Lessons from the Habitat Suitability Models to evaluate the environmental variability of *Pinus nigra* Arnold. and *Pinus sylvestris* L. in the Iberian Peninsula.

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1. Introduction

- PREDICT POTENTIAL DISTRIBUTION → spatial and temporal evolution of the species under different climate scenarios → generation of habitat suitability models (HSM) → high degree of uncertainty and limitations.
- The importance of their validation has been stressed.
- In this work we discuss the present potential distribution of *P. sylvestris* and *P. nigra* in the Iberian Peninsula by using MaxEnt, and evaluate the influence of the different environmental variables.
- Our intention is to select a set of environmental variables that explains better their current distribution, to achieve the most accurate and reliable models. Then we project them to the past climatic conditions (21 to 0 kys BP), to evaluate the outputs with existing palaeo-ecological data.

2. Data

Input data:

**P. nigra** & **P. sylvestris** presence data:

Third Spanish Forest Inventory (1 km grid) → using (1) current presence and (2) natural distribution deduced from regions of origin maps

3. Environmental variables and models: dealing with the data

Climate data → Worldclim database and the Spanish Phytoclimatic Atlas (Gonzalo, 2010).

Models → Maxent → Method for modelling habitat suitability of species as a function of various ecologically-meaningful environmental predictors with presence-only data (Philips et al., 2006).

Selection of the variables:

- What environmental variables had the most influence as predictors in the model?
- Firstly, we run different models → evaluate how each environmental variable contributes to the model performance.
- We select the most meaningful vbles. for each model (Fig 1) → avoid correlated variables

4. Tests and results

- Natural occurrences produced best performances on the HSMs.

**WORLDCLIM DATABASE**: bio 1 to bio 19 are used

Hypothesis → the most limiting environmental variables for these species: bio5 (Warmest Month Max Temp), bio6 (Coldest Month Min Temp) & bio17 (Summer Precip).

- Models show that bio17 does not have a major influence.
- Bio4 (T Seasonality) → highest gain when used in isolation and appears to have the most meaningful information by itself and has information that is not present in other variables.
- Models show Bio15 (Precip Seasonality) as the more influential precipitation variable.

- **Pinus sylvestris**: the most influential variables are: bio3 (Isothermality), bio4 (Temp Seasonality), bio5 (Mean of Driest Quarter), bio6 (Mean T of Coldest Month) and bio15 (Precip Seasonality).
- **Pinus nigra**: the most influential variables are: bio3 (Isothermality), bio4 (Temp Seasonality), bio6 (Min T of Coldest Month), bio5 (Mean T of Driest Quarter) and bio15 (Precipitation Seasonality).

**SPANISH PHYTOCLIMATIC ATLAS**:

- **Pinus sylvestris**: the most influential variables are: tmin (lowest monthly average temperature), pe (summer minimum monthly precipitation) and pmax (Precipitation of the warmest month).
- **Pinus nigra**: the most influential variables are: tmin (lowest monthly average T), p (Annual precipitation) and pmax (Precipitation of the warmest month).

The resulting models obtained with the Spanish Phytoclimatic Atlas predict a smaller distribution and linked to mountain areas. Instead the distributions predicted by the WorldClim database reflect a more general extension.

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