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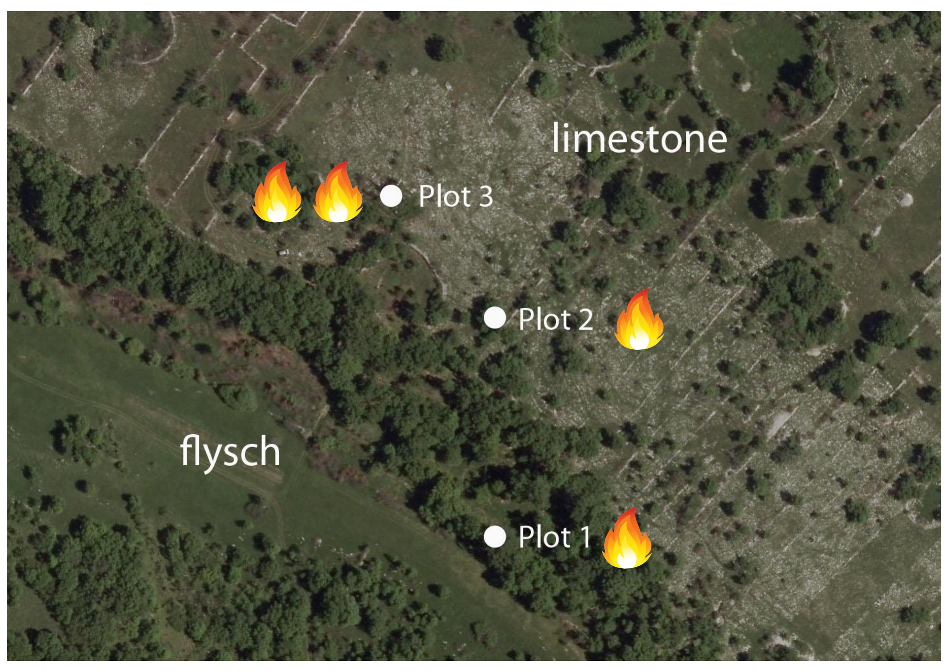
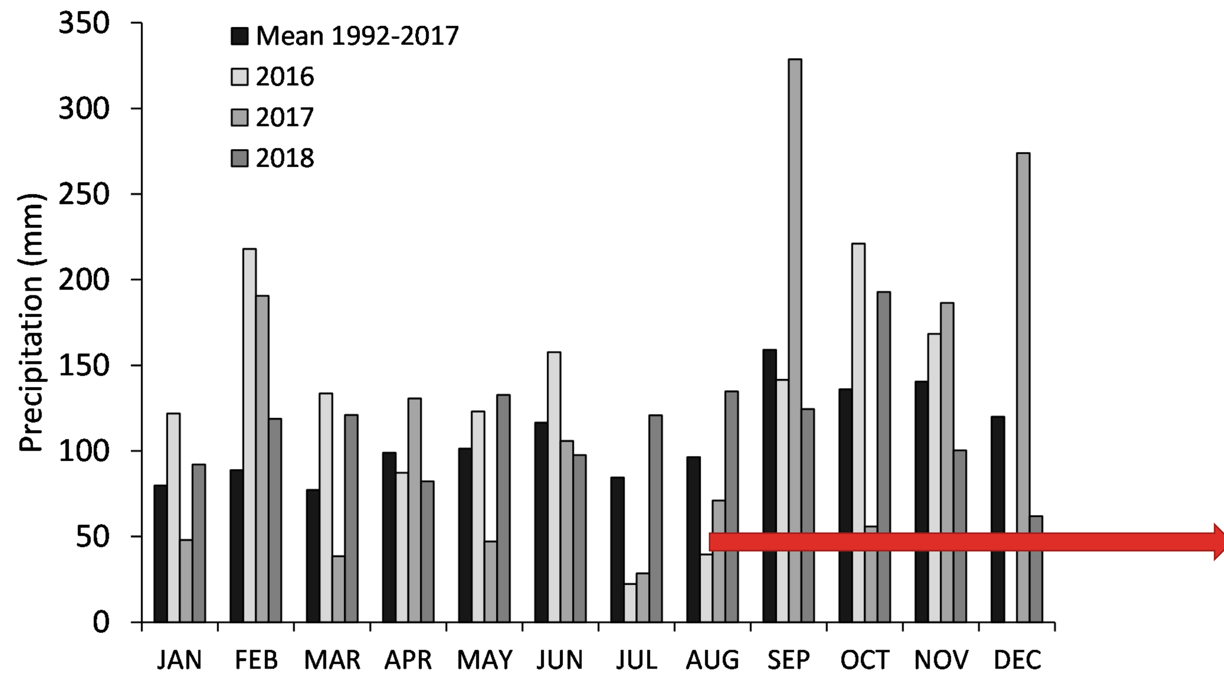
Ectomycorrhizal fungi of *Quercus pubescens* suffering from drought and wildfire

