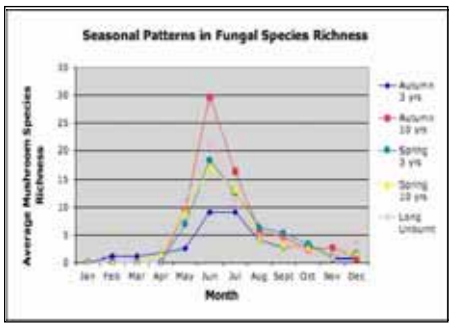
Fire, Fungal Richness and Functional Groups

Madeleine Osborn
PhD Candidate, University of Melbourne, Creswick
Supervisor Dr. Tina Bell

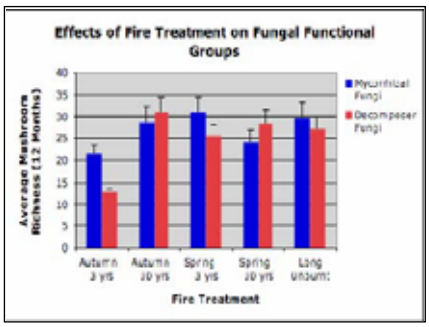
Chemical and molecular techniques are used to complement traditional survey techniques to determine fungal biodiversity.



Fungal communities are species rich and can be grouped into several main functional types.

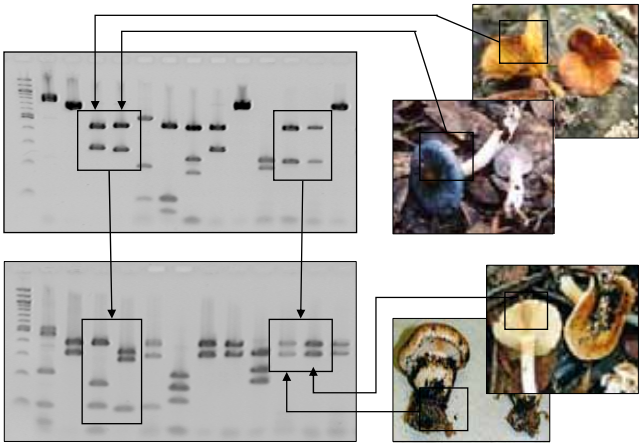
Mycorrhizal fungi form symbiotic associations with plant roots, providing water and nutrients in exchange for carbohydrates.

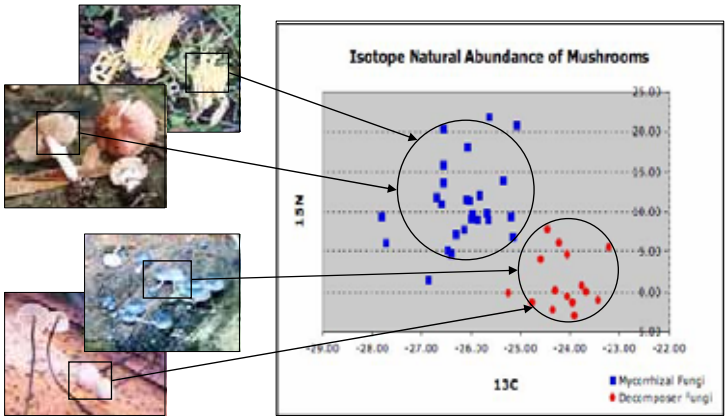
Decomposer fungi break down dead organic matter releasing stored nutrients back into forest systems.



Over 12 months fungi in forest plots were monitored for community composition. Fire treatments of frequent (3 yrs) and infrequent (10 yrs) burning were compared to a long unburnt site (above). Species richness peaked during winter in all sites and was greatest in the site infrequently burnt during autumn. Species richness in the unburnt site was similar to both spring treatments.

As shown above, richness of mycorrhizal fungi was greater than decomposer fungi in frequently burnt and unburnt sites, and was less in infrequently burnt sites. Reduction in organic matter at frequently burnt sites is the most likely reason for such trends, however this does not explain the greater number of mycorrhizal species found in the long unburnt site.





Species were distinguished using visual characteristics, however some appeared similar and were difficult to categorise. Molecular tools were used to assess similar species by comparing banding patterns of DNA sequences. In the picture above the banding on the left indicates two different species, and on the right shows the same species despite their different appearance.

Stable isotope analysis allows tracking of carbon and nitrogen 'movement' through a system. Since mycorrhizal and decomposer fungi obtain C and N from different sources, isotope analysis was used to discriminate between mushrooms of the two functional groups. In the graph above mycorrhizal fungi cluster together with more positive ^{15}N and more negative ^{13}C signals than decomposer fungi.