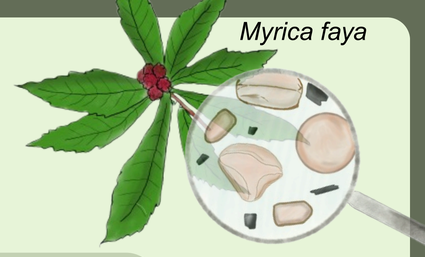
ECHOES OF MACARONESIAN VEGETATION: 3 ARCHIPELAGOS, 3 STORIES.
A palaeoecological analysis through vegetation, charcoal and spores

Bachelor's Degree Final Project - Data analysis - BSc in Environmental Biology (2024-25).
Author: Cèlia Lladonosa Soler - **Tutor**: Sergi Pla Rabés



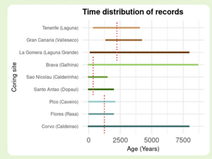
INTRODUCTION

Archaeological and palaeoecological studies provide abundant evidence for both the magnitude of human impact and the speed at which it can occur on islands worldwide (Burney, 1997; Rick et al., 2013; Braje et al., 2017). This study analyzes palaeoecological data from nine islands across three Macaronesian archipelagos — the Azores, Cabo Verde, and the Canary Islands — to explore vegetation changes over time in relation to the timing and nature of human colonization on each island.

MAIN GOALS
1. **Multiproxy dataset creation**
2. **Analysis of the arrival times**

More rapid transformations occurred during the colonial era due to increased human disturbance.

Figure 2. Time distribution of records



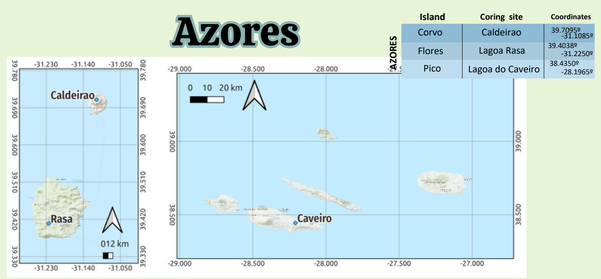
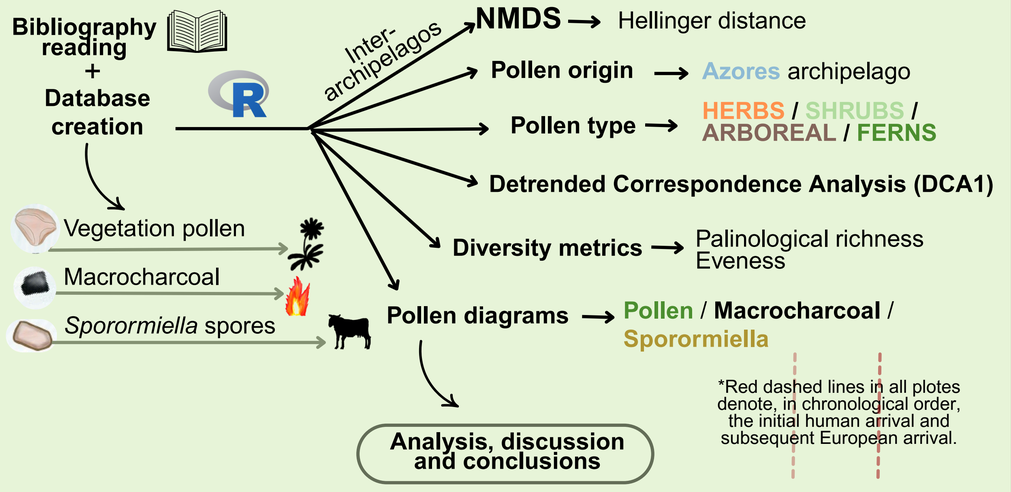


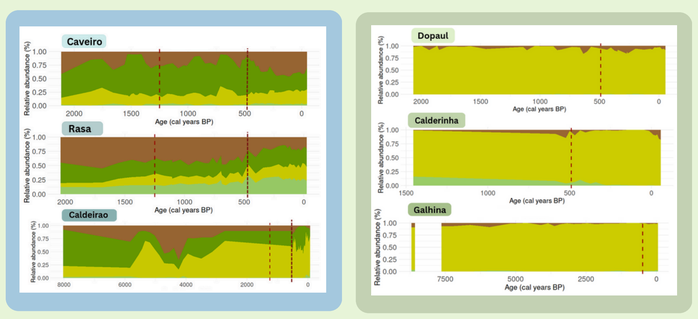
Figure 1. Maps of the Macaronesian archipelagos included in this study, showing the coring sites: Azores (blue), Canary Islands (brown), and Cabo Verde (green). The map was produced in QGIS using a modified OpenStreetMap base layer.

