

Fun with aquatic hyphomycetes

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Ed. This is an edited extract from a more extensive article Dr Newbery has written on the subject of micro-fungi, including also plant pathogens and lichenicolous fungi, which is expected to be published in the winter 2025 edition of the Quekett Journal of Microscopy.

As readers of *Field Mycology* may know, The Quekett Microscopical Club (<https://www.quekett.org/>) has a certain kinship with the British Mycological Society, sharing a founding member in the inimitable form of M.C. Cooke (1825–1914). It therefore brings the editors of our two publications great pleasure to collaborate on sharing the fun that can be had with aquatic hyphomycetes.

If you get a thrill out of admiring amazing shapes under the microscope, the spores of aquatic hyphomycetes are well worth searching for. These are released into flowing water by tiny fungi growing on dead plant material that has fallen into rivers and streams, even tiny dykes that have some flow. Without these fungi our waterways would be choked with dead vegetation. As with all other hyphomycetes, these fungi are growing in an

asexual form and produce their spores on the tips, and sometimes on the sides of, special hyphae called conidiophores that stick out of the decaying plant material. When fully developed the spores are released into the water.

Most of this ecological group of fungi prefer dead leaves rather than more woody material. Their released spores need to travel in the water until they encounter another suitable leaf to grow into and feed on. How do these spores stay afloat? How do they ensure that they travel well? How do they fasten onto a leaf rather than being washed past? The answers seem to be in their design, particularly in their shape. Each fungal species has come up with a slight variation on some simple ‘rules of thumb’, so often only an examination of a spore’s shape is needed to provide an identification of the species.

Two basic designs are most prevalent: four-armed spores; and sinuous spores i.e. spores that are long and narrow and twist in two-dimensions (Fig. 1).

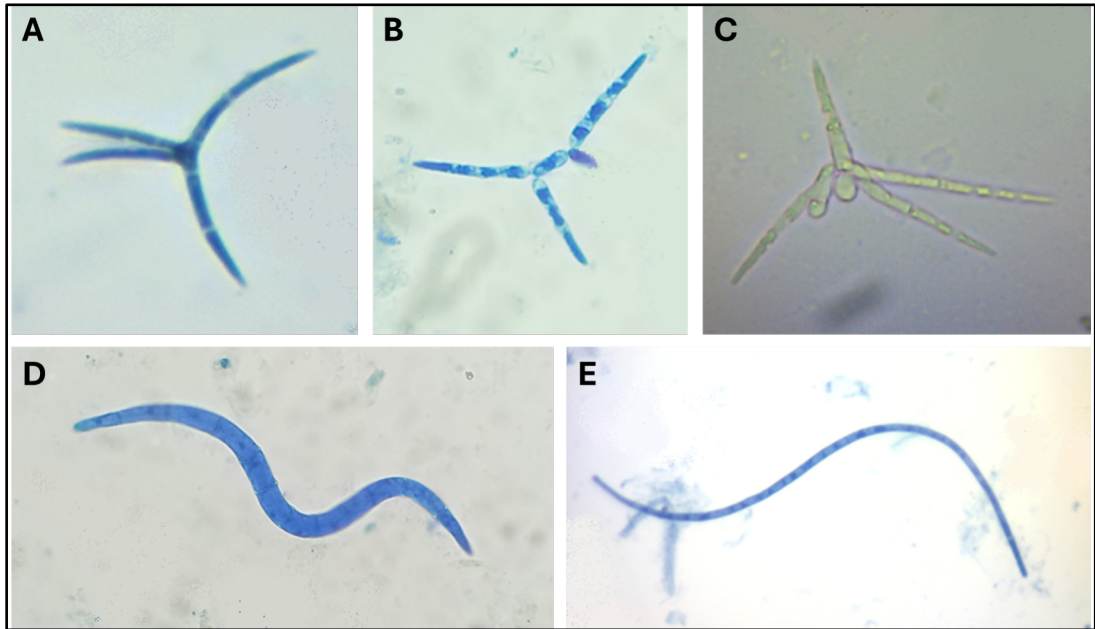


Fig. 1. Aquatic hyphomycete spores. A, B, D and E dyed with aniline blue. A-C Tetra-radiate spores with four ‘arms’: A *Alatospora acuminata*. One of the UK’s smallest and most common aquatic hyphomycetes. B *Articulospora tetracladia*. C *Tetracladium marchalianum*. D-E Sinuous spores which curve in two dimensions: D *Anguillospora crassa*. E *Anguillospora rosea*. Micrographs © Fay Newbery.



Fig. 2. The author collecting river foam. Photographs © Sam Booth.

Aquatic hyphomycetes were first studied by C. Terence Ingold in the 1940s. Because of this, the group is often known as Ingoldian fungi. It is still possible to buy Ingold's 1970's *Guide to Aquatic Hyphomycetes* from the Freshwater Biological Association website. Although many more species have been described since this was written, it's still a good starting point and cheap at only £10.

Luckily for passing microscopists, aquatic hyphomycete spores tend to get trapped in the menisci of bubbles in river foam, so this is the easiest way to collect them: find some river foam and scoop it up into a jar. Scooping the foam up into some type of sieve can be useful as any unwanted water runs away (Fig. 2).

However, aquatic hyphomycete spores germinate as soon as they touch a solid surface. This is one of the design mechanisms that helps them to colonise fresh plant material – as soon as they touch something, germination starts. Their shapes mean that often more than one part of a spore comes into contact with a surface. Spores will germinate simultaneously from each touching point, increasing the likelihood that the spore will stay attached and the fungus can grow into the plant material. Unfortunately for both the fungi and for collectors, the spores don't appear to be able to distinguish between different types of

surfaces so spores will be wasted germinating on useless surfaces such as river stones and the inside of glass jars or plastic containers!

