

Which environmental predictors are driving the response of lichen functional traits in a Temperate-Mediterranean fragmented landscape?

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INTRODUCTION

- Fragmentation, climate change and habitat loss are responsible for the decline of species worldwide (Fahring, 2003).
- Lichen functional traits** are important tools to detect environmental changes (Hurtado et al., 2020).
- Soft** (categorical) **traits** such as growth form, type of photobiont and reproduction strategy have been the most popular traits employed in lichen research.
- However, **hard** (quantitative) **traits** such as water holding capacity (WHC) and specific thallus mass (STM) constitute a promising approach (Ellis et al., 2021).
- OBJECTIVE:** To assess which environmental predictors drive the response of lichen functional traits in an ecotone area between Temperate and Mediterranean climates.

MATERIAL AND METHODS

❖ **STUDY AREA:** Twenty *Quercus* forests in a fragmented landscape below the Cantabrian Range (León, Spain) (Fig. 1).

❖ **RESPONSE VARIABLES**

- Soft traits:** We recorded the cover of each lichen species in several plots per fragment and 4 trees per plot. In total, 1504 sampling units (20 x 20 cm). Each species was classified according to their soft traits and we calculated the richness and cover of each trait category per fragment and plot (Trobajo et al., 2022a).
- Hard traits:** 7 macrolichen species with different growth forms and types of photobiont were selected (Fig. 2) and we gathered 5 thalli of each species per fragment. In total, 475 thalli. We measured their WHC and STM (Trobajo et al., 2022b).



Fig. 2. Species selected. A: *Parmelia sulcata*; B: *Parmelia tiliacea*; C: *Nephroma resupinatum*; D: *Lobarina scrobiculata*; E: *Lobarina pulmonaria*; F: *Evernia prunastri*; G: *Ramalina farinacea*.

❖ **ENVIRONMENTAL VARIABLES**

- Soft traits**
 - Fragment size
 - Min temperature of the coldest month
 - Summer precipitation
 - Tree diameter at breast height (DBH)
 - Slope
- Hard traits**
 - Isothermality
 - Canopy openness
 - Shrubland cover
 - DBH

