Field Mycology

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Field Mycology

Field Mycology is a quarterly publication produced by the British Mycological Society, available as an open access online journal and in printed magazine format. It covers all aspects of fungal identification, recording and conservation, catering to all levels of expertise.

It focuses primarily on the wild fungal diversity of the British Isles, including the United Kingdom, the Republic of Ireland, the Isle of Man, and the Bailiwicks of Guernsey and Jersey (Channel Islands). Reports and examples of the practice of field mycology from elsewhere may also feature, where they are of relevance and interest to the field mycology community. However, articles describing taxa which are new to science will only be considered for publication if their holotypes were collected within the British Isles.

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The Editorial Team will be reviewing and updating these instructions over the course of 2025. In the meantime, authors are encouraged to look to the back issues of *Field Mycology* for inspiration and examples of typical article style, structure and formatting.

Authors are welcome to contact the Editorial Team, via the email address above, with any pre-submission enquiries. In the case of articles dealing with taxa that are new to science or new to the British Isles, the Editorial Team requests that a pre-submission enquiry is made in advance of submitting the manuscript, so that consideration can be given to suitability for publication in *Field Mycology* and any necessary arrangements for scientific review.

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Vol. 26 (3) October 2025

CONTENTS

Front cover: A group of *Mycena olivaceomarginata* (Brownedge Bonnet), showing their coloured gill margins nicely, which popped up in Geoffrey Kibby's lawn this September, in Norfolk. Good to know he is enjoying his garden! Photograph © Geoffrey Kibby.

Back cover: An observation of *Favolaschia claudopus* (Orange Porecap) reported from Brighton in south-east England in September 2025, with a springtail taking an interest. This is one of the species being studied by the FunDive project (see article on pages 78–86) through their 'Eyes on Alien Mushrooms' campaign (https://fun-dive.eu/en/get-involved/current-projects/eyes-on-alien-mushrooms/). Photograph © Max Mudie.

EDITORIAL

Current Biology: Fungi special issue

Current Biology published a 'Fungi special issue' in June which, alongside a fascinating article on 'Fungal diversity, evolution, and classification' (Hibbett *et al.*, 2025), included a rather wonderful poster (in PDF format) titled "Fungal Tree of Life: Macroscopic Diversity of Fungi'. It is free to download and redistribute under a CC BY-NC licence, and can be found under 'supplemental information', here: https://doi.org/10.1016/j.cub.2025.01.053.

Although much of the special issue is accessible only via purchase or subscription, parts are accessible for free, including an article by Lynne Boddy and Maxine E. Herman-Oakley Mills on 'The visual art of mycology' (2025). This includes short profiles of three notable women from the history of mycology: Beatrix Potter, Mary Elizabeth Banning and Anna Maria Hussey, who is something of a hero to your editor, because she wrote so marvellously on the subject of fungi:

> "Sticks indeed—dead rotten sticks, such as poor old hags fill a ragged apron with to boil their tea-kettle, are not the despicable things that many would imagine; it would probably be impossible to pick one out which should not be garnished with some species of fungus life; some possessing exquisite beauty, all exquisite contrivances for self-development and propagation and the task they have to fulfil, the disintegration of dead wood."
>
> (Hussey, 1847)

You can see why Lynne Boddy (Professor at Cardiff University) would be taken with Hussey: an early contemplator of fungal ecology and wood decomposition.

Field Mycology

Every issue is a 'Fungi special issue' in *Field Mycology*, and we have a diverse array of species between the pages this month, as well as a feature article on the FunDive project which is launching fungi sampling campaigns across Europe and inviting field mycologists in the UK to get involved.

A field mycologist's centenary

One of *Field Mycology*'s loyal readers, Bert Brand, who will be well known to all long-term BMS forayers, this year celebrated his 100th birthday on October 6th.

He has earned a permanent place in the history of British mycological recording as chairman of the remarkable team of amateur mycologists who assembled the 1980 *Fungus Flora of Warwickshire* under the editorship of Malcolm Clark, still unsurpassed as a county Mycota.

A keen photographer, he came across *Clathrus archeri* in a neighbour's garden and wanted to know what it was. Birmingham Natural History Society put him in touch with the Warwickshire mycologists and a late starting but very fruitful mycological career got under way. The *Fungus Flora* was not Bert's only contribution to the field mycology community—he also published a very thorough compilation of the literature on *Agaricus* in Britain, at a time when there was little else available.

My thanks to Alick Henrici and Geoffrey Kibby for sharing these recollections. A longer feature celebrating Bert Brand's lifetime in mycology can be found in the September 2025 edition of the BMS Newsletter.

Clare Blencowe

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Fungal Portrait: 103

Gibellula attenboroughii H.C. Evans & J.P.M. Araújo

Harry C. Evans[1]

Fig. 1. *Gibellula attenboroughii*, specimen on orb-weaving spider, *Meta menardi* (*Tetragnathidae*: *Araneae*), showing dense, white mycelium covering the spider body from which arise short projections, the conidia-bearing structures (synnemata), on cave roof, Whitefathers' Caves, County Cavan, Northern Ireland. Photograph © Tim Fogg.

The type specimen (Fig. 2A) was found during filming of the 2021 BBC Winterwatch series and an image was received, via RBG Kew, for comment. Based on the unusual white colour, denoting a lack of pigmentation, as well as the compact nature of the synnemata and the dense conidial chains in blocks, it was posited that this could be a new species of *Gibellula* (*Cordycipitaceae*: *Hypocreales*), a genus parasitic on and specific to spider hosts and, more typically, associated with tropical countries. At the end of the series in 2022, the specimen was collected, air dried and sent for identification. A subsequent morphological and molecular analysis confirmed it as a new taxon sitting in a subclade with two species from Asia. This information, plus the implication that the fungus could be controlling the behaviour of the spider host—since the infected spider had moved from its normal concealed habitat and died fully exposed—was

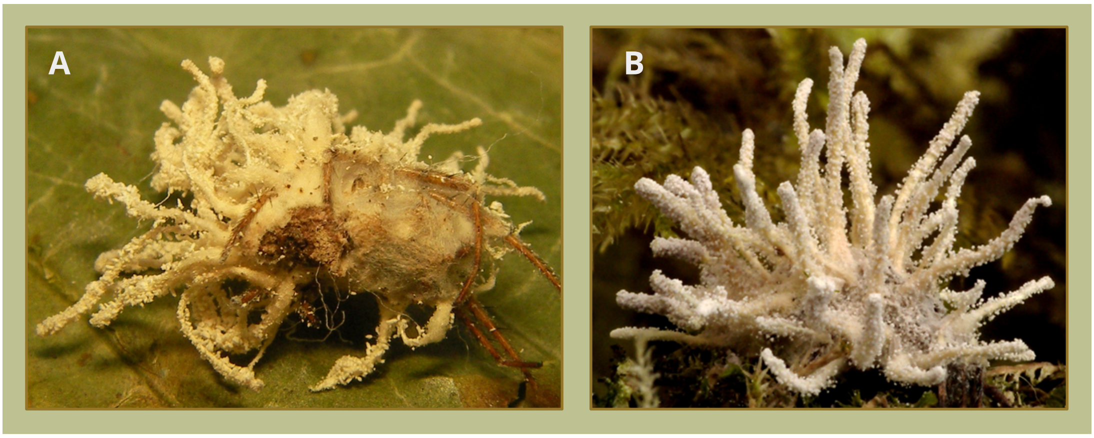

Fig 2. *Gibellula attenboroughii* on orb-weaving spider, *Metellina merianae*. A. Type specimen, after removal and drying to show the spider body, lower surface, and cream-coloured mycelial mat and synnemata; B. *In situ*, attached to *Sphagnum* moss, Lake Vyrnwy, Powys, Wales. Photographs: A. © H.C. Evans, B. © D. McNeil.

presented during the subsequent Springwatch series, with the further speculation that this could be an alien species, based on its phylogeny and the fact that the former owner of Castle Espie worked with the East India Company and regularly imported goods from Asia. Fortunately, a speleologist viewer dispelled this speculation and reported its presence on spiders in caves in Ireland. On request, specimens from several Irish cave systems were sent for identification and the occurrence of the fungus was confirmed on two species of orb-weaving spiders: *Metellina merianae*, a small spider (body length 6–12 mm) found around cave entrance and in the twilight zone; and, *Meta menardi*, a larger spider (body length 10–17 mm; Fig. 1), occupying both the twilight and dark zones within the cave system. The new species was duly described and named in honour of Sir David Attenborough (Evans *et al.*, 2025), not least because of his association with the founding of the BBC Natural History Unit.

Description

Spider body covered by a white to pale yellow mycelial mat, bearing numerous white to cream, cylindrical synnemata, up to 1 cm in height. Conidiophores produced along most of the synnematal surface, with long, rough-walled stipes near the base becoming short and almost astipitate nearer the apex, bearing *Aspergillus*-like heads from a smooth, neck region; heads with a central vesicle and metulae forming clavate phialides producing chains of hyaline ellipsoidal, conidia (Fig. 3).

Simpler, penicillioid conidiophore heads also occur occasionally. This is the dominant form on the synnemata formed on the larger spider host, *Meta menardi*, particularly towards the tapered apex (Fig. 1 & 4). It is conjectured that this ecotypic variation is due to the different niches occupied by the spider hosts.

This species is also a psychrotroph (a microbe able to grow at 7 °C, or below) which may explain why it has been collected in the mountains of mid-Wales in the winter months (McNeil, 2012). The latter author collected hundreds of specimens from two lake sites (Bala and Vyrnwy)—on *Sphagnum* moss hanging from the rocks and crevices (Fig. 2B)—demonstrating again the altered behaviour of the infected *Metellina merianae* spiders as they emerged from their hidden lairs to die fully exposed. A similar situation has been reported recently (author, pers. comm.) from the border country in central Ireland with numerous infected spiders hanging from vegetation along a rocky stream, and this has been followed by the observation of infected *Meta menardi* on a cave ceiling in north Yorkshire. It is likely, therefore, that *G. attenboroughii* is a much over-looked fungus which may be common throughout the British Isles, sometimes in epizootic proportions. Undoubtedly, more novel species of *Gibellula* occur on different spider hosts in the British Isles which, historically, would simply have been identified as *G. aranearum* (Evans *et al.*, 2025).

It should be noted that long-legged cellar spiders (*Pholcus* spp.) are frequently infected with the entomopathogenic fungus, *Engyodontium aranearum*, which, although covered in a similar white mycelial mat, can easily be distinguished by the absence of synnemata and the formation of conidia on denticles from simple conidiophores.

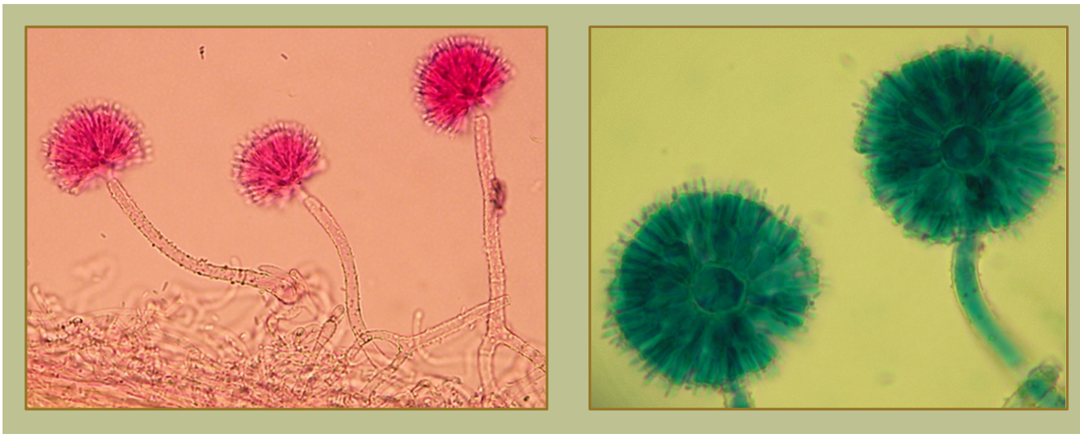

Fig 3. *Gibellula attenboroughii*: micromorphology of the type specimen, showing the rough-walled conidiophores tapering to a smooth neck on which the *Aspergillus*-like heads are produced, with a central vesicle, metulae and spore-bearing phialides. Photographs © H.C. Evans.