Tanja Mrak*, Nataša Šibanc, Ines Štraus, Philip Brailey-Jones, Mitja Ferlan, Jožica Gričar, Hojka Kraigher

Slovenian Forestry Institute, Večna pot 2, 1000 Ljubljana, Slovenia
*tanja.mrak@gozdis.si

Due to global climate change, the probability of heatwaves, droughts and fires is expected to rise, affecting forest productivity and the distribution of tree species. Due to their role in the supply of water and nutrients ectomycorrhizal (ECM) fungi are crucial for tree survival during stress conditions, but knowledge from the field is still limited. Our study was aimed to investigate the vitality and community composition of *Quercus pubescens* Willd. ectomycorrhizal (ECM) fungi over two consecutive years in a stress-prone Submediterranean area.





Limestone and flysch: soils with different water holding capacity
Sampling of ECM roots: June 2016-May 2018, in topsoil, morphotyping, quantification of morphotypes by WinRhizo, Sanger sequencing, classification into exploration types

Stress events: summer drought 2016 and 2017 (-66% and -45% of 25-year average precipitation for Jul + Aug, respectively), wildfire August 2016

Vitality of ECM root tips

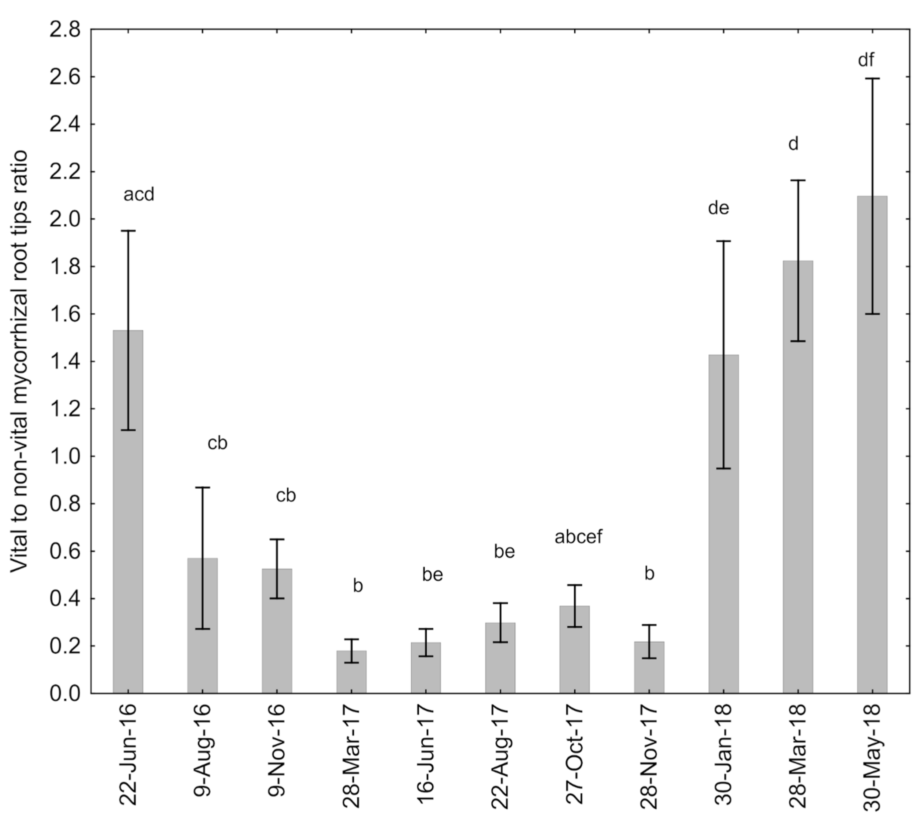


Fig. 1: Ratio among vital and non-vital ECM root tips. Vitality was significantly affected only by the sampling date (H=68.5, P<0.0001), but not by the plot (H=5.05, P=0.0802).

ECM community composition

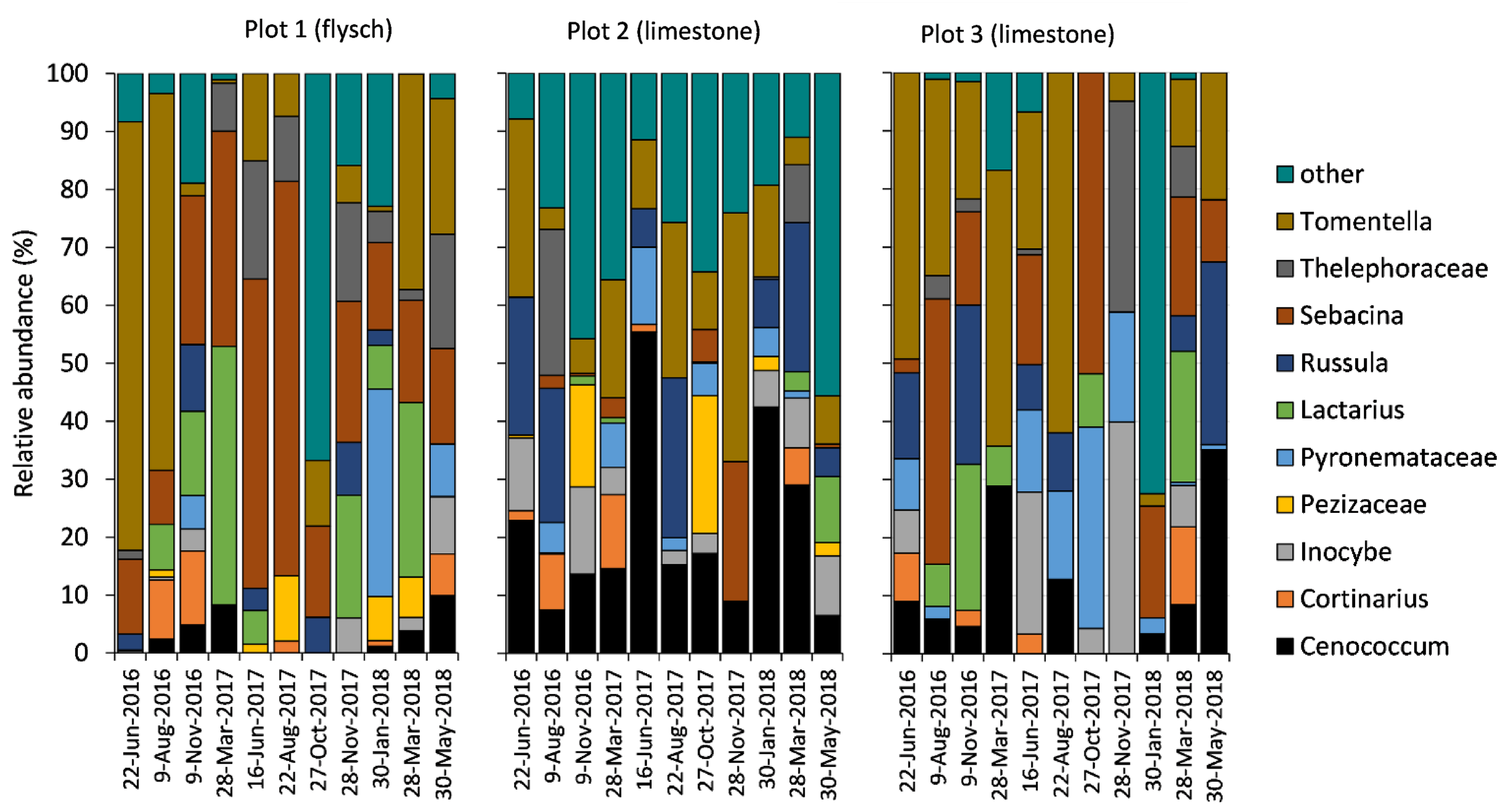


Fig. 2: Relative abundances of ECM lineages for the tree plots.

