagalis-aquatica*.
- Plant species associated with high K contents: *Dactylis glomerata*, *Quercus rotundifolia*, *Olea europaea sylvestris* and *Umbilicum rupestris*.
- Plant species related with pH: *Pistacia lentiscus*, *Rosmarinus officinalis*, *Cistus albidus* and *Myrtus communis*.



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