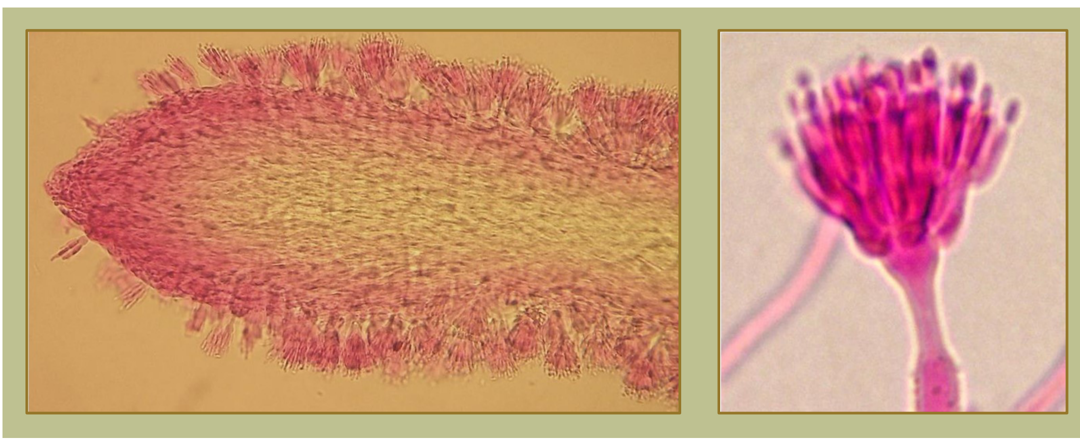

Fig 4. *Gibellula attenboroughii*: micromorphology of *Penicillium*-like conidiophores more typical of the form associated with the synnemata on the larger orb spider, *Meta menardi*. Photographs © H.C. Evans.

Glossary

Conidia – asexual, non-motile spores produced by some species of fungi

Conidiophores – specialised stalked structures which bear conidia

Metulae – conidiophore branches bearing phialides

Phialides – cells producing conidia in basipetal succession

Synnemata – conidia-bearing structures composed of compact, erect hyphae, producing conidiophores laterally

Vesicle – the swollen apex of a conidiophore

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Join FunDive and help mycologists gain a deeper understanding of fungal diversity in Europe!

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[*] These authors share first authorship; [#] These authors share senior authorship.

Introduction

FunDive is a pan-European project funded by the Biodiversa+ partnership, launched in 2024 to improve awareness of fungal diversity in nature conservation (https://fun-dive.eu/). Upon its launch, 26 partners from 18 European countries were engaged, but since then, the consortium has expanded and currently includes a total of 42 partners across 26 countries (Fig. 1). This number includes the United Kingdom, with the University of Stirling, Royal Botanic Garden Edinburgh, and Royal Botanic Gardens Kew, joining the consortium as collaborating partners in 2025.

The overall project goal is to develop, improve, and compare methods for mapping and monitoring of fungal diversity and to analyse drivers of its patterns. In addition, we aim to assess how well current conservation strategies, which are typically based on plants and animals, target globally red-listed fungi (https://www.iucnredlist.org/). FunDive's focus is on engagement, with both policymakers and the broader mycological community. We aim to raise awareness about fungi as crucial components of ecosystems, and encourage people to become actively engaged in generating data to promote fungal conservation. While engagement is the focus of this article, Fig. 2 provides a graphical overview of how the project is organised more broadly.

To understand and monitor the drivers of fungal diversity patterns in Europe, high-quality mapping of species distributions is needed. To do so, we are combining two approaches: environmental DNA sequencing and occurrence recording mainly based on sporophores collected by participants across Europe. However, to be able

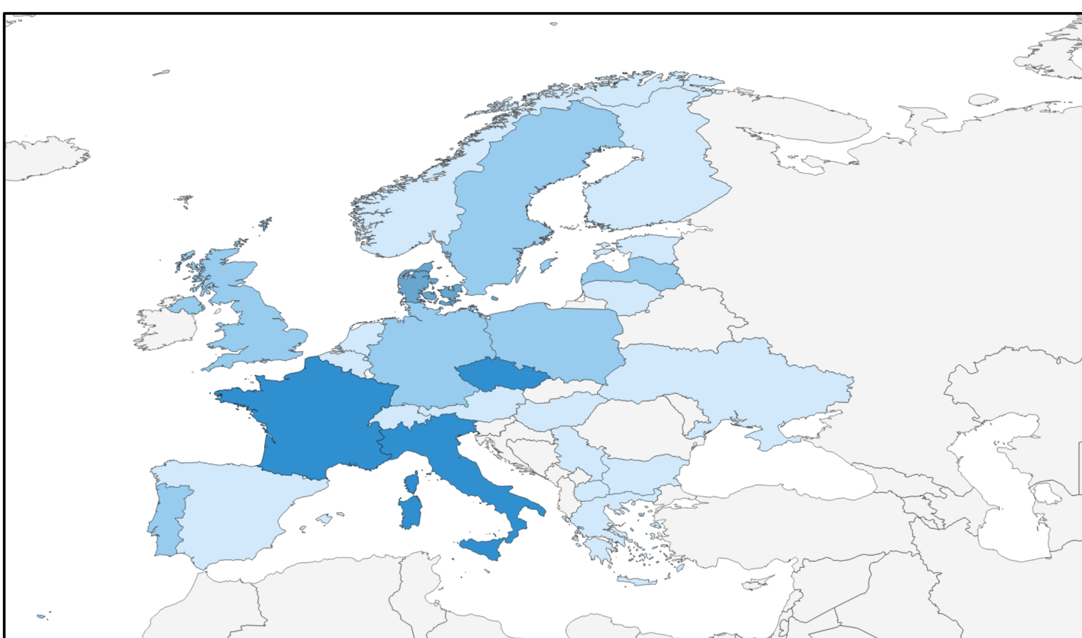


Fig. 1. Overview of the FunDive consortium. Currently, FunDive includes 42 partner institutions from 26 countries, and we are open to more. Darker shading means a higher number of partner institutions within individual countries.

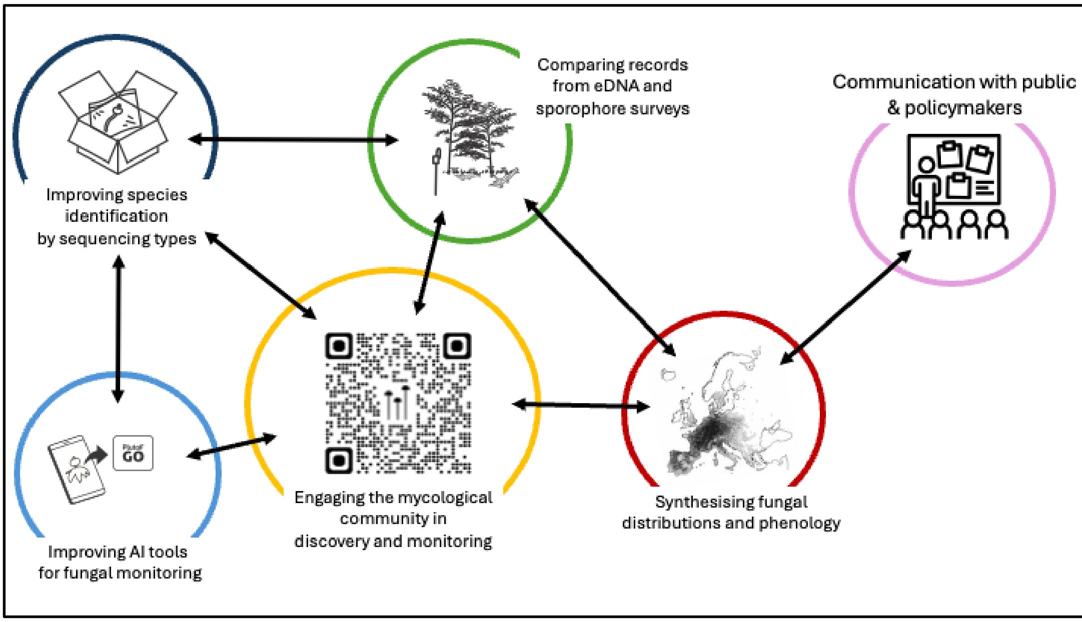


Fig. 2. FunDive is focused on fungal records collection, data curation, and the development of tools to aid mycologists. This schema will inform data analysis and synthesis, which can be relayed to the public and policy-makers. The arrows represent synergies among work packages within FunDive.

to combine these reliably, development of several other components is needed. Besides providing access to DNA barcoding of fungal specimens to the broader audience, we also focus on developing molecular protocols, sequencing old fungarium specimens that are representative of described species (called "type specimens"), and enhancing identification tools based on artificial intelligence (AI). A fungal species recognition system built by applying machine-learning models on photographs and metadata in the Atlas of Danish Fungi (https://svampe.databasen.org/en/; Picek *et al.*, 2022) is being developed further and incorporated into the biodiversity recording app PlutoF GO (http://plutof.ut.ee/go) to assist users in documenting their findings. We hope that the readers of this paper share our consideration of fungi as much as we do and want to join our efforts to incorporate fungal diversity into European conservation strategies.

Citizen science has always played an important role in fungal research (Watling, 1998). For centuries, some of the leading taxonomic experts in mycology did not have academic positions. For example, one of the most famous Italian mycologists, Giacomo Bresadola (1847-1929), who described more than 1000 new fungal species, served as a priest. As in earlier centuries, but even more nowadays, the availability of proper equipment could limit the engagement of enthusiasts in mycology. Molecular tools and protocols (including DNA barcoding) have become a standard in fungal research but these techniques are usually not available to the broader audience, creating a growing lack of comparability of data originating from professional and non-academic mycologists. The targets of FunDive include closing this gap by providing access to DNA barcoding using Oxford Nanopore Technology, standardising protocols, and training the broader mycology community. Nanopore sequencing can process long stretches of DNA in real time by measuring electrical signals as molecules pass through nanopores. Among the benefits of this high-throughput sequencing technique are its portability and independence from full sequencing facilities.

The British Mycological Society (BMS) has played a pioneering role in making DNA barcoding more accessible to non-professional mycologists. For example, the BMS established a DNA barcoding network across the UK in collaboration with local groups of field and amateur mycologists. In addition, the Lost and Found Fungi (LAFF) project, coordinated by BMS, the Royal Botanic Gardens Kew, and the British Lichen Society, further broadened access with easy-to-use DNA extraction kits (Douglas, 2020).

