

## Fungal-bacterial interactions in wetwood of British broadleaf trees

### Supervisory team:

**Lead supervisors:** Dr Sarah Christofides (Cardiff University), Dr Carrie Brady (University of the West of England) Prof Lynne Boddy (Cardiff University), Dr Robin Thorn (University of the West of England)

**Collaborators:** Prof Dawn Arnold (Harper Adams University)

**Host institution:** Cardiff University, University of the West of England

**Submit applications for this project to Cardiff University**

### Project description:

Bacterial wetwood is a common feature of living trees, characterised by patches of saturated wood in the centre of trunks colonised by highly abundant bacteria. In many tree species it is asymptomatic and apparently harmless, but almost nothing is known about how, when and why it forms. The interior of trees is usually a fungal-dominated habitat, and wetwood provides an intriguing exception where it seems that bacteria are dominant. Recent work has indicated distinct communities of both fungi and bacteria in wetwood, but their functions and interrelationships remain unknown. Wetwood is of ecological importance, as it remains an unknown factor in tree health and carbon sequestration, and of economic importance as it negatively affects the value of the wood. Understanding wetwood will also assist arborists and other tree professionals in making management decisions. This PhD project will investigate the occurrence, distribution and ecology of wetwood using a combination of fieldwork, culturing, molecular ecology, bioinformatics and statistics. It will explore the microbial communities associated with wetwood and how they form and function. The project will involve hands-on experience with community profiling using next-generation sequencing and metabolite profiling through mass spectrometry. You will therefore be equipped with a valuable skillset, much sought after by employers.

We anticipate that the project will develop in five stages:

1. A survey of felled and recently fallen trees to identify different tree taxa with symptoms of wet wood.
2. Sampling wetwood from those trees for culturing and community analysis of both fungi and bacteria.
3. Physiological and metabolic characterisation of key bacteria isolates.
4. Mapping and model routes of water ingress from possible entry points to wetwood patches within the trunk.
5. Microcosm experiments to examine key interspecific interactions in detail.

### Key reading

Johnston, S.R., Boddy, L. and Weightman, A.J. 2016. Bacteria in decomposing wood and their interactions with wood-decay fungi. *FEMS Microbiology Ecology* 92(11). [doi: 10.1093/femsec/iw179](https://doi.org/10.1093/femsec/iw179).

Yu, X. et al. 2019. Amplicon sequencing reveals different microbial communities in living poplar wetwood and sapwood. *Trees* 33(3), pp. 851–865.

**Our aim as the SWBio DTP is to support students from a range of backgrounds and circumstances. Where needed, we will work with you to take into consideration reasonable project adaptations (for example to support caring responsibilities, disabilities, other significant personal circumstances) as well as flexible working and part-time study requests, to enable greater access to a PhD. All our supervisors support us with this aim, so please feel comfortable in discussing further with the listed PhD project supervisor to see what is feasible.**