MATERIALS AND METHODS



RESULTS

Pollen Types Turnover (%)



→ Herbs predominance

Carpinus betulus

Figure 3. Variation of pollen types through time in Azores Islands (blue), Cabo Verde (green) and Canary Islands (brown). Red dashed lines denote, in chronological order, the Early colonization and subsequent European colonization.

Community turnover (DCA1)

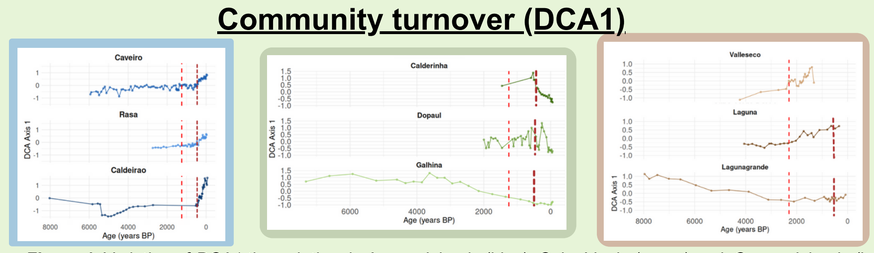


Figure 4. Variation of DCA1 through time in Azores Islands (blue), Cabo Verde (green) and Canary Islands (brown). Red dashed lines denote, in chronological order, the Early colonization and subsequent European colonization.

Diversity metrics

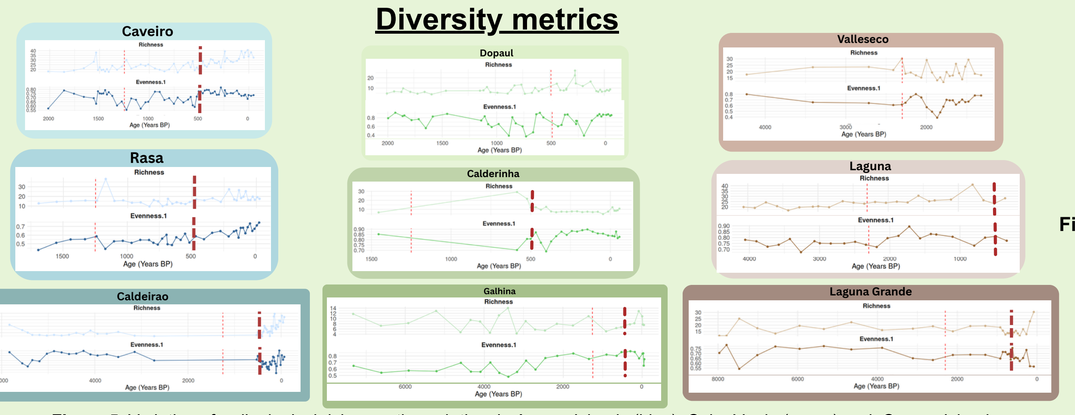


Figure 5. Variation of palinological richness through time in Azores Islands (blue), Cabo Verde (green) and Canary Islands (brown). Red dashed lines denote, in chronological order, the Early colonization and subsequent European colonization.

NMDS

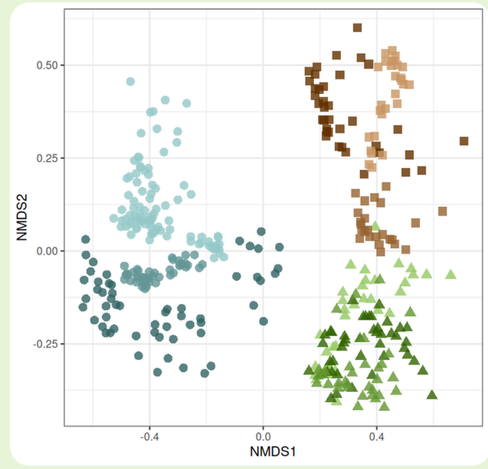


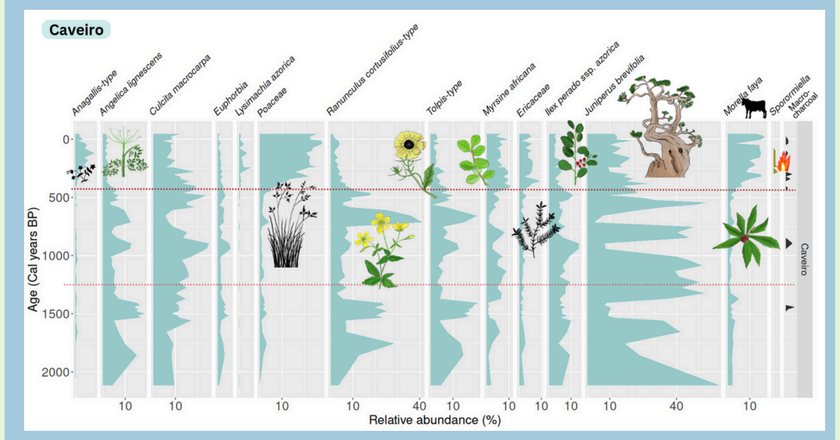
Figure 6. Results for non-metric Multidimensional Scaling (nMDS) analysis.

