Ingoldian Fungi from a former industrial site in Yorkshire, England

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Abstract: An account is given of a particularly rich collection from a foam sample taken from a site in Yorkshire, England. This collection gives an interesting example of the anthropogenic effects on fungal diversity caused by former industrial activity in a country where "natural" habitats are increasingly scarce. Several of the fungi identified have few British records, and one has apparently never been seen since its original collection in Portugal in March 2001.
Keywords: Ascomycota, aquatic, freshwater fungi.

"Change must come; but it is ours to determine whether change of growth, or change of death. Shall . . . these mills of yours be the consummation of the buildings of the earth, and their wheels be as the wheels of eternity? Think you that 'men may come and men may go,' but mills go on for ever? Not so; out of these, better or worse shall come; and it is for you to choose which".
John RUSKIN (1864)

Introduction

The study of freshwater aquatic fungi, which mostly fall into the categories of "Aquatic Hyphomycetes" or "Ingoldian Fungi" offers a fascinating opportunity for the amateur mycologist with access to a good quality compound microscope. The purpose of this paper is to illustrate some of these species which appeared in a very rich collection of stream foam from Yorkshire, England in the vicinity of a former large woollen mill. It is also hoped that others may feel inspired to enter this unique, often intriguing, and indeed beautiful, fungal world. One of the fungi encountered has apparently never been seen since its original collection in Portugal in March 2001.

As in many other areas of fungal studies there are limiting factors. Many of the laboratory based techniques and field collecting methods are in general beyond the amateur, as is the sequencing of cultures based on single conidia. A perennial problem for the amateur mycologist is access to the often very scattered literature, although in the digital era this is becoming less and less of a problem as more and more material is being made open-access, a good example being the publications made available through membership of Ascomycete.org.

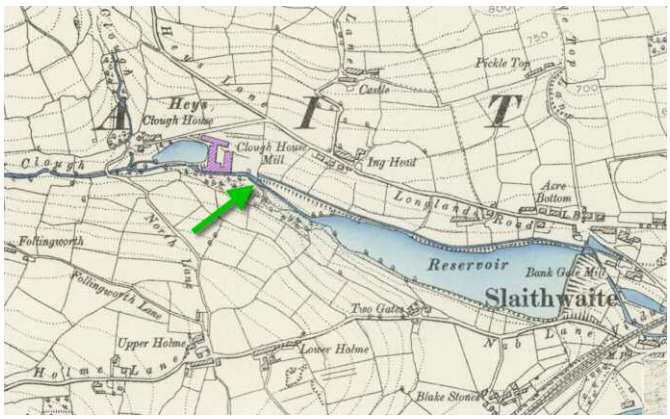
The "foam-cakes" which appear from time to time at the sides of generally quite fast-moving streams function as traps for the aquatic fungi which colonise dead leaves, twigs etc. The conidia of such fungi will germinate quickly once in contact with a solid body, the foam bubbles mean that this doesn't immediately happen. However, if the foam is carefully scooped into a small watertight container the solid surface of that container will stimulate that conidial germination, and to prevent this a fixative is required. Formol Acetic Alcohol (a standard fixative for botanical tissues) is the one which I have always used. A few drops (depending on the size of the collection) will stop the germination process. Once back indoors each collection can be decanted into a suitable glass tube and labelled. Providing the tube is water- and air-tight the collection can be stored virtually indefinitely. This makes it really useful as one can examine material at any time — perhaps during periods when weather conditions make the study of other fungi difficult. A disadvantage of this technique is that the conidia are effectively killed, and so there is no possibility of any culture work.

Another technique which can be employed is collecting submerged leaves which are starting to skeletonise and then keeping these submerged in petri dishes. This technique enables the student to observe the process of conidiogenesis in living material, important for the identification of some species. There are species, in particular those with slender sigmoid conidia, which cannot be safely identified simply by reference to conidial morphology. Fortunately many other species form very distinctive conidia which can be identified from morphology alone

The following is an account of a particularly rich collection, which combines natural and human history, as the quality of the collection is almost certainly due to the anthropogenic character of the collection site, which has been shaped by industrial processes in the past.