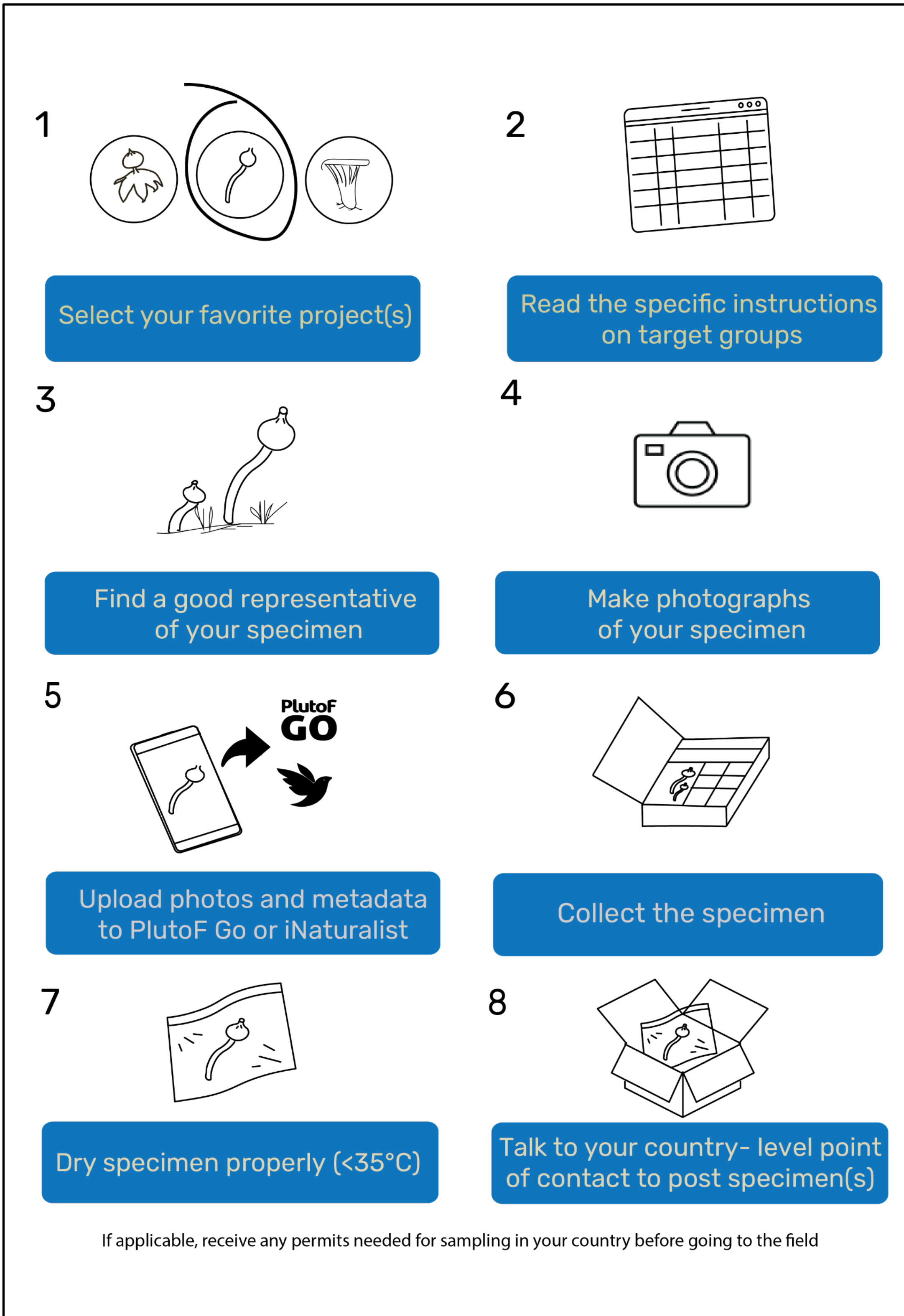


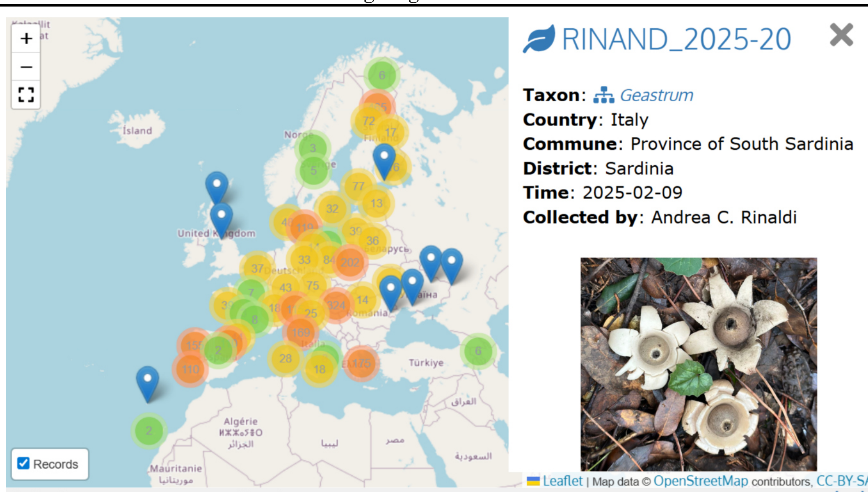
Fig. 3. Simplified roadmap of instructions for participants to contribute specimens to FunDive campaigns.

How can you become involved in FunDive?

FunDive strives to bring together everyone interested in mycology from across Europe (Haelewaters *et al.*, 2025). We encourage you to visit the project webpage, https://fun-dive.eu/, and to follow us on social media. There you will find instructive materials, such as sampling protocols and identification keys but also information about upcoming mycological meetings, conferences, and events across the continent. Most importantly, we use these online platforms to announce our sampling campaigns and communicate their outcomes.

Due to the huge diversity of the fungal kingdom (Blackwell, 2011; Niskanen *et al.*, 2023), we needed to create a step-by-step approach. Each season, we launch centrally coordinated campaigns targeting specific groups of fungi, led by experts. The ongoing campaigns vary widely. Some are easy to attend, whereas others require more extensive mycological experience. For some campaigns, recording and sharing observations is enough, while for others we ask you to sample specimens to sequence and confirm their identification. You can find all ongoing campaigns on our website, https://fun-dive.eu/en/get-involved/current-projects/.

You can participate in FunDive campaigns, either individually or by joining country-level organised activities. The process to record fungal specimens for FunDive campaigns is simple (Fig. 3): (1) select your favourite project(s), (2) read the specific instructions, (3) find a representative of a target species, (4) make a photo of your specimen, and (5) document it in a biodiversity recording platform, *e.g.*, PlutoF GO or iNaturalist (https://www.inaturalist.org/). If sampling of specimens is required: (6) collect the specimen that you documented, (7) dry it properly, and (8) send it to a FunDive country-level point of contact following online instructions (https://fun-dive.eu/en/get-involved/how-to-engage/). A unique code needs to be physically attached to the specimen and its digital record to which the DNA barcode will be added. Your specimen will be processed in our molecular lab and identified based on the resulting DNA sequence. You can follow the progress of your (and other FunDive) fungal specimens in this workflow on our website: https://fun-dive.eu/dataportal/.



#	Country	Records	#	Country	Records	#	Country	Records
1	Finland	642	10	Lithuania	73	19	Croatia	13
2	Italy	275	11	Sweden	64	20	Belgium	9
3	Portugal	252	12	Czechia	62	21	Armenia	7
4	Poland	245	13	Slovenia	60	22	Netherlands	6
5	Greece	209	14	Ukraine	23	23	Belarus	2
6	Hungary	193	15	North Macedonia	21	24	Switzerland	2
7	Denmark	143	16	Spain	19	25	Slovakia	1
8	Germany	79	17	Austria	15			
9	France	75	18	Estonia	14			

Fig. 4. Visual summary of the 2024–2025 sampling season. Left, map representing all 2504 fungal records from the last season. Blue icons represent individual records; coloured circles represent multiple records in a given area (green <10 records, yellow 10-99 records, orange ≥100 records). Right, example of a fungal record, a collection of *Geastrum* sp. from Sardinia (Italy), photo by Andrea Rinaldi. Bottom, summary of records made in 25 countries.

Figure 5. Different types of FunDive activities engaging the broader audience. A. The Muurola hospital area in Rovaniemi (Finland) is built on a pine heath, where mushrooms were collected for FunDive. From left to right Tapio Kekki and Raisa Sunnari. Photo © Merja Lipponen. B. A group of citizen scientists admiring earthstars in the Cabour Dunes (Belgium). Photo © Martine Decoussemaeker. C. Participants of the Micocosmo festival, sampling in Capo di Ponte, Lombardy (Italy), 2–6 October 2024. Photo © Simone Graziosi. D. Excerpt of a sketchbook with drawings made during a mushroom walk. Photo © Lindsay Robbins. [*Caption continued on page 83 …*]

The first FunDive campaigns were announced in August 2024. During our first sampling season, which ended in July 2025, 2504 fungal records (186 observations, 2316 specimens) from 25 European countries were made by 309 participants (Fig. 4). Most records originated from Finland (642), followed by Italy (275), Portugal (252) and Poland (245). Although DNA barcoding of these specimens is still ongoing, 849 ITS sequences have been generated. Preliminary analysis of these sequence data has already uncovered species that are new to science, as well as new records for several countries. These are exciting results that will undoubtedly lead to multiple academic papers, including formal descriptions of new species (*e.g.*, Marxmüller *et al.*, 2025) and molecular phylogenetic inferences.

One of the first campaigns we launched deals with the distribution of earthstars (*Geastrum*) in Europe. As most of the 37 *Geastrum* species currently known in Europe are rare and occur in declining habitats, species in this genus are under assessment for the IUCN Red List. To perform these assessments, reliable data on species distribution are needed. After only one season, we collected 324 specimens that were all DNA-barcoded. Most of these specimens originated from Poland (124), Greece (53), and Hungary (24), broadening the known distribution to southeastern European countries, where fungal distribution data are particularly scarce.

Additionally, in several countries, sampling activities were organised by local mycological organisations and working groups. For example, guided excursions were organised in Belgium, Finland, Greece, Italy, and Poland (Fig. 5F). FunDive partners also gave open lectures (in person and online), presented during scientific conferences (*e.g.*, the International Mycological Congress in The Netherlands), and organised stands during mycological events such as the "Micocosmo" festival in Italy (Fig. 5C). Finally, a DNA barcoding workshop was organised in Poland for the exchange of knowledge between 38 participants, including researchers, lab technicians, students, and amateur mycologists (Fig. 5G–I).

From basic research to public engagement and policy recommendations

In FunDive, we aim to (1) examine temporal changes in fungal phenology and community composition in a spatial context, (2) compare the potential of sporophore- and environmental DNA-based approaches for fungal monitoring and conservation, and (3) analyse whether existing international conservation areas are effective in protecting fungal biodiversity. To do this, we combine three different sources of data. First, occurrence records generated by citizen scientists have leveraging power in that they capture a spatiotemporal range that professional researchers are unable to reach (Haelewaters *et al.*, 2024). Second, other occurrence records are based on sequencing of environmental DNA (eDNA) from soil, dead wood, air etc. This approach usually yields a higher number of species allowing for a greater understanding of diversity patterns (*e.g.*, Tedersoo *et al.*, 2014; Van Nuland *et al.*, 2025). Finally, data are also collected from existing datasets published previously in the Global Biodiversity Information Facility (https://www.gbif.org/).