For this reason, spores are usually killed as soon as they are collected. The usual chemical to use for this is formal acetic alcohol. Dyes often help to visualise the spores and, depending on the solvent in the dye, may also kill the spores preventing the need for formal acetic alcohol. However, if samples are looked at quickly after collection, spores will still be recognisable even if they have not been killed.

A tiny drop of fluid resulting from the breakdown of the foam, can be placed on a microscope slide and covered with a cover slip. Since the spores are so tiny, it is important to use the minimum drop size that will allow full coverage of the area under the cover slip. If available a x10 or x20 objective lens can be used to scan methodically back and forth over the slide to search for spores.

As well as Ingold's book, a useful key to aquatic hyphomycetes is available via the Ascofrance website. The key was developed for use in a British Mycological Society workshop held in 1989 and can be found at <http://www.ascofrance.com/uploads/document/1989DescalsAquaticHyphos-0001.pdf>.

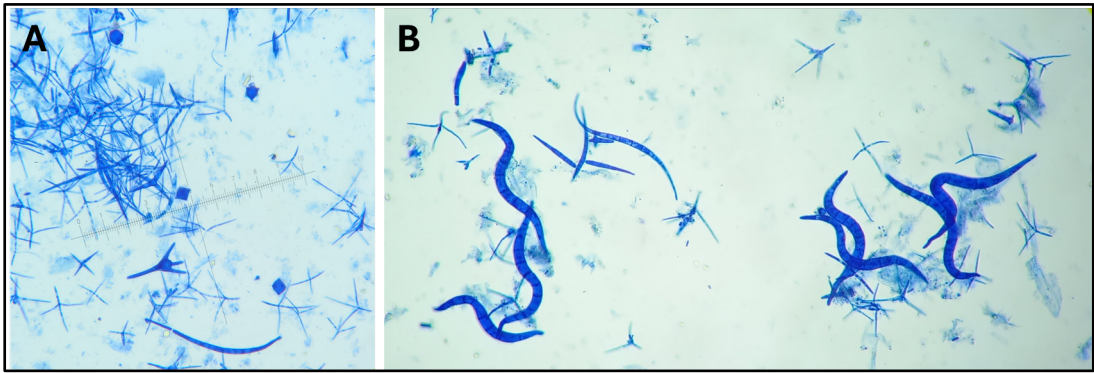


Fig. 3. Two river foam samples, both dyed with aniline blue. Photographed under a $\times 20$ objective. (A) River Aeron in Aberaeron below a weir, November 2024. (B) Small stream in woodland in Parc Natur Penglais in Aberystwyth, November 2024. Micrographs © Fay Newbery.

The sinuous spores are more difficult to identify from shape alone as there are fewer character differences between them and the size ranges often overlap. Because of this the conidiophores and the way that the spores develop can be important but these characters can only be seen if the fungus is growing on a leaf or in culture such as in a Petri dish. Even if many of the long, sinuous spores can't be named, there is still a lot of fun to be had with spores that have a more distinctive shape.

In 2015 Chris Yeates sampled some foam from a stream in Yorkshire. As well as many other species, he found spores of *Collembolispora barbata*. This fungus has very distinctive spores that can't be easily confused with anything else. Chris's collection was only the second collection of this fungus in the world. It had been discovered in a stream in Portugal in 2001 and was formally described in 2003. Since then, the species has been seen twice more in the UK, once in Bristol in 2021 and once in a different Yorkshire location in 2024.

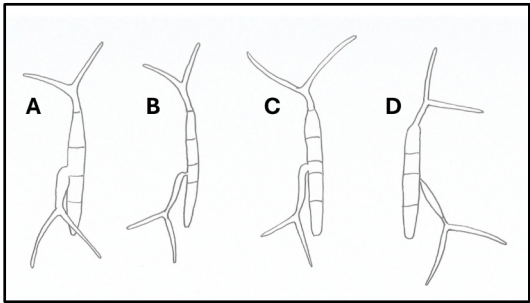


Fig 4. *Collembolispora barbata* spores. (A) North-west Portugal. Described in 2003. (B) Mid-West Yorkshire (vc64), Harrogate, 2024. (C) South-west Yorkshire (vc63), Near Slaithwaite, 2018. (D) North Somerset (vc6), Bristol, 2021. Line drawings © Fay Newbery.

You can read about Chris's Yorkshire foam sample at <https://ascomycete.org/Journal/Article/art-0283>.

So why not have a look for some aquatic hyphomycetes and enjoy the rich diversity of their microscopic world.

Want to learn more?

A new online group is starting on 8 October 2025 to share knowledge about aquatic hyphomycetes. It will run on the second and fourth Wednesday evenings of the month, through from October to March. Four international experts will be supporting the group to offer enthusiasm, knowledge and encouragement. People may join at any time.

So little is known about the distribution and ecology of these species that there are lots of questions that can be addressed by 'amateur' enthusiasts. For example, what are their distributions? There are lots of first County records to be made!

If this sounds interesting, sign up by contacting Fay Newbery at:

aquatichyphomycetes@gmail.com

Extra participants will always be welcome.

(Please be aware that at least one email provider is identifying emails from aquatichyphomycetes@gmail.com as spam. So look in your spam folder if you are waiting for a reply.)

There will also be an in-person course in the UK in October 2026 with tutors Andi Bruder and Isabel Fernandes from the University of Applied Sciences and Arts of Southern Switzerland. Watch out for new events listings on the British Mycological Society website.

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