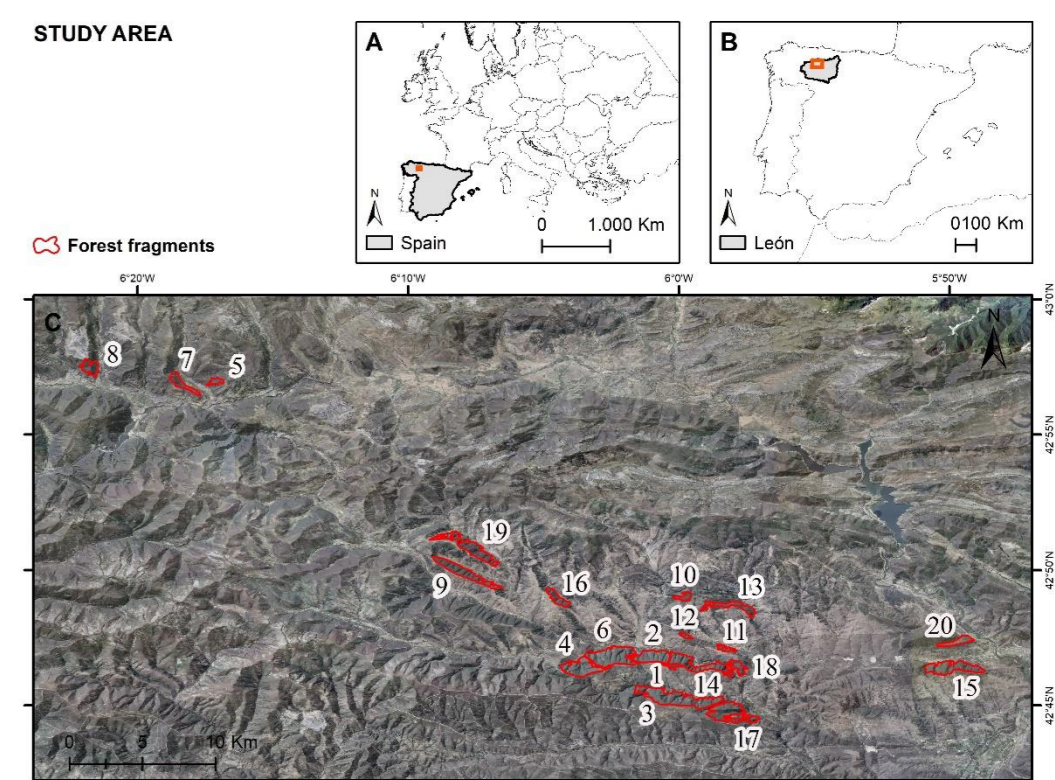
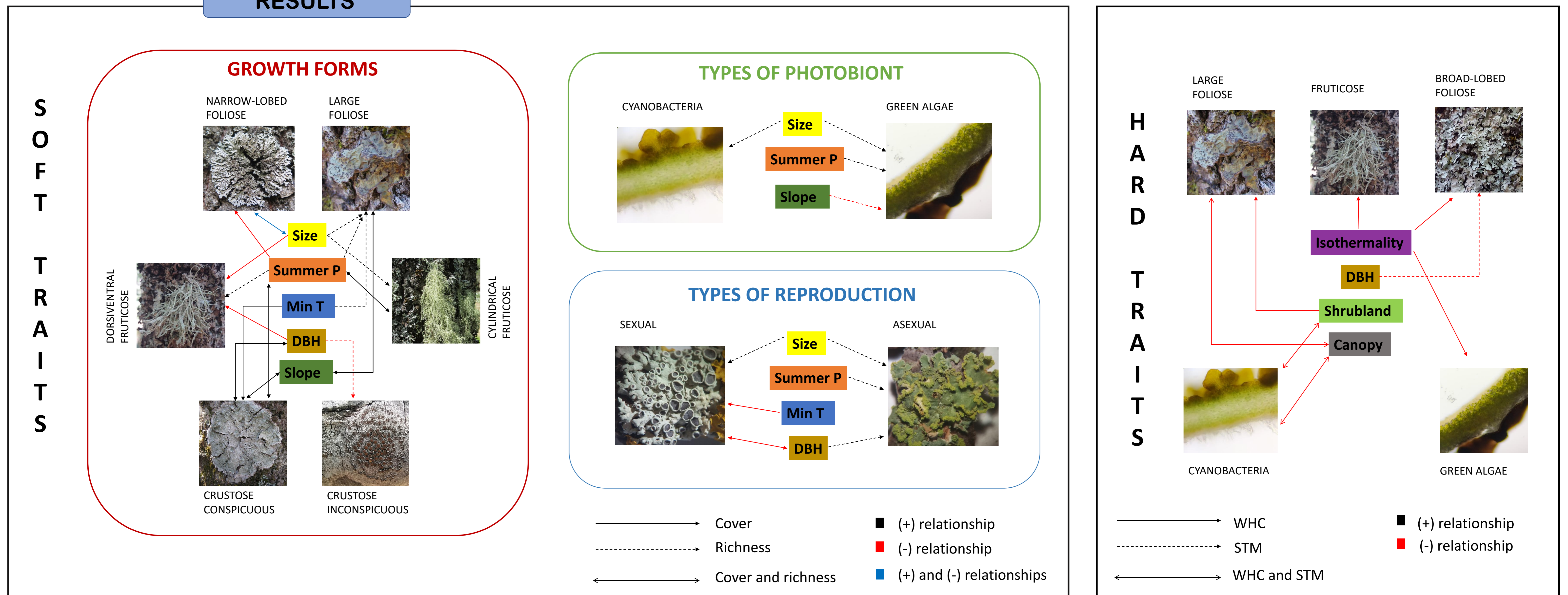


Fig. 1. Study area and fragments selected

❖ **DATA ANALYSES**

Soft traits GLM and GLMM
Hard traits Linear models

RESULTS



CONCLUSIONS

- At fragment level, forest size and summer rainfall positively influenced the richness of growth forms, types of photobiont and reproduction.
- At plot level, both cover and richness of lichen traits responded to DBH (especially reproductive traits) and slope (mainly growth forms).
- Climatic variables were responsible for the variation in the WHC (but not the STM) of several functional groups.
- On the contrary, microclimatic and forest structure predictors modulated the variability of both WHC and STM.

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