To achieve our goals, we need reliable fungal names that can be linked to different data sources, including specimens, environmental samples and their respective DNA barcodes. This can be challenging as new fungal species are continuously being discovered, especially from eDNA data, and many classical fungal taxa are revealed to represent species complexes. For

[... *cont. from page 82*]: E. *Xylaria longipes*, documented during the "Summer School 2024: From Fungal Morphology to Genotype" in Skryje (Czechia), 1–7 September 2024. Photo © Danny Haelewaters. F. Presentation of fungal specimens collected during guided walk at the Pietraporciana Nature Preservation, Tuscany (Italy) where the Italian Mycology Union and Italian Botany Society organised Mycological Days, 18–20 October 2024. Photo © Simone Graziosi. G. Visit in the WA fungarium at the University of Warsaw (Poland) during the FunDive barcoding workshop, 17–21 March 2025. Photo © Mathias Rocheleau-Duplain. H. Participants of the FunDive barcoding workshop in Warsaw, 17–21 March 2025. Standing from left to right Mathias Rocheleau-Duplain, Marta Tischer, Christos Asimakopoulos, Dominik Knop, Karolina Grabowska, Vasco Fachada, Kinga Walczak, Aneira Williams, João Silva, Anna Mostowska, Heidi Tamm, Marcin Mazurkiewicz, Ana Posta, Anna Galińska, Balázs Palla; sitting from left to right Michał Kochanowski, Julia Pawłowska, Agnieszka Grochowska, Ariadne Furtado, Ivana Kusan, Katarzyna Szlendak, Maria Furman, Sara Piechota; on the floor Beniamin Abramczyk. Photo © Mathias Rocheleau-Duplain. I. Karolina Grabowska-Grucza handling a MinION device in the mobile molecular laboratory in Góry Stołowe National Park (Poland). Photo © Julia Pawłowska.

example, the names *Paxillus involutus* (Batsch) Fr. and *P. rubicundulus* P.D. Orton [= *P. filamentosus* (Scop.) Fr.] have been applied to two species complexes, each consisting of multiple species, potentially with overlapping geographic distributions (Hedh *et al*. 2008; Jargeat *et al*., 2016). To better understand species distribution patterns and host ranges, this genus is one of the FunDive target taxa for the upcoming sampling season.

Species in such complexes can often be separated morphologically by trained field mycologists, whereas in other cases, only DNA can distinguish closely related species. In contrast, species identification in studies of fungal communities based on environmental samples is based solely on DNA sequence data, typically a fragment of the internal transcribed spacer (ITS) barcode region of the nuclear ribosomal DNA. When species are being described, it is recommended that a DNA sequence is linked to the holotype collection (Aime *et al*., 2021). For many classical taxa, this is difficult to achieve either because the type specimen cannot be barcoded or because no type specimen exists at all. Again, in FunDive, we are running a "typification campaign" to address this issue. The goal of this specific campaign is to identify and barcode specimens that can serve as nomenclatural and interpretive types for fungal species currently based on ambiguous or missing original material.

We aim to sequence as many type specimens of fungi as possible from fungaria across Europe and make the resulting data available in public repositories to improve DNA-based delimitation of fungal taxa. Currently, no comprehensive database of fungal type specimens exists. We have access to ~10,000 type specimens deposited at 31 of the total 274 European fungaria (Thiers, continuously updated). We are also collaborating with researchers at the Royal Botanic Gardens Kew, who are undertaking similar work on their extensive fungal collections.

To compare the diversity captured by sequences generated from sporophores and eDNA, we have designed a comprehensive study in pine forests. Using sequences generated from soil, dead wood, passive spore traps, bulk sporophore samples in 200 pine forest locations across Europe, we will (1) analyse how fungal species composition and diversity in pine forests differ across a broad climatic range and (2) compare how different sample types represent fungal communities.

Finally, DNA barcodes of reference specimens and those collected during sampling campaigns will be uploaded via the PlutoF platform and mapped to UNITE Species Hypotheses (Kõljalg *et al*., 2020). These, alongside newly generated eDNA-based sequences and existing datasets on fungal occurrences (*e.g*., GBIF), will be analysed to understand drivers of fungal phenology, diversity, and species composition across Europe. Based on the results of these studies we hope to be able to formulate recommendations for eDNA-based and sporophore fungal monitoring and conservation to policymakers and stakeholders.

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'*Mycena dasypus* rediscovered after 30 years': the sequel

Penny Cullington[1]

Fig. 1. *Mycena dasypus* from Burnham Beeches, November 2020. Photograph © Penny Cullington.

Background

Readers may recall my article entitled as above on this little-known species of *Mycena* (Cullington, 2023). I'd recommend that interested parties might like to read that article through prior to continuing – now available at https://doi.org/10.63482/g4ndx925 – but here is a very brief résumé before I report on some recent interesting developments.

Potted history

Mycena dasypus (Fig. 1) was originally described (Maas Geesteranus & Læssøe, 1992) with a holotype (K-M000018304) collected in 1990 on *Pinus* litter and *Quercus* twigs in a Surrey heathland (Esher Common) and a paratype (K-M000018303) collected in 1991 on a fallen *Rubus* stem in Epping Forest. In autumn 1993 two further collections were made from Kew Gardens, the first on litter of *Ilex* and *Prunus*, the second on *Pinus* needles. Both were determined by Læssøe and are held at Kew together with his notes, which include drawings of microscopic details. Thereafter the species remained in obscurity until 2023 when the paratype held at RBG, Kew, was sequenced in order to ascertain whether it might possibly be a match to the mysterious species I'd been struggling to identify since 2017, having found it growing regularly with *Sphagnum* at Burnham Beeches, Bucks. It was, with 99% ITS similarity. This is a fairly nondescript smallish delicate pale *Mycena* but with remarkably long thin cystidia (on gill edge, stem and cap)—their shape apparently unique to the genus (Figs. 2 & 3). The 1992 type description, however, failed to recognise these cells as cystidia, dismissing them as some invading parasitic fungus, though Laessøe's notes on both 1993 collections refer to them but as 'hairs' rather than cystidia, possibly pointing to his re-evaluation of the original theory describing them as a contaminant of some sort.

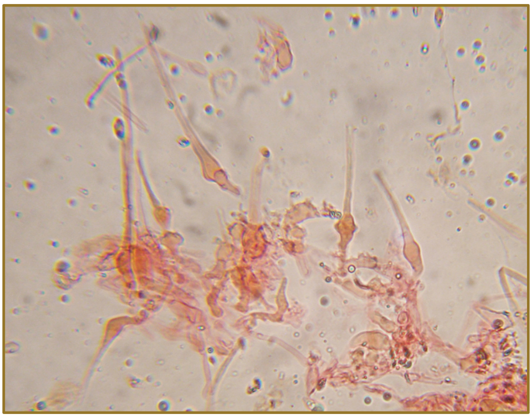

Fig. 2. Cheilocystidia. Photograph © Penny Cullington.

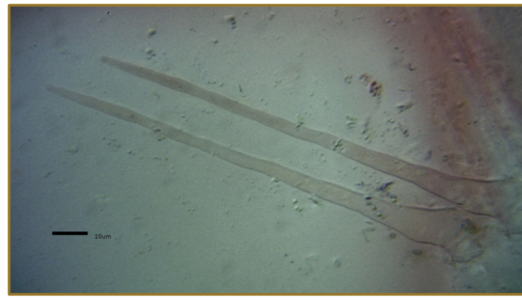

Fig. 3. Caulocystidia. Photograph © Eric Janke.

Developments since my first article (Summer 2023)

The 2024 season was by general consent one of the worst in living memory for fungi in S. England, and that autumn certainly proved a disappointing one for *Mycena dasypus* at Burnham Beeches compared to the previous six years since its discovery in the Mire where it often fruited in impressive numbers in autumn amongst the *Sphagnum*. (It is interesting that the type description includes a comment on its apparently equally common occurrence at the Surrey site.). However, in late October I was surprised and pleased to receive an email from *Mycena* specialist Arne Aronsen who was looking to add details and photos of *M. dasypus* to his excellent *Mycena* website (Aronsen, 2025) though he was personally unfamiliar with the species. (I did try to rectify this by posting him a few fresh samples, but transporting to Norway proved too much of a challenge—he received some nice damp moss and some useless infected rotten specimens!) I was intrigued to learn from him of a recent Spanish paper (Villarreal *et al.*, 2024) describing several collections of *M. dasypus*, confirmed with sequencing, from both Spain and Portugal—the first reports of the species in continental Europe. Interestingly the three Spanish finds (2023) were with woody leaf litter under *Cistus* and *Eucalyptus* and the single Portuguese find (2024) with woody leaf litter under *Quercus*, *Pinus* and *Sphagnum*, giving a much wider range of substrate than experienced at Burnham Beeches where fruiting so far had been solely with *Sphagnum*. The paper makes interesting reading—if you read Spanish! I was lucky enough to have colleague Claudi Soler on hand to help with translation. At one point there is discussion that this *Mycena* may originally have been inadvertently imported from Oceania with *Eucalyptus*, a tree now firmly established in the Iberian Peninsula, though there is no *Eucalyptus* present at Burnham Beeches nor in fact any record of *M. dasypus* from Oceania. It was also apparent from the images shown in the paper that the Spanish and Portuguese collections have more rusty brown colours in the cap than we've seen in our at most off-white British collections (Fig. 4).

Two possible earlier UK collections

There are a few earlier UK reports which I should now mention. Two were from Lancashire – found by John Watt – which appeared to match well to *M. dasypus* though neither was

Fig. 4. *Mycena dasypus* from Iberian Peninsula 2023. Photograph © A. Couceiro & M. Villarreal.

Fig. 5. Collection from Stoke Common, November 2022. Photograph © Russell Ness.

substantiated with DNA sequencing therefore consequently omitted from my first article. The first, John informed me, was of a single *Mycena* specimen found on a *Rubus* stem in early 2021 which matched nothing he could find in available literature: could I help? Though the substrate seemed somewhat remote from the *Sphagnum* in mire which was at that stage the only habitat we knew for this unidentified species, his specimen appeared so similar that I suggested he send it to me for molecular sequencing together with my collections. However, when sent to Eric Janke and Aberystwyth University his sample sadly failed, though we did now have several viable sequences from the Burnham Beeches collections though they matched nothing in GenBank or Unite. (See my first article for more on this.) Then in late 2022 John made a second collection, this time growing on an unidentified herbaceous stem, but again despite obvious similarities I had my doubts if it could be the same species because of what at that stage appeared to be an unlikely substrate. In late 2022 a further collection was found by Bucks Fungus Group member Russell Ness at Stoke Common – only a few miles from Burnham Beeches and another acidic heathland site – this time from amongst a clump of *Juncus* (Fig. 5). However, it was not until Aronsen alerted me to

Fig. 6. Collection on *Castanea* husk, September 2024. Photograph © Dave Shute.

the Spanish paper two years later, which describes the substrate as clearly more diverse and not restricted to *Sphagnum* as I'd thought, that with hindsight I realised the possible significance of John's two earlier collections, the substrates of which were now looking much more plausible.

Four more sequenced UK collections

This wider range of substrate for *Mycena dasypus* is now further confirmed in the UK. In 2020 Alick Henrici found a mysterious 'mycenoid' in Kew Gardens on buried roots under *Pinus* though it was not identified until sequenced in 2023 (see footnote in my first article). More recently, in 2024 *M. dasypus* was sequenced from collections found in Hampshire by Eric Janke: in September on a *Castanea* husk (Fig. 6); in November on a grass stem; in December in litter under conifer and *Betula*. Finally last December I collected a small whitish *Mycena* at Burnham Beeches fruiting on fallen *Quercus* wood and to my surprise a 'scope quickly revealed the familiar tell-tale cystidia. Sadly this collection failed when sequenced, however.