This collection site lies in West Yorkshire, England, above the small town of Slaithwaite. The geology of the area dates from the Namurian Stage of the Carboniferous Period, some 320 million years ago. Soils, and the stream and river waters in this region are generally acidic. It is on the site of a former woollen mill, Clough House Mill. The original mill was constructed around 1790 and was added to in subsequent years. Here is a very early 20th century (exact date unknown) photograph of the — by then — large mill © Kirklees Image Archive:

Here is the mill on a map dating from 1892 (the collection site is arrowed in green):



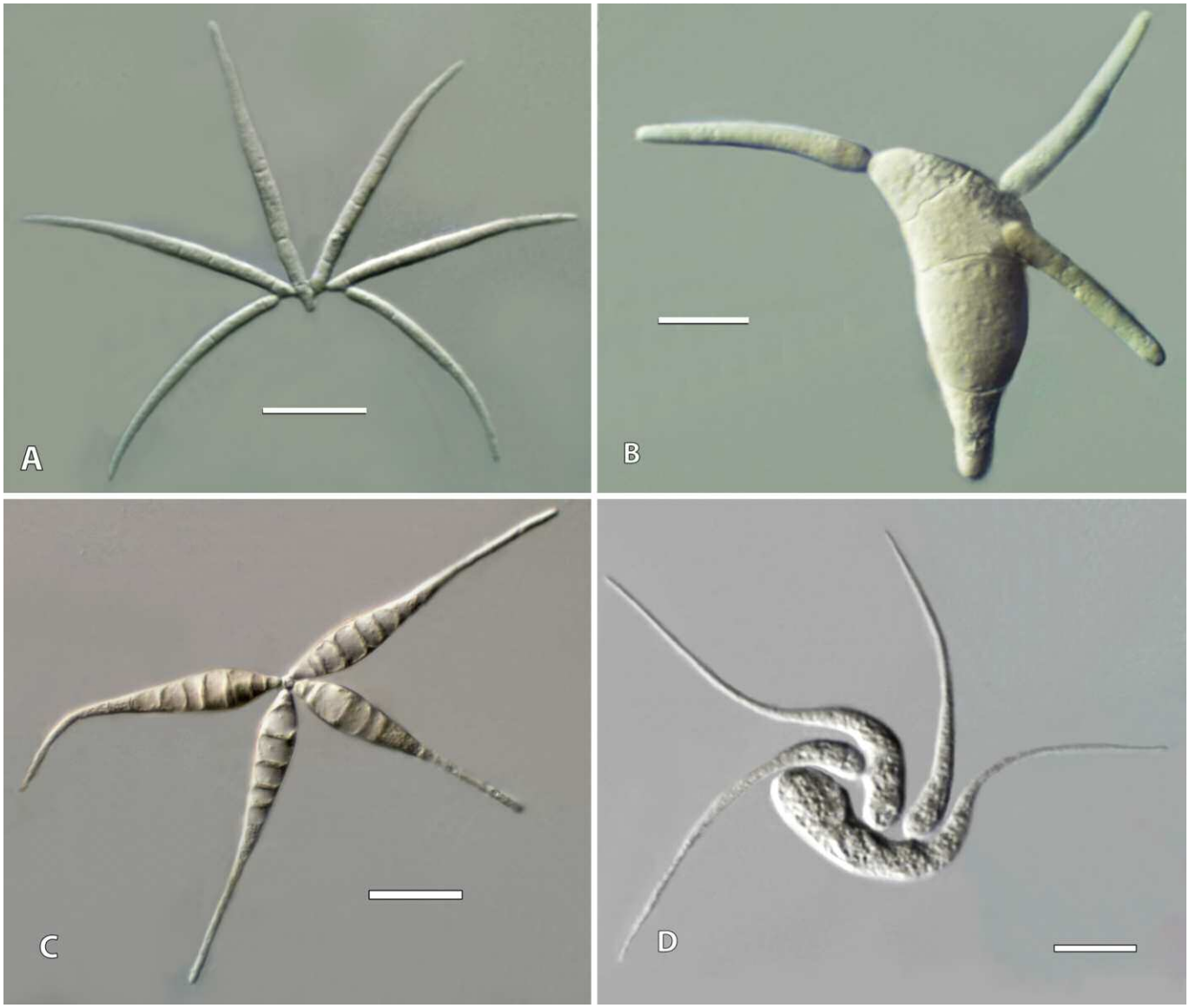
As can be seen from the map the mill had a mill-pond (which still remains), supplied by diverting two fast-flowing streams. The place-name "clough" is a northern English term meaning a narrow valley. The mill pond provided the power for the mill, at first using the water itself, then for the later steam engines. Nowadays the mill buildings have been dismantled (most probably in the 1970s), and have completely disappeared, leaving only an access track, the stone retaining wall of the pond and the "weir" mentioned below; secondary woodland has colonised the rest. The mill-pond is now surrounded by trees, the leaves, twigs etc. of which, falling into the water, providing an abundant nutrient supply for aquatic fungi. The pond overflow drops several metres back into the stream and the water then pours over a 5-step weir, a man-made "waterfall" immediately above the collecting site (see image below). These sudden drops help oxygenate the water and provide the source of the foam. On the occasion of my visit a large branch had fallen into the water and became wedged; this helped to retain a foam "cake" and to make collection relatively easy. So human intervention in this former "natural" site has inadvertently provided a pond for fungal development, and also fast flowing water for conidial dispersal.

