Like a phoenix from the ashes – influence of repeated burning events on biodiversity on heathlands

Thunder Dee, Tine Vatland Østvold, Franziska Wachter, Maia Zini

University of Bergen, Department of Biological Sciences, BIO250

INTRODUCTION

What are heathlands?

- Heathlands are cultural landscapes characterized by recognizable purple heather *(Calluna vulgaris)* and other heather plants.

Where are they found?

- Heathlands stretch from Norway to Portugal and can also be found in the British isles

From when?

- Since the neolithic, through burning, grazing and other methods.

What are happening to our heathlands?

- Due to abandonment, pollution and cultivation, heathlands are going extinct. It's considered a critically endangered nature type

The importance of heathlands

- It is considered home to a wide variety of fauna. Ca. 900 red listed species are accounted for by the decline in traditional land use.

Our research question

- The effect of burning on species composition and biodiversity on heathlands. Our study site was Lygra. Proxies: Charcoal and pollen

METHODS

- Russian peat corer to sample across a bog in Lygra (60°41'39.7"N 5°06'08.5"E)
- Proxies: Pollen and charcoal
  - How? → Counting!
- Statistical Analysis done on R:
  - Wilcoxon-Mann-Whitney test to evaluate changes in the Shannon index and Species richness following the fire
  - PERMANOVA test to evaluate changes in the species composition following the fire



RESULTS

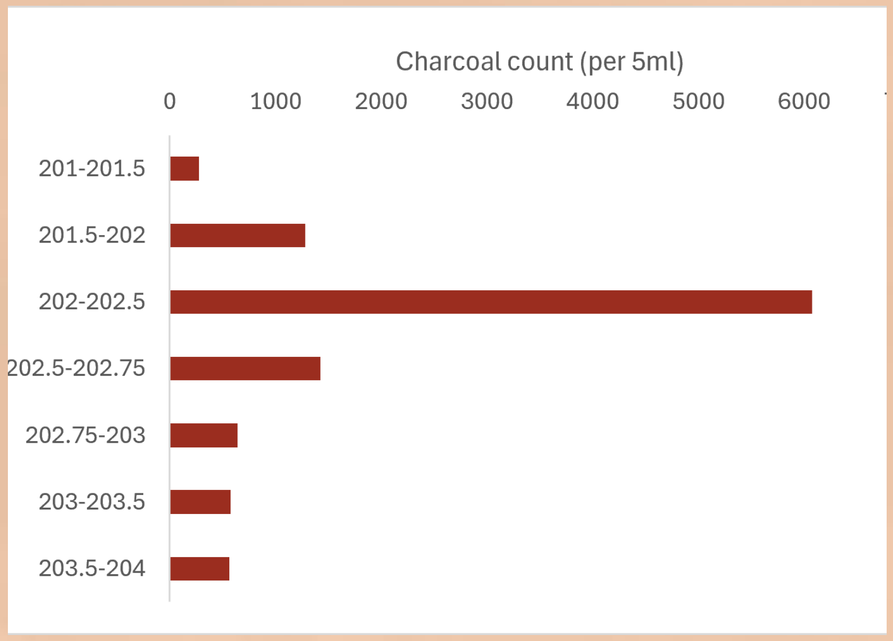


Figure 1. *Number of charcoal particles per 5 ml broken down by depth* Clear peak of charcoal particles at the depth of 202-202.5 cm. It was therefore identified as the depth at which the high point of the fire happened