Claudi Soler's interesting theory

When Claudi sent me his translation of the Spanish paper he suggested a possible theory which might provide an explanation for the diversity in substrate between the Iberian collections and those from Burnham Beeches. He observed that though the soil type is not mentioned in the paper, *Eucalyptus* is notorious for causing impoverished soil, leaving it so acidic that nothing else thrives beneath the trees. Areas of mire such as at Burnham Beeches also have nutrient-poor acidic soil: could the acidic soil be the missing link? This led to further research with the following interesting results:

England. Bucks, Burnham Beeches (Cullington 2017-24) & Stoke Common (Ness 2022): both sites with acid sandy soil. Essex, High Beach Epping Forest (Henrici 1991): acid clay soil. Hants, New Forest area (two of Janke's three collections (2024): acid; the third (on *Castanea* husk) not so. Lancs (Watt 2021/2): the first collection in woodland - not acid; the second collection possibly acid - not confirmed. RBG Kew (EW Brown & Laessøe 1993, Henrici 2020): acid to neutral soil. Surrey, Esher Common (Læssøe & Spooner - holotype collection, 1990): similar in habitat to Burnham Beeches, i.e. wooded heathland with wet boggy areas – acid sandy soil. **Iberian Peninsula** sites (2023/4): - acid, recently confirmed by M. Villarreal.

Observations

- As a result of DNA sequencing enabling us to identify all the various collections of this *Mycena* as one species, we are now better placed to recognise the diversity of substrate involved together with the apparent preference for acidic soils. This opens up the possibility that the species may occur much more widely than had at first been realised. Is it really as rare as the few records above would suggest?
- It would be useful to augment the species description to include the recently realised diversity of substrate and habitat together with soil preference now so much more detail has come to light.
- As *M. dasypus* is omitted from any existing key, also barely mentioned in any monograph or handbook, it is only likely to be recognised or identified by those with a knowledge of this article, my previous article or the 2024 Spanish paper. In my opinion, at the moment, the most likely scenario for discovering its identity is via a close match to our several sequences held at GenBank. Much more likely is that such a find would join the ranks of those frustrating collections which come out at the end of a key unsolved: very unsatisfactory, and there probably isn't a mycologist amongst us who hasn't experienced this!

Description

The species description in the Spanish paper is comprehensive and excellent, but for convenience and in view of the observations above I felt the inclusion of a description here would be useful. It might also be beneficial for Mycenologists to insert appropriate notes into whatever literature they like to use for the genus, stressing those amazing and remarkable cystidia—this would go some way to compensate for the absence of the species in available keys, etc.

Mycena dasypus Maas Geesteranus & Læssøe, (1992).

Etymology: dasypus—hairy foot, also derived from the Greek for 'hare'.

Type collection placed in Section *Polyadelphia* but the Spanish authors now place it in Section *Fragilipedes*.

A typical delicate and pretty *Mycena*, small in stature. **Cap** to 10 mm across, campanulate, thinfleshed and translucent striate to fluted, pale to off-white with pinkish tinge (Spanish collections more beige to rusty brown) and with slightly darker centre, surface somewhat pruinose. **Gills** not crowded, up to 18 reaching the stem with lamellules between, adnate, concolorous. **Stem** to 80 × 2 mm, cylindrical, fragile, concolorous above though gradually darker below, entirely pruinose, base fibrillose. **Smell and taste** insignificant. **Spore print** white.

Basidia 4-spored; spores pip-shaped, amyloid, 8–9 × 3–4 µm, Q av. 2.3–2.7; **cheilocystidia** to 60 × 10 µm, forming a sterile band, smooth, lageniform with or without pedicel, narrowing abruptly with notable lanceolate extension only 2 µm wide (at lower power reminiscent of the rostrate cystidia of *Pluteus thomsonii* extending well beyond the gill edge), sometimes forking; occasional secondary, much smaller, pyriform cystidia with a few low excrescences can be found, more typical of members of Sect. *Polyadelphia*; **pleurocystidia** absent; both **caulo- and pileocystidia** present, similar to cheilocystidia.

Substrate and habitat known so far: in UK mainly with *Sphagnum* in wet boggy areas when gregarious, sometimes in good numbers, but also amongst woody debris, both deciduous and coniferous, and on stems of vegetation; in Iberian Peninsula mainly in litter, both leaf and woody, with *Eucalyptus* and *Cistus*, also with *Pinus* and *Sphagnum*. A preference for acidic soil is now apparent but further data is needed.

What next? A request

One can surmise that though we know that *M. dasypus* has been present at Burnham Beeches since 2017, often fruiting in abundance, it may well have been present there (and elsewhere) though unobserved or overlooked from time immemorial. I find it hard to believe that it is genuinely rare, and the records now beginning to trickle in to give us a better insight into habitat surely point to the likelihood that it is ‘out there’ but for whatever reason remains elusively under the radar.

I would therefore like to ask all *Mycena* devotees to keep a look out for this species, bearing it in mind when coming across smallish pale specimens which fail to key out or to fit with other more familiar species. The microscopic characters are so unusual and, dare I say, almost unmistakeable! If you find it, make a careful note of (a) the substrate and habitat and (b) the cap colour – both these details need better clarification to give us a fuller picture of the species, furthermore it’s not impossible that there may be some link between the variation in cap colour depending upon habitat, climate and latitude. *M. dasypus* may have been first described 25 years ago but it is still so little known; this is an opportunity for citizen science to make a valuable contribution by helping to increase our knowledge about a species which may prove to have its stronghold in this country.

If you do find it, please get in touch – I’d love to hear from you!

Acknowledgements

I’d like to thank several people for their assistance in various ways. Claudi Soler kindly translated parts of the Spanish paper for me and also alerted me to the issue regarding soil conditions; Eric Janke supported and assisted throughout with preparing collections for sequencing, analysing results and he also discovered the three 2024 collections from Hants; Aberystwyth University, with funding from the BMS, provided Eric with the vital sequences which have secured the identification of the species; Manuel Villarreal, Martyn Ainsworth, Alick Henrici, Eric Janke, John Watt and Tim Rogers all provided additional information about soil conditions; Dave Shute provided a useful photo; Martyn Ainsworth also provided invaluable editing assistance.

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Fungi Royale from Kensington Gardens and Hyde Park

Andy Overall[1]

It had been 15 years since I carried out the first larger fungi survey of Kensington Gardens, so it was an honour to be asked again in 2024, this time with the addition of Hyde Park.

It is tempting to compare the outcome of the two Kensington Garden surveys. Regarding fungi, however, this would be rather foolhardy because various elements, such as weather conditions and atmospheric pollution, influence the fruiting occurrence of many fungal species.

Kensington Gardens and Hyde Park are the most popular of the Royal Parks. A 2015 Ipsos MORI survey revealed that Kensington Gardens had 10.3 million visitors that year. This can only have risen over the period to 2024. As a result, this will have impacted habitats and fungal populations, especially through soil compaction, which was noted during the 2024 survey.

Kensington Gardens

The 98 hectares that constitute Kensington Gardens are home to 3,650 trees, dominated by *Quercus* (oak), *Castanea sativa* (Sweet Chestnut) and *Tilia* (lime) with a smattering of *Fagus sylvatica* (Beech), *Carpinus betulus* (Hornbeam), *Taxus baccata* (Yew), *Quercus ilex* (Holm Oak) *Populus* (poplar), *Betula pendula* (Silver Birch), *Salix* (willow) and *Alnus cordata* (Italian Alder) as well as *Alnus glutinosa* (Alder). There are also a number of *Platanus* × *hispanica* (London Plane), *Acer pseudoplatanus* (Sycamore) and *Aesculus hippocastanum* (Horse Chestnut) trees present. Dead wood is well represented.

Grassland accounts for 87 hectares, which includes acid grassland remnants among the dominant amenity grassland sward.

Soils are generally free draining, mildly acidic brown earths of a sandy loam texture, overlying river terrace gravels. Two water features—the Round Pond and the Long Water—provide additional habitat diversity on the site. The banks of the Long Water provided some good records.

Hyde Park

The 140 hectares that comprise Hyde Park contains 70 hectares of amenity grassland, circa 28 hectares of neutral grassland and small pockets of acid grassland. There are approximately 3,970 trees. 37% of the tree cover in Hyde Park is *Platanus* × *hispanica* (London Plane), which is non-ectomycorrhizal, accompanied by smaller numbers of *Tilia* × *europaea* and *T. cordata* (Common and Small-leaved Lime), *Aesculus hippocastanum* (Horse Chestnut) and *Castanea sativa* (Sweet Chestnut), and *Quercus robur* (English Oak). These six species account for over two thirds of the trees in the park. The soils, unsurprisingly, are the same as those in the adjacent Kensington Gardens. There are also small numbers of *Fagus sylvatica* (Beech), *Betula pendula* (Silver Birch), *Carpinus betulus* (Hornbeam), *Quercus cerris* (Turkey Oak), *Populus* (poplar) and *Corylus avellana* (Hazel) throughout the park. Dead wood is well represented.

The Long Water of Kensington Gardens connects with The Serpentine in Hyde Park and, although differently named, they are in fact the same water body. The banks of The Serpentine are

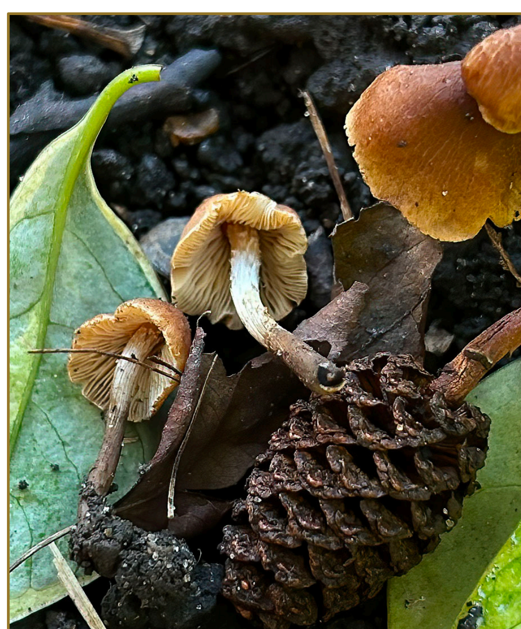

Fig 1. *Alnicola salabertii* in Kensington Gardens - New to Britain. Photograph © Andy Overall.

less tree-lined than those of the Long Water, and therefore fewer fungi were found upon its banks.

Some important fungi found during the survey

Alnicola salabertii P.-A. Moreau & Guy Garcia (2005) [2004]. Kensington Gardens (Fig. 1).

A rather nondescript species, appearing very much like other *Alnicola/Naucoria* species associating with *Alnus*. However, this species is so far only known to occur with *Alnus cordata* (Italian Alder), with which it was occurring on the banks of the Long Water in Kensington Gardens. Its name was validly published in 2005 from natural stands in Corsica and plantations in continental France. The ITS barcode sequence derived from the first British collection was over 99% similar to several GenBank sequences labelled as *A. salabertii*, including two sequences from collections made by P.-A. Moreau and published in Moreau *et al.* (2005). A distinguishing feature, apart from associating with *Alnus cordata*, is the relatively small, non-dextrinoid spores.

<u>Description of the illustrated collection</u>

Collected on 26 November 2024.

Habitat: parkland, in soil, on riverbank with *Alnus cordata* (Italian Alder). **Cap** 10–70 mm, ochre-brown, hygrophanous, slowly drying and becoming beige, conic-convex, when young with white velar remnants at the margin, less so at the centre. Margin incurved when young. **Gills** adnate to notched, whitish, pale brown, becoming brownish grey in maturity, edge white, serrulate. **Stem** 30–33 × 3–15 mm, cylindrical, with coarse white fibrils in upper third, then darkening, blackening toward the base. **Flesh** cream, dark brown in stem. **Smell** raphanoid-herbaceous. **Taste** not sampled but otherwise described as bitter after 2–3 seconds. **Spores** 6.91 × 3.98 µm average from 29 measured spores, with distinct yet irregular spines, non-dextrinoid to very weakly dextrinoid, some with single guttule, amygdaliform. **Cheilocystidia** 25–50 × 5–10 µm, bulbous base with thin worm-like, lanceolate neck always with a rounded apex. **Pleurocystidia** absent.