Although May is not normally the best time for collecting Ingoldian fungi, an initial scan under the microscope showed that this collection was exceptionally rich, not so much in the numbers of conidia, but in their sheer variety. To date I have identified 45 species with confidence, almost all from conidia, the majority being obligately aquatic ones. There remains a ragbag of "possibles"/"unidentified" fungi all photographed and filed away for later, this could amount to a further 25–30 species; I suspect there may be some undescribed ones in there, certainly some which will always remain unnamed. As stated before the ideal of sequencing cultures derived from solitary, living conidia is beyond the writer at this time. So, 70+ fungal species in little more than 5 millilitres of liquid.

Because they are not hampered by the need to be aerodynamic the propagules of Ingoldian fungi often assume complex shapes which must assist their transportation in water and their subsequent germination. These shapes are also often very attractive or intriguing to human eyes. The opportunity is being taken here to show some examples of less commonly encountered species.

Materials and methods

Following the methods described in Ingold (1975) material was collected in the field and fixed immediately in Formol Acetic Alcohol. When the time comes to examine a sample a pipette is used to suck up a small amount from towards the bottom of the tube, and one mounts this as one would with any other microscope slide preparation; then one methodically scans the slide. I personally would recommend not staining at first; then as the mount starts to dry a drop of Cotton Blue in Lactophenol can be fed in from the side if required. This has the advantage that the Lactophenol will not dry out for several days so one can return to the same slide later if nec-



essary. How rewarding a collection may be soon becomes evident as the scanning proceeds. In general winter into early spring will prove the best periods for field collections, when there are lots of decaying leaves etc. in the water. A few days after heavy rain tends to produce the best foam. A thorough scan of a single slide preparation can easily take an hour, often longer with good collections. In general I would recommend working with a magnification of ×400. Sometimes it is necessary to use oil immersion at ×1000, this is best done at the end of a scan as the oil on the coverslip precludes much further study.

The photographs are all of fixed (i.e. dead) conidia. No stains were used, any colours are those of the original conidia. The images were taken using a Nikon Optiphot 2 compound microscope with Nomarski differential interference contrast illumination, and a Tucsen 10 megapixels digital camera. Often a considerable number of images of each conidium was taken, these images were then stacked and edited using 64-bit Zerene™ stacking software (zerenesystems.com). Extraneous material in the resulting images was carefully edited out using Adobe Photoshop software without affecting the fungal subject. The scale bar in all the images represents 10 µm except K image where it represents 20 µm.

Notes on the accompanying images

A. *Magdalanaea monogramma* G. Arnaud, *Bull. Soc. mycol. Fr.*, 68: 209 (1952).

(Ascomycota, *incertae sedis*).

There appear to be no British records since the three collections mentioned by Ingold (1977).

B. *Culicidospora gravida* R.H. Petersen, *Mycologia*, 55(1): 24 (1963).

(Ascomycota, *incertae sedis*).

A rather striking, fairly frequently encountered species, living up to its scientific name, which translates as a pregnant mosquito-spore.

