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FORESTCHECK: The response of macrofungi to silviculture in jarrah forest

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Background

Soil, litter and wood inhabiting fungi play major roles in decomposition and nutrient cycling. Mycorrhizal fungi enhance nutrient uptake in plants and may be associated with increased resistance to some pathogens, soil borne fungal hyphae also bind particles and improve soil structure, and in the nutrient poor soils of jarrah forest these processes are particularly important. Jarrah forest harbours a rich diversity of hypogeous (underground-fruiting) macrofungi that are an important food source for small mammals, especially immediately after fires when they may be their only source of food. In jarrah forest, mycophagous mammals also turn over a significant amount of soil when digging for hypogeous fruit bodies, which increases water penetration in hydrophobic soils. Macrofungi are therefore an important component of jarrah forest biodiversity and their response to silvicultural treatments in the jarrah forest was examined as part of the FORESTCHECK project (Robinson and Williams 2011).

The FORESTCHECK project contributes to adaptive management of Western Australian forests by providing timely and relevant information about the implementation, effectiveness and biodiversity consequences of silvicultural practices in jarrah forest. Monitoring takes place at five locations within four jarrah forest ecosystems at 48 sampling grids. Grids represented examples of unharvested forest (or forest that had not been harvested for at least 40 years) and forest subject to either gap release or shelterwood/selective cut silvicultural treatments during the period 1988-2002.

Grids were surveyed over a five-year period with grids at one of the five locations sampled in autumn in each year. At each grid the fruit bodies of all epigeous (above ground) macrofungal species were recorded, along with details of the substrates on which they were fruiting.

Above Left: *Ramaria ochraceosalmonicolor*, a common coral fungus found fruiting in and under litter.

Above Right: *Melanotus hepatochrous*, a wood decay species fruiting on dead marri wood.

Below Left: An unnamed ascomycete fruiting on marri fruits.

Below Right: *Cortinarius* (*Dermocybe*) *kula*, a mycorrhizal species associated with eucalypts

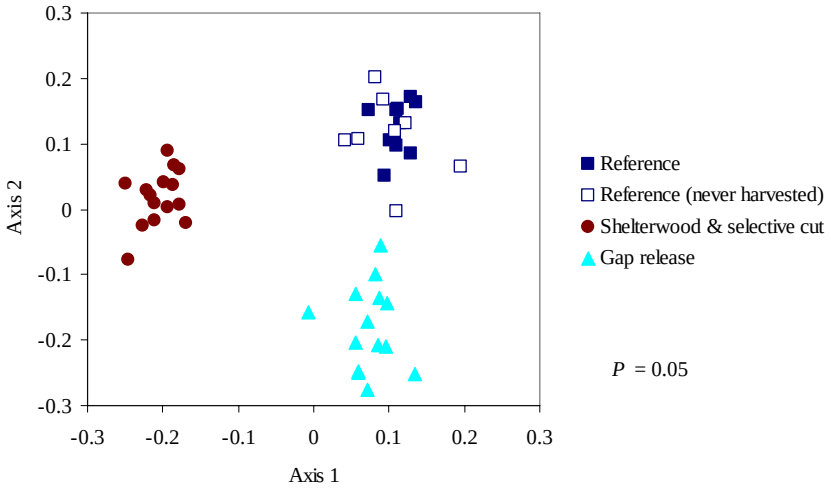
Findings

Species richness and abundance

- 450 species of macrofungi were recorded, of which about 60% were unnamed species.
- Sixty-nine species were restricted to reference forest while 35 were restricted to shelterwood/selective cut and 62 to gap release treatment.
- Neither silvicultural treatment, nor time since treatment had an effect on mean species richness or abundance.
- The majority of species recorded fruited on soil, but significantly more fungi fruited on soil and wood in the gap release treatment.

Community composition

- Species compositions were significantly different in each treatment and within each of the forest ecosystems.



Left: CAP ordination based on macrofungal species assemblages recorded in three silvicultural treatments ('never harvested' is a subset of the reference forest). The ordination compares species assemblages on each grid and identifies differences. Grids with similar assemblages group together. The ordination shows that species assemblages were similar on grids with the same treatment (i.e. they grouped together), but were significantly different between treatments.

- Time since treatment had an effect on species composition.

Management Implications

Each forest ecosystem supported its own unique fungal community. This supports the concept of ecosystems in jarrah forest based on forest structure and understory vegetation resulting from variation in climate, soils and landforms.

Current conservation policy and silviculture practice in jarrah forest produces a landscape mosaic containing early succession stands through to mature forest with ranges of time since fire across the landscape, which is important for the maintenance of fungal biodiversity.

Currently, much of the fungal population in jarrah forest remains unknown thereby negating the use of 'indicator' species in future monitoring that will need to continue to be based on the whole of the fungal community approach.

Reference: Robinson, R.M. and Williams, M.R. (2011) FORESTCHECK: The response of epigeous macrofungi to silviculture in jarrah (*Eucalyptus marginata*) forest. *Australian Forestry* 74, 288-302.

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