Kew accession number K-M001445223. Sequence data is accessioned on GenBank: PV577429.

Bjerkandera fumosa (Pers.) P. Karst. Kensington Gardens (Fig. 2).

This is a species that I have been looking out for, for many years in London and elsewhere, without

Fig 2. *Bjerkandera fumosa* in Kensington Gardens. Photograph © Andy Overall.

success until now. Not surprising since *Bjerkandera fumosa* is far less common than its ubiquitous cousin, *Bjerkandera adusta*. The latter is easily identified in the field by its grey pores. The FRDBI holds 443 records of *B. fumosa* across Britain & Ireland. These records run from 1886 to 2024, 139 years, making this an uncommon to rare species. In comparison, over 7000 records of *B. adusta* have been recorded since 1799 making this a common and widespread species.

Since 1958 only 13 records of *B. fumosa* have previously come from Middlesex, the last being in 1998.

There are many matching sequences with >99% similarity labelled as *B. fumosa* in GenBank and UNITE including one from material collected in Surrey (AJ006673).

<u>Description of the illustrated collection</u>

Collected on 26 November 2024.

Habitat: this collection was found on the remains of a young, standing, dead *Ulmus procera* (English Elm) tree on the banks of the Long Water.

Fruitbody sessile, 50–80 mm, light brown, latte, very weakly zoned, upper surface finely velutinous, becoming glabrous, uneven, slightly lumpy. **Pores** cream-white, 2–4 per mm, bruising light brown where rubbed. **Flesh** cream, darkening slightly when cut and with a thin brown line between flesh and tubes, visible when cut in section. **Smell** disagreeable, weak; an odour of anise is mentioned in other collections. **Taste** not sampled. **Spores** 4.70 × 2.95 µm an average from 24 measured spores, ellipsoid, smooth. **Hyphae** monomitic with numerous clamp connections.

Kew accession number K-M001445342. Sequence data is accessioned on GenBank: PV595900.

Fig 3. *Cortinarius megacystidiosus*. Photograph © Andy Overall.

Cortinarius megacystidiosus Reumaux. Kensington Gardens and Hyde Park (Fig. 3).

During research by Kuyper *et al.* for Vol 8, Flora Agaricina Neerlandica, *Cortinarius*, 2024, they were unable to find any consistent morphological differences between accessed barcoded collections of *C. megacystidiosus* and *C. flexibilifolius* and chose to combine them, with the unambiguous and earlier name, *C. flexibilifolius* having priority. Furthermore, the study revealed that the long, septate cystidia that inspired the epithet of *megacystidiosus*, were also found in accessed barcoded collections of *C. flexibilifolius*. Both holotypes are however, included in the phylogenetic tree on p.435 of the monograph (Kuyper *et al.*, 2024).

The tree used in FAN Vol. 8 *Cortinarius* has been adopted from Liimatainen *et al.* (2002) and shows that the two taxa cluster distinctly and separately.

As *C. megacystidiosus* was only added to the Checklist of the British & Irish Basidiomycota (CBIB) in 2020 and could be easily confused with similar-looking species, its distribution in Britain is not yet fully understood. Three collections are held at the Kew Fungarium as *C. megacystidiosus*, the first from 2018 is a collection by me from NW London, the 2nd and 3rd collections, 2018 & 2021 respectively, are from Kent. The 2018 collection from Kent was sequenced and matched to the holotype sequence by Kare Liimatainen at Kew in 2020. *Cortinarius flexibilifolius* was then added to the checklist by Kare in 2021 from collections made in 2002 (Surrey) and 2007 (Radnorshire).

Currently there are no records of *C. megacystidiosus* held on the FRDBI, despite the three collections held at Kew, most probably due to the ambiguity surrounding the correct name. There is however, one uncertain record of *C. flexibilifolius* from Oxfordshire in 2023.

Interestingly, this was recorded from both Hyde Park and Kensington Gardens during the survey, with 99.8% (Kensington) and 100% (Hyde Park) DNA matches being made with the type specimen of *C. megacystidiosus*.

Following considerable debate, I have decided to stay with the name *C. megacystidiosus* despite the difference of opinion surrounding it.

<u>Description of the illustrated collection</u>

Collected on 23 October 2024 (Fig. 3) in parkland with *Quercus robur* (English Oak) and *Tilia* × *europaea* (Common Lime) on London clays with gravels.

Cap 15–30 mm, conic-convex, smooth, dark brown, hygrophanous, becoming light brown from the margin inwards. Veil white-cream, visible at margin when young. **Gills** emarginate, sub-distant, cinnamon to rust brown, edge creamy white to concolorous, entire. **Stem** 35–55 × 2–3 mm, brown with white velar covering and annular zone, darkening with age, cylindrical. **Flesh** ochraceous brown in cap, yellowish brown in upper stem, dark brown toward the base. **Smell** absent. **Taste** not sampled. **Spores** 9.60 × 5.17 µm, an average from 35 measured spores. Ellipsoid, amygdaliform, strongly dextrinoid in Melzer's reagent.

Kew Accession Number K-M001445438. Sequence data is accessioned on GenBank: PV577443.

Inocybe grammatoides Esteve-Rav., Pancorbo & E. Rubio. Hyde Park (Fig. 4 & 5).

This is a rare species with only two British records, both of which are from Middlesex and from Royal Parks, the first was from my Bushy Park survey in 2021 (Overall, 2022).

The Hyde Park collection was of course DNA sequenced, as was the first British collection, and both were found to be a 100% match to the holotype.

Fig 4 (above). *Inocybe grammatoides* in Hyde Park. Photograph © Andy Overall.

Fig 5 (right). *Inocybe grammatoides* in Hyde Park. Photograph © Andy Overall.

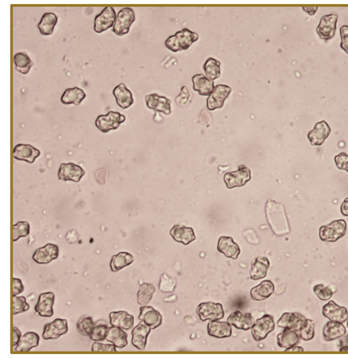

Fig 6. *Inocybe grammatoides* spores. Micrograph © Andy Overall.

Both collections were found beneath *Quercus robur* on shingly, neutral, clay soils.

This species is very similar to *Inocybe grammata* hence the given epithet which means, "like *I. grammata*". The two species have most probably been confused before now. The persistent white veil covering the cap and differently shaped spores help separate *I. grammatoides* from *I. grammata*.

<u>Description of the illustrated collection</u>

Collected on 30 October 2024.

Cap 25–30 mm, conic-convex, pinkish grey to pale brown covered with a persistent, dense white veil, therefore appearing white, margin incurved. **Gills** not particularly crowded, whitish becoming pinkish buff, smooth to finely crenulate, uneven, edge white. **Stem** 44–50 × 5–6 mm, white, pink, fibrous, cylindric with swollen base, pruinose. **Flesh** white–cream. **Smell** weakly spermatic; reported aromatic element not detected. **Taste** not sampled. **Spores** 8.20 × 5.20 µm (7.0–9.8 × 4.4–5.9 µm) 33 spores measured. Heterodiametric, polygonal-sub-rectangular with 4–5 low knobs. Somewhat *Entoloma* like (Fig. 6). **Cystidia** cheilocystidia, pleurocystidia and caulocystidia from apex to the base of the stem, all metuloid and with thick walls. 52.3–64.8 × 16.7–17.9 µm. Walls 1.6–3.9 µm thick.

Kew Accession Number K-M001445302. Sequence data is accessioned on GenBank PQ645076.

Additionally, an *Otidea* species was collected from Kensington Gardens on 16 October 2024, the sequence of which matches the holotype of *O. cupulata*. Research into this collection is ongoing (Parslow & Overall in prep.).

Acknowledgements

Big thanks to the BMS DNA sequencing programme, to Caron Hughes for sequencing at Aberystwyth University and to David Harries for help in interpreting the results.

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Fun with aquatic hyphomycetes

Fay Newbery[1]

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).

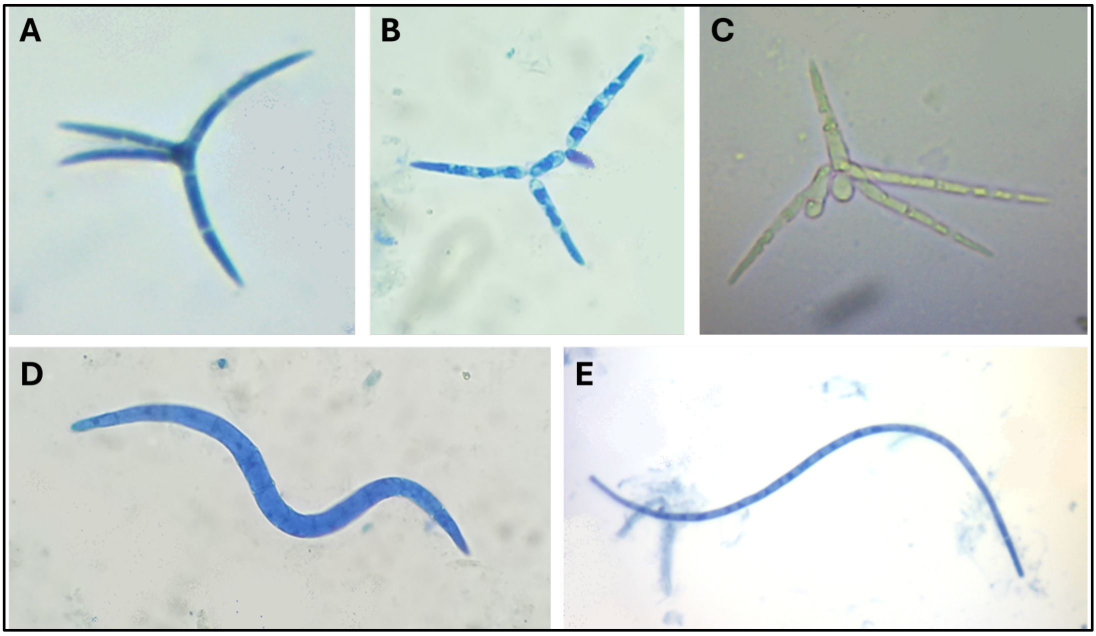

Fig. 1. Aquatic hyphomycete spores. A, B, D and E dyed with aniline blue. A-C Tetraradiate spores with four 'arms': A *Alatospora acuminata*. One of the UK's smallest and most common aquatic hyphomycetes. B *Articulospora tetracladia*. C *Tetracladium marchalianum*. D-E Sinuous spores which curve in 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.

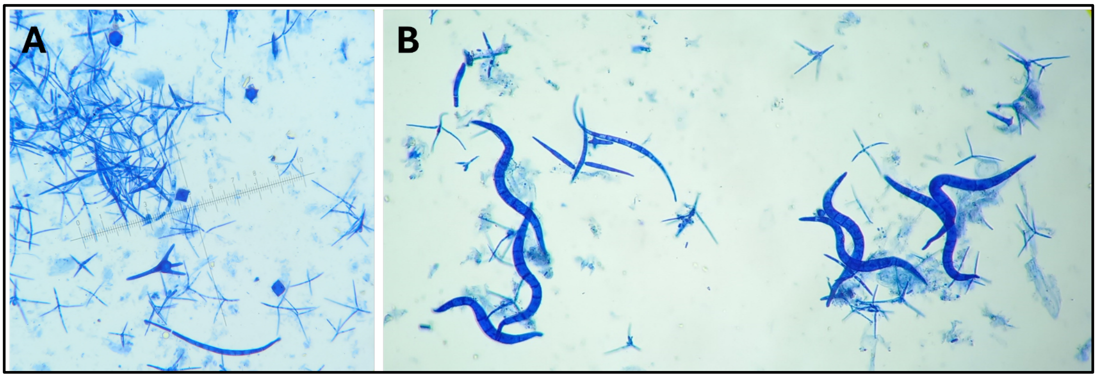

Fig. 3. Two river foam samples, both dyed with aniline blue. Photographed under a ×20 objective. (A) River Aeron in Aberaeron below a weir, November 2024. (B) Small stream in woodland in Parc Natur Penglais in Aberystwyth, November 2024. Micrographs © Fay Newbery.