C. *Flabellospora acuminata* Descals, *Trans. Brit. mycol. Soc.*, 78(3): 411 (1982).

(Ascomycota, *incertae sedis*).

Another not uncommon, but readily-recognised species; it can have 4, 5 or 6 arms, very occasionally more.

D. *Gyoerffyella rotula* (Höhn.) Marvanová, *Persoonia*, 5(1): 41 (1967).

(Ascomycota, *Helotiales, Discinellaceae*).

One of several similar species, care needs to be taken when separating them.

E. *Lateriramulosa uni-inflata* Matsush., *Microfungi of the Solomon Islands and Papua-New Guinea*: 34 (1971).

(Ascomycota, *incertae sedis*).

A small species easily overlooked; most British records are from the south and west of the country.

F. *Pleomassaria holoschista* (Berk. & Broome) Sacc., *Syll. Fung*., 2: 239 (1883).

(Ascomycota, *Pleosporales, Pleomassariaceae*).

A stray conidium of the anamorphic state of this fungus, readily identifiable by its distinctive shape. It is not surprising that this Alnus specialist should find itself in an aquatic environment; more surprising is that there are relatively few records of this fungus in Britain.

G., H. *Collembolispora barbata* Marvanová, Pascoal & Cássio, *Cryptog. Mycol.*, 24(4): 341 (2003).

(Ascomycota, *Helotiales*, *incertae sedis*).

Described from Braga, Portugal, 1400 kilometres distant from this Yorkshire site, in 2001 (Marvanová *et al.*., 2003). Professor Marvanová informs me (pers. comm.) that she is unaware of any other collections. Were it not for the excellent illustrations in Seifert *et al.*. (2011) this species would almost certainly have gone unrecognised in my collection

I. *Tetracladium* aff. *palmatum* A. Roldán, *Mycol. Res*., 93(4): 460 (1989).

(Ascomycota, *Helotiales*, *incertae sedis*).

Provisionally placed here using the paper by Roldán *et al.*. (1989). So far only previously recorded from two southern counties of England, Wiltshire and Hampshire.

J. *Excipularia fusispora* (Berk. & Broome) Sacc., *Syll. Fung*., 3: 689 (1884).

(Ascomycota, *incertae sedis*).

Another terrestrial species of which several conidia were observed in this collection. There are fewer than 10 records on the

British Mycological Society online database [https://basidiochecklist.science.kew.org/BritishFungi/GBCHKLST/gbchklst.asp?].

K. *Clasterosporium flexum* (Matsush.) B. Sutton & R.T.A. Cook., *Plant Path*., 43(6): 1071 (1994).
(Ascomycota, *Magnaporthales*, *Magnaporthaceae*).

Known from relatively few British sites. This is a *Cupressaceae* specialist, and the likelihood is that a nearby householder has dumped trimmings of *Cupressus* × *leylandii* in or near one of the streams feeding into the mill pond. This *Cupressus* hybrid is much planted in Great Britain and its rapid growth often leads to neighbourhood disputes, legal issues, and — on one occasion — a murder. The bent conidia, resembling a boomerang, are very distinctive.

Acknowledgements

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References

Ingold C.T. 1975. — *An illustrated guide to aquatic and water-borne Hyphomycetes (Fungi Imperfecti): with notes on their biology*. Ambleside, Freshwater Biological Association, Scientific Publication 30, 96 pp.

Ingold C.T. 1977. — Identity of some conidia from stream foam. *Transactions of the British mycological Society*, 69 (2): 325–326. doi: 10.1016/S0007-1536(77)80057-0

Marvanová L., Pascoal C. & Cássio F. 2003. — New and rare hyphomycetes from streams in northwest Portugal. *Cryptogamie, Mycologie*, 24 (4): 339–358.

Roldán A., Descals E. & Honrubia M. 1989. — Pure culture studies on *Tetracladium*. *Mycological Research*, 93 (2): 452–465. doi: 10.1016/S0953-7562(89)80039-5

Seifert K., Morgan-Jones G., Gams W. & Kendrick B. 2011. — *The Genera of Hyphomycetes*. CBS Biodiversity Series 9. Utrecht, CBS-KNAW Fungal Biodiversity Centre, 996 pp.

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