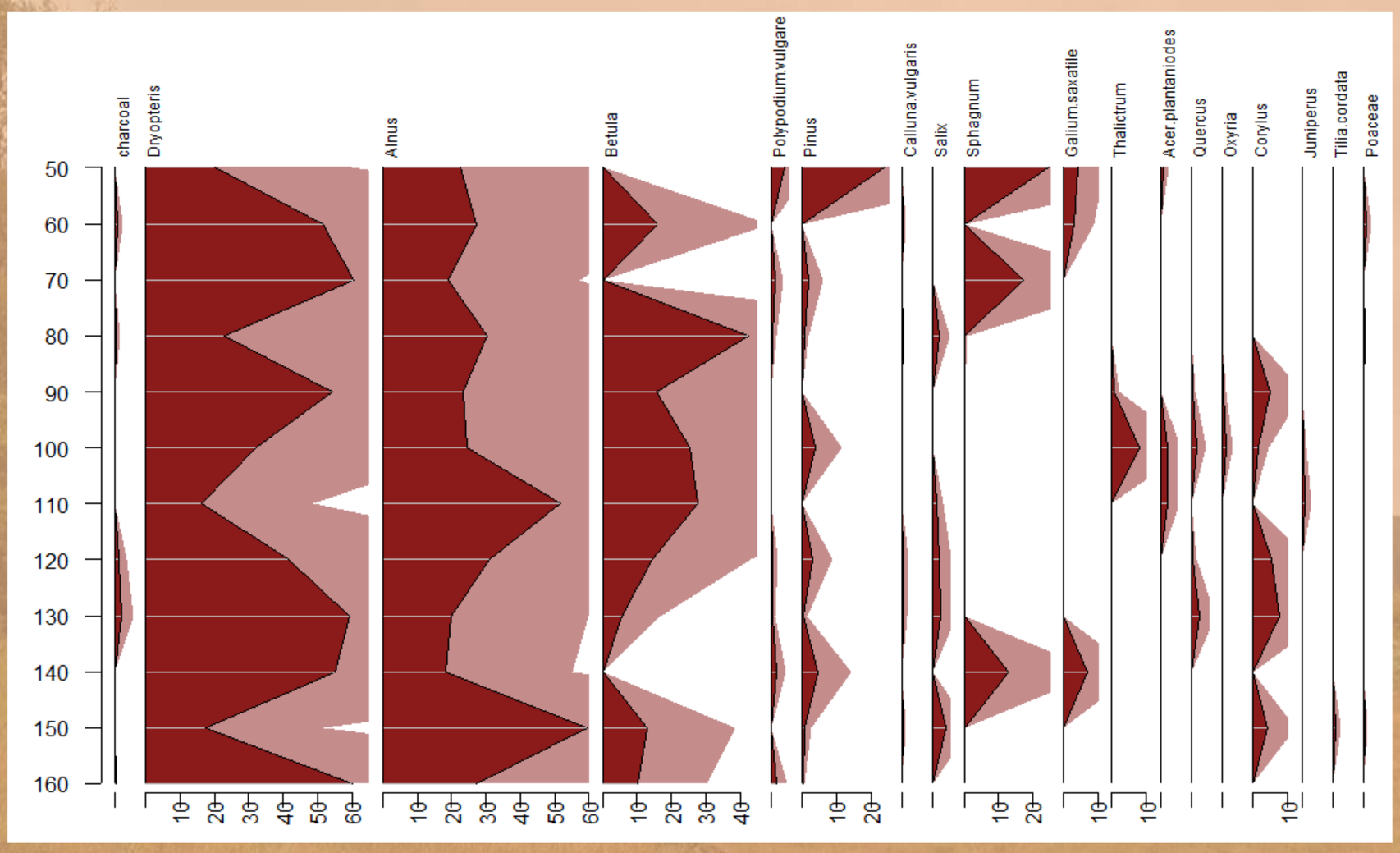


Figure 2. *Quantity of pollen per species and depth*

	p-value (threshold at 120 cm)	p-value (threshold at 130 cm)
Species richness (Wilcoxon-Mann-Whitney test)	0.94	0.55
Shannon index (Wilcoxon-Mann-Whitney test)	0.81	0.6
PERMONOVA test	0.72	0.91
Species richness (Wilcoxon-Mann-Whitney test) No tree taxa	0.64	0.66
Shannon index (Wilcoxon-Mann-Whitney test) No tree taxa	0.81	0.73
PERMONOVA test No tree taxa	0.76	0.96

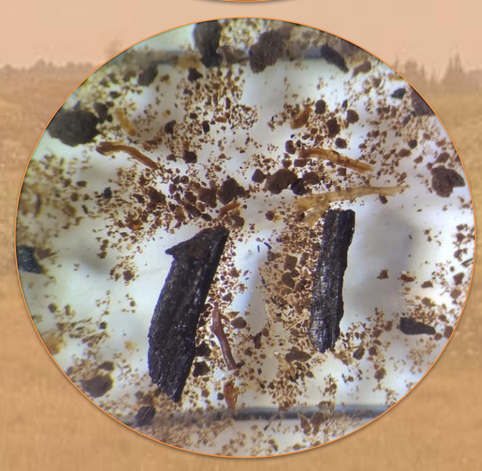
DISCUSSION

- All statical tests done test provided p-values well over 0.005 → There is no of significant shift in species composition and change in biodiversity following the fire and that the null hypothesis could not be rejected.
- Periodical heath burning is necessary to maintain these semi-natural ecosystems at an early to intermediary successional state. This is confirmed by the not changing biodiversity before vs. after a fire

Potential error sources

- Too small of a sample size to perform statistically significant tests. To get more reliable results, the sample size should be increased.
- Biases towards wind pollenated pollen .This reduces the informativeness about the biodiversity belonging the heathland
- Biases occurring during counting. Both the species identification and the counting itself are highly error drawn, since all people participating are untrained
- The pollen samples did not originate from the sediment core which was used to identify when the fire happened. There is a chance that depth of pollen samples counted did not correspond to the depth we identified the fire in.





CONCLUSIONS

There was no significant change in biodiversity before versus after a burning event. Burning the heather keeps up the heathlands at an early to intermediate stage of succession, making heathlands a perfect example of an anthropic landscape, managed by periodic fire

Our results are consistent with Kaland, 2014.

250.4

References

Kaland, P. E. (2014). Heathlands – Land-use, EcoLogy and Vegetatlon History as a Source for Archaeological Interpretations. I *Northern Worlds – landscapes, interactions and dynamics*. University Press of Southern Denmark. Northern Worlds Conference.

Påvirkningsfaktorer for truede arter. (2021). Artsdatabanken. https://artsdatabanken.no/arter/rodlista-arter/om-rodlista/resultater/pavirkningsfaktorer-truede-arter

The Heathland Centre. (n.d.). https://muho.no/lyngheisenteret/en/about-us

The vital role of heathland habitats in the battle against climate change. (2023, june 30). The Heart of England Forest. https://heartofenglandforest.org/news/vital-role-heathland-habitats-battle-against-climate-change