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.

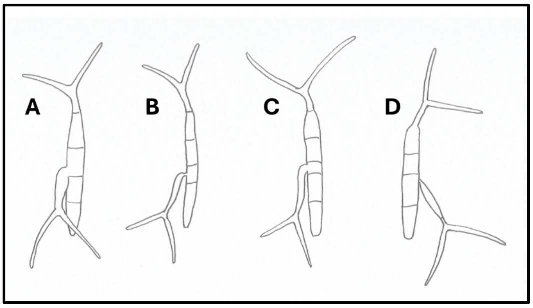

Fig 4. *Collembolispora barbata* spores. (A) North-west Portugal. Described in 2003. (B) Mid-West Yorkshire (vc64), Harrogate, 2024. (C) South-west Yorkshire (vc63), Near Slaithwaite, 2018. (D) North Somerset (vc6), Bristol, 2021. Line drawings © Fay Newbery.

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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Three Interesting *Cortinarius* Species from Anglesey and Caernarfonshire

C. E. Aron[1]

Thaxterogaster subporphyropus from Pentraeth, Anglesey, a second British record

On a brief walk through broad-leaved copses and pasture woodland close to my home during early October 2019, a small, viscid *Cortinarius* was found in grass under an isolated oak. The area where the fungus was encountered, to the southeast of Pentraeth, on Anglesey, consists of a broad ridge with Precambrian greenschist rock outcrops, giving rise to neutral to acid soils (N. Brown, pers. comm.) covered in abundant gorse (*Ulex*) with associated Greater Broomrape (*Orobanche rapum-genistae*).

Identification to the *Purpurascens* group within *Thaxterogaster* (formerly *Cortinarius*) was easy, with the purplish stipe and lamellae and darker purple bruising, however, getting to species level was trickier as the Pentraeth material was much more gracile than other British species in the group, and its spores were too large. *Thaxterogaster subporphyropus* was considered, and the spore size fitted, but my specimens seemed too large for that taxon, stated to have a cap diameter no greater than 4 cm in Kibby & Tortelli (2021). With this uncertainty it seemed a good idea to have the material sequenced and this was carried out at both Aberystwyth and Alvalab. Both sequences were similar and the latter, accessible as GenBank PP741535, closely matched (99.8%) the sequence derived from the holotype of *T. mendax*, not on the British list, which seemed ideal as the collection did not seem to match others in the group. However, it has been found that barcode sequences derived from the holotypes of *T. subporphyropus* and *T. mendax* match closely enough for the species to be considered as synonyms (K. Liimatainen, *in litt.*). This, of course, implies a wider species concept for *T. subporphyropus*, whose name takes priority, certainly with regard to cap size. It also transpired that this was not a new British record because material in the Kew Fungarium collected from East Suffolk (Minsmere) in 2009 had been sequenced by Wang and Liimatainen and determined as this taxon as reported in Ainsworth & Henrici (2023).

A description of the Pentraeth material (Fig. 1) is given below.

***Thaxterogaster subporphyropus* (Pilát) Niskanen & Liimat.**

Wales, Anglesey (VC52), Pentraeth, Rhiwlas, (SH53257886) under *Quercus*, 3/10/19. Fung. C.E. Aron 4332.

Cap. 27–60 mm. Shallow convex to slightly depressed with age. Margin slightly incurved. Viscid. Yellowish-brown, darker towards the margin. **Lamellae**. Moderately crowded. Slightly emarginate. Violaceous, bruising darker violaceous, becoming rust-coloured with age. **Stipe**. 25–35 × 7–8 mm. More or less equal. Quite bright violaceous. **Flesh**. Violaceous. **Smell**. Sweetish. **Spores**. Ellipsoid, moderately to strongly verrucose, 10.2–11.6 × 6–6.6 µm (Fig. 1B).

A similar, more slender collection was made under *Quercus rubra* at Plas Cadnant in 2014 and may well turn out to also be *T. subporphyropus*.

Phlegmacium olidoamethysteum, new to Britain from Capel Curig, Snowdonia

During August 2017 a pale *Cortinarius* with a strong, sweetish smell was found in an acid beechwood close to Capel Curig in Snowdonia (Fig. 2). My son and I have visited this area of upland woodland in August for a number of years, almost as an annual ritual. The woodland is rich in mycorrhizal fungi and is a stronghold for the rare *Lactifluus volemus* within north west Wales.

Although the fungus was distinctive and appeared to be in subgenus *Phlegmacium* (a rarity in Snowdonia), the species was unclear. I speculated on *C. argutus* but that species is associated with *Populus* on clay soils and it is not known to have such a sweet smell. Material was sent to Alvalab and the derived sequence was identical to that of an unnamed *Cortinarius* (Section *Elastici*) collection from Quebec. A subsequent LSU (Large Subunit) sequence indicated a taxon close to *olidus*, and also *papulosus*, a pale species which seemed close to

Fig. 1. *Thaxterogaster subporphyropus*. A: collected specimens. B: spores. Photographs © Charles Aron.

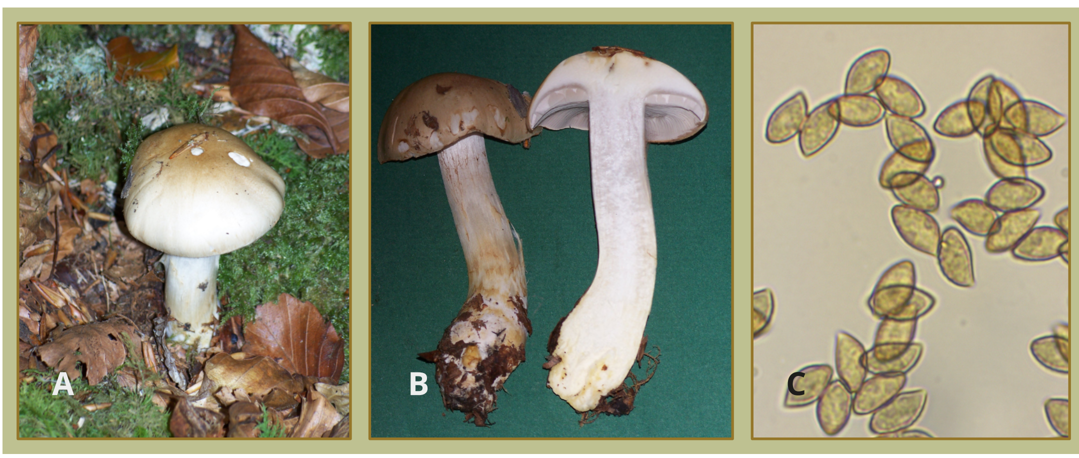

Fig. 2. *Phlegmacium olidoamethysteum*. A: *in situ*, Capel Curig, Snowdonia. B: in cross-section. C: spores. Photographs © Charles Aron.

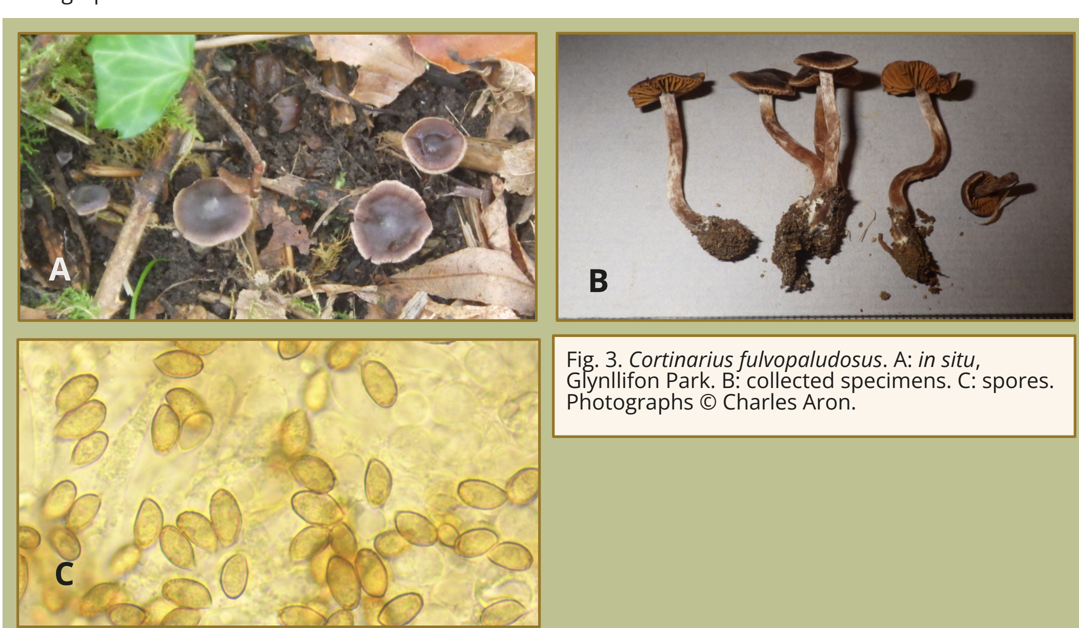

Fig. 3. *Cortinarius fulvopaludosus*. A: *in situ*, Glynllifon Park. B: collected specimens. C: spores. Photographs © Charles Aron.

the Capel Curig find. I had not taken *Cortinarius olidus* into account before as in Breitenbach & Kränzlin (2000), for example, a rather brightly coloured *Phlegmacium* is figured, with abundant yellow veil bands. However, my photo of the Capel Curig specimen did, indeed, show some yellowish veil banding which, together with the distinct smell, pointed to a link with *C. olidus* but the habitat, although with *Fagus*, was on acid soils, not calcareous. The sequence was sent to Kare Liimatainen who consulted his extensive database of *Cortinarius* sequences and came to the rescue with *Cortinarius olidoamethysteus*, now recombined in *Phlegmacium*. This appears to be a boreal taxon with most records from southern Norway and Sweden, as well as Finland, the Baltic states and an isolated record from eastern Europe (see https://www.gbif.org/species/3347809). The photos accompanying the distribution map match the Capel Curig specimen well, a description of which is given below.

***Phlegmacium olidoamethysteum* (Rob. Henry & Ramm) Niskanen & Liimat.**

Wales, Caernarfonshire (VC 49), Capel Curig (SH 72545756), 29/8/17. Fung. C.E. Aron 4033.

Cap. 45 mm. Domed–convex. Dry. Beige, darker towards the centre. Margin slightly incurved. **Lamellae**. Very crowded. Concave. With abundant lamellules. Pallid when young with a slight violaceous tint. **Stipe**. 70 × 15 mm, 20 mm at base. Clavate. Cream with grey–ochre veil zones over lower half, with violaceous tints over the upper half. **Smell**. Strong and sweet, similar to *Hebeloma sacchariolens* group. **Flesh**. Pallid, with violaceous tints over the upper half of the stipe. **Spores**. Amygdaliform, weakly verrucose, 10–10.6 × 5.2–5.7 µm (Fig. 2C).