→ Biogeographical patterns in community turnover differentiation across archipelagos.

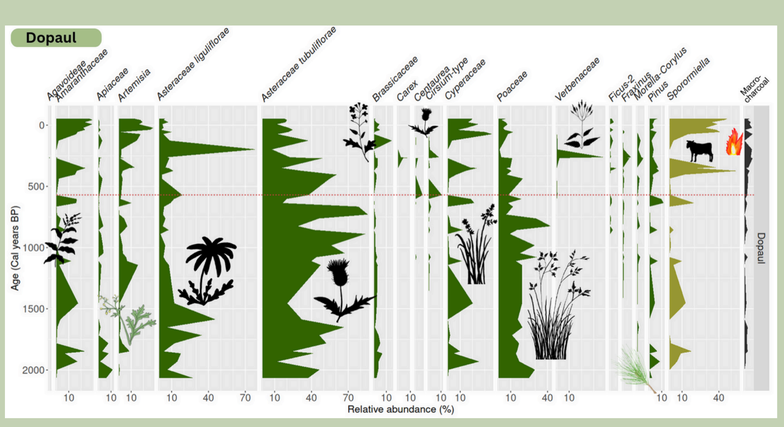
Euphorbia tuckeyana

Pollen diagrams

Azores



Cabo verde



Canary Islands

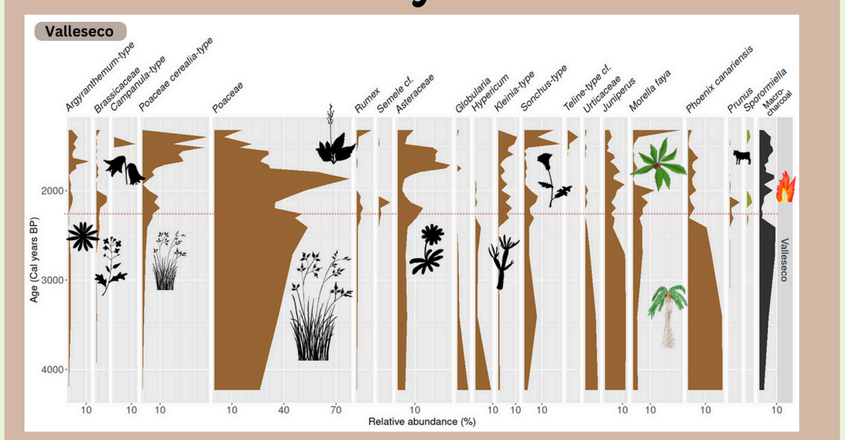


Figure 7. Pollen diagram for sediments from Azores Archipelago (blue), Cabo Verde Archipelago (Green) and Canary Islands (Brown). Percentage pollen abundances, microcharcoal, and Sporormiella concentrations are plotted against calibrated years before present (cal yr BP). Red dashed lines denote, in chronological order, the Early colonization and subsequent European colonization. Original taxon illustrations by the author are included for selected taxa.

DISCUSSION

Distinct vegetation histories across the Azores, Canary Islands, and Cabo Verde, shaped by climate, geography, and human activity.

- **Azores**: Highest vegetation turnover; strong impact from exotic species and land-use change post-European colonization.
- **Cabo Verde**: Most ecologically distinct; low diversity and gradual changes due to arid climate and sparse vegetation.
- **Canary Islands**: Intermediate turnover; La Gomera retains relict forest due to rugged terrain buffering human impact.

Drivers of change

- **Climate**: Long-term shifts (e.g., African Humid Period end) shaped baseline ecosystems before human arrival.
- **Volcanism** (e.g., Azores): Localized but significant; often led to endemic species recovery.
- **Human impact:** The most dramatic changes occurred after European colonization—deforestation, fire and grazing regimes, native species loss, introduction of allochthonous species, and subsequent landscape homogenization. Island ecosystem vulnerability amplifies this reality.

Juniperus brevifolia

CONCLUSIONS

- **European colonization** was the dominant force behind rapid ecological transformation in most islands.
- Results highlight the value of palaeoecological synthesis for understanding **long-term island resilience and vulnerability**.
- Interpretations are **constrained** by intrinsic limitations in pollen records, including time gaps and uneven temporal resolution.
- Provides a baseline for **conservation** and future ecological management in Macaronesia.

Tolpis sp

REFERENCES