The most abundant ECM lineages

Fig. 3: The most abundant lineages of ECM fungi in the investigated area. Relative abundance of Sebacinales decreased after fire, while relative abundance of *Cenococcum* sp. increased.

Indicator species

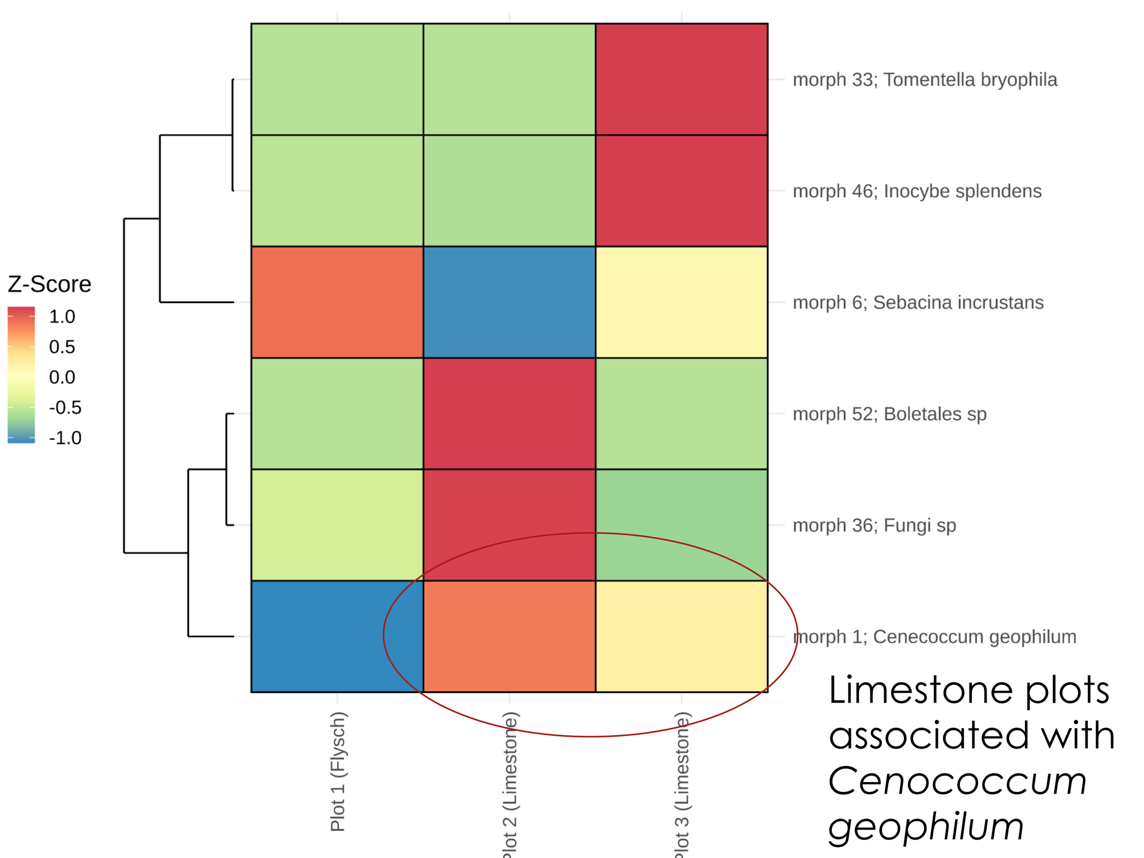


Fig. 4: Heatmap of ECM fungi significantly associated with one or more of the plots as revealed by indicator species analysis.

ECM exploration types

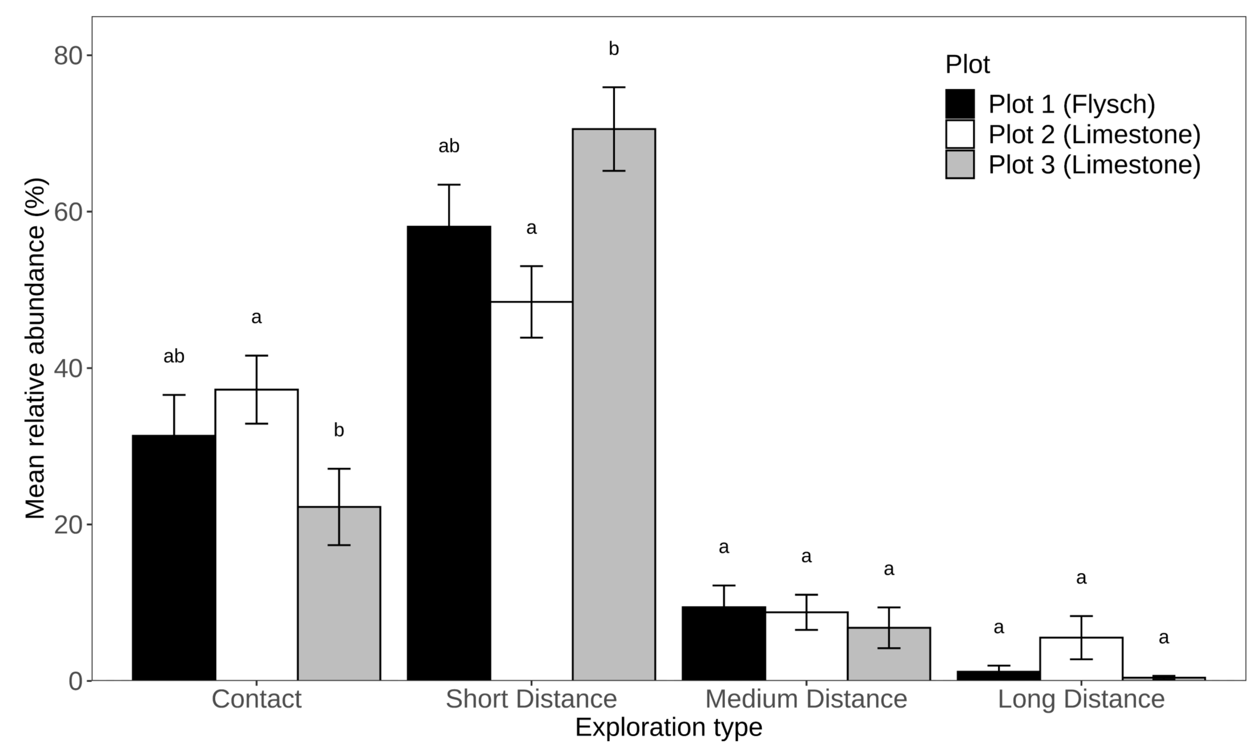


Fig. 5: Exploration types of ECM fungi. Allover, the most abundant was short distance exploration type. Significantly lower contact and significantly higher short distance exploration type for plot 3 could be associated with higher intensity of fire at plot 3 (preference of short distance exploration type for the uptake of nitrate and ammonium released by the fire).

• **The vitality of ECM fungi** was strongly reduced due to **stress events.** • **ECM community composition** was mainly affected by the plot. • Different **water-holding capacity of soils** on the plots did not affect overall ECM community composition but affected the abundance of a stress resistant ECM fungus *Cenococcum* sp. • **Wildfire** affected **relative abundance** of Sebacinales (decrease) and *Cenococcum* sp. (increase). • Significantly higher relative abundance of short distance **exploration type** occurred at the plot most affected by the **wildfire.** • The presented results indicate a **complex interplay of abiotic stress factors, soil type, tree vitality and ECM fungi** that needs further investigation.

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