Cortinarius fulvopaludosus, new to Britain from Glynllifon Park, Caernarfon

Glynllifon Park is an area of wooded parkland situated to the south of Caernarfon and surrounding the stately pile, Glynllifon Hall. During the autumn of 2022 a fungal survey was carried out there on behalf of Gwynedd County Council. Under the exotic conifers and other introduced trees fungi were generally scarce but there was one small area of beech and oak on the south western flank of the parkland where mycorrhizal fungi were abundant and diverse, including uncommon species, at least in north west Wales, such as *Boletus aestivalis* and *Amanita pantherina*. In the same area, a group of a small, dark *Telamonia* species was found (Fig. 3). They struck me as interesting, with the black-brown caps contrasting with the slightly olivaceous-tinged lamellae and reminded me of the myriad small, dark species found on dwarf shrub heaths. The specimens were dried and material sent to Alvalab, Spain for DNA analysis. The resulting sequence was passed onto Martyn Ainsworth who conferred with Kare Liimatainen, then working on *Cortinarius* at Kew, and it transpired that this sequence was identical with that derived from the Finnish holotype of *Cortinarius fulvopaludosus*, new to Britain. While it was very pleasing to receive this result it was also puzzling as my specimens were not fulvous and the habitat was well-drained. See Liimatainen (2017) for type description. However, in Kokkonen (2020) *C. fulvopaludosus* is shown to be a very variable taxon with an Italian collection with an identical sequence to the type also having a dark brown cap. Another boreal collection, whose ITS sequence differed slightly from that of the type, had a dark brown, obtusely umbonate cap, similar to the Glynllifon collection.

A description of the Glynllifon specimens is given below.

***Cortinarius fulvopaludosus* Kytöv., Niskanen & Liimat.**

Wales, Caernarfonshire (VC 49), Glynllifon Park, Caernarfonshire (VC 49, SH45655523), 6/10/22. Fung. C.E. Aron 4701.

Cap 9–13 mm. Expanded umbonate. Sericeous. Blackish-brown with a greyish bloom at the umbo. Pale and faintly striate at the concentrically ridged margin. **Lamellae** crowded. With abundant lamellules, *circa* 2 mm broad. With a distinct olivaceous tinge. **Stipe** dark brown, overlain by whitish veil fibres. **Flesh** dark brown with a distinct white patch at the stipe apex. **Smell** quite strongly raphanoid. **Habitat**. Under *Quercus* with *Fagus* in rather open broad-leaved woodland. **Spores**. Ellipsoid, finely verrucose. 8–10 × 4.9–5.9 µm (Fig. 3C).

In Kibby & Tortelli (2021) mention is made of the fact that some Cortinarii are only identified with confidence by sequencing and, given its small size and variability, this certainly applies to *Cortinarius fulvopaludosus*.

Acknowledgements

Many thanks to Kare Liimatainen and Martyn Ainsworth for their help with identification, to David Harries and University of Aberystwyth staff for DNA extraction and sequencing of the *Thaxterogaster subporphyropus* material, to staff at Alvalab for sequencing the material of all three collections and to Nigel Brown for information on geology.

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Fungal Futures: Conservation news and views

Matt Wainhouse[1], Rich Wright[2] & Kat O'Brien[3]

Species recovery in England

Species conservation stole the spotlight in August with the launch of Natural England's new Threatened Species Recovery Actions (TSRA) database (Wilkins *et al.*, 2025). It maps out what more than a thousand species need when broad-brush habitat improvements—even at a landscape scale—aren't enough.

The database draws together England's 'priority species' from Section 41 and those classed as threatened or near-threatened on official GB Red Lists (for fungi, this is only the boletes and lichens and their associated fungi). In all, TSRA includes actions for 129 fungi, made up of 66 non-lichenised macro-fungi, 49 lichens, 7 lichenicolous fungi, and 7 non-lichenised micro-fungi.

The actions vary dependent on the species and its needs. For example, actions include survey and production of species dossiers for *Amanita friabilis* and *Desarmillaria ectypa*; autecology research for *Cotylidia pannosa*, *Tremella moriformis* and *Myriostoma coliforme*; establishing the taxonomic status of *Boletus immutatus* and *Microglossum olivaceum*; and trialling management and reintroductions for *Puccinia scorzonerae*, *Chlorencoelia versiformis* and *Hericium coralloides*. One action all non-lichenised macro-fungi share is the urgent need for a conservation assessment (or re-assessment for the boletes) under the IUCN criteria.

Crucially, the TSRA is not a one-off publication. It is a dynamic database designed to help hit the Government's extinction risk targets under the Environment Act, and as such will be the focal point for species-level funding within Natural England. It will also be regularly updated to ensure it stays relevant. It currently accounts for around 20% of the threatened lichens in England with the remaining 80% of species to be given actions in future updates. Similarly, as new GB Red Lists for fungi are adopted, newly assessed threatened species will be added.

Many individual experts have either contributed to or reviewed TSRA data. Chris Knowles, Shelley Evans and Peter Roberts, in particular, have made significant contributions on the fungi side—to give credit where credit's due.

Fig 1. Observation of escaped Golden Oyster Mushroom (GOM) in the UK made by Heather Clarke (2025). Photograph © Heather Clarke.

The invasive Golden Oyster Mushroom

The Golden Oyster Mushroom (GOM), *Pleurotus citrinopileatus* (Fig. 1), is an attractive, easy-to-cultivate, and popular edible wood saprotroph originating from Eastern Asia. Today it is cultivated worldwide and is a mainstay for both small- and large-scale commercial mushroom growers in the UK, as well as being favoured by home cultivators. However, GOM is also one of the first commercially cultivated fungi known to have escaped from controlled environments into natural habitats, and it has been recognised as invasive in several countries.

The species rose in popularity among American growers in the early 2000s and was first recorded as an escape into North American forests around 2010. Since then, it has spread rapidly across eastern North America (Bruce, 2018; Veerabahu *et al.*, 2025). In the UK, golden oysters are now established at three sites in northern England and the Midlands. At least one of these populations has been present for several years, and the species is already well established in a number of European countries.

Despite its subtropical origin, GOM has proven adaptable to cooler temperate regions, tolerating winter freezes and producing sporocarps from early spring onwards in some places (Bruce, 2018).

Like native oyster mushrooms, it is most often found on hardwoods such as beech, oak, elm, and ash. While its fruiting seasonality in the UK is not yet clear, current observations suggest that early summer fruiting is possible, with multiple flushes following.

A recent paper by Veerabahu *et al.* (2025) has confirmed that aggressive commercial strains of GOM, selected for their rapid substrate colonisation and prolific sporocarp production, displace other wood-inhabiting saprotrophs. Genetic evidence from American populations also suggests repeated escapes of commercial strains. Concerns are heightened by the potential for hybridisation with native British *Pleurotus* species, which has already been demonstrated to be possible with *P. pulmonarius* (Rosnina *et al.*, 2016) and *P. cornucopiae* (Yoo *et al.*, 2006).

Alongside other work the authors are undertaking to address this threat, an informal meeting was held with members of the fungi cultivation community at the recent *All Things Fungi Festival*. The session went very well, with many supportive and thoughtful responses from small- and medium-scale growers, who shared concerns for the health of our habitats. The festival organisers had already shown foresight by requesting a site-wide ban on GOM this year, which greatly helped in getting the message across.

This species raises a number of wider issues around biosecurity, cultivation practices, and the applied use of fungi in our environment. It is through two-way communication at this community level that the most rapid and effective changes can be made to respond to the threat, and we hope this will encourage larger growers to follow suit.

If you think you have spotted GOM, we would very much like to receive your records. Please submit them through the usual routes: FRDBI, iNaturalist, or iRecord, and also post on the British Mycological Society Facebook page (https://www.facebook.com/groups/18843741618/) so that we can be notified promptly.

Launch of the Underground Atlas

Researchers from the Society for the Protection of Underground Networks (SPUN) have published a new Underground Atlas: Mycorrhizal Biodiversity Map v1.0—a digital map showing predictions of the diversity of mycorrhizal fungi across the globe at 1 km^2 resolution (Van Nuland *et al*, 2025). The 4-year project to create the map is based on 2.8 billion DNA sequences taken from locations all over the world. The map identifies key diversity hotspots for arbuscular and ectomycorrhizal fungi, with one crucial finding being that >90% of these hotspots are not within the existing protected areas, leaving them vulnerable to land-use change.

The Underground Atlas is a free resource for everyone and will help to inform policy on soil and fungal conservation. It's really cool – go check it out here: https://www.spun.earth/underground-atlas/mycorrhizal-biodiversity.

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The Fungal Records Database of Britain and Ireland

Getting data flowing: exploring the application of 'verification' to fungal records

Stuart Skeates[1] & Clare Blencowe[2]

The Fungal Records Database of Britain and Ireland (FRDBI) will be familiar to many readers as the system for fungal recording developed and maintained by the British Mycological Society (BMS): https://www.frdbi.org.uk/.

The FRDBI in its current form (sometimes referred to as FRDBI2) is powered by Indicia, the open source wildlife recording toolkit developed by the Biological Records Centre (BRC): https://indicia.org.uk/. Indicia has been used to build many different biological recording tools and websites, so you may have noticed that FRDBI2 has a similar look and feel to iRecord (https://irecord.org.uk/), the website for recording and sharing wildlife sightings.

Using this shared underlying technology gives the BMS the opportunity to learn from innovations in other parts of the UK biological recording community and make use of additional tools that have already been developed and tested. The facility to overlay a 'verification' system and apply it to the FRDBI2 records is one such tool.

In the context of fungal recording, 'verification' can be a somewhat alarming word, having at its root that most elevated of concepts: *veritas*, or 'truth'. Everyone reading this article knows how hard it is to approach an understanding of a fungal organism's identity—even with the best skills, equipment and literature for observing, recording and keying out specimens, we are workers on the shifting sands of fungal taxonomy and nomenclature. To borrow a phrase from the physicist Jocelyn Bell Burnell, it is perhaps better to view science as a quest for *increased understanding*, rather than truth, as this leaves a way forward for future change.

BRC and its partners in the iRecord network have more than 10 years' experience developing and applying a system for 'verification' of biological records which is more nuanced than a simple binary assessment of 'correct' or 'not correct'. There are multiple levels of 'verification status', descriptions of which can be found at https://irecord.org.uk/help/records-verified.

Within the iRecord system, the people doing the 'verification' are mostly expert volunteers, working on behalf of national recording schemes and societies, which can develop their own bespoke guidance on applying the 'verification status' terms, appropriate to specific taxonomic groups. 'Verification' doesn't have to follow an all-or-nothing approach: it can be broken down into manageable chunks, *e.g.* geographically or taxonomically.

In the wider UK biological recording community, 'verification' is a frequently applied concept / system which supports the flow and use of biological records, by giving end users some assessment of the reliability of the records and datasets that are being shared. The importance of improving and standardising verification of UK fungal records was highlighted in a recent report published by Natural England (Amy *et al.*, 2025).

The BMS is therefore keen to have a dialogue with the field mycology community to explore possible approaches to verification. We had an initial conversation with Fungus Group Leaders at a BMS meeting in June 2024. This will be followed up with a session after the BMS Autumn Open Meeting at Royal Botanic Gardens, Kew, on Saturday 29 November 2025, which will be facilitated by Keiron Derek Brown from The Biological Recording Company (https://biologicalrecording.co.uk/meet-the-team/).

To inform discussions in November, fungus recorders are invited to share their perspectives through an open-to-all online survey, accessible here: https://biologicalrecording.co.uk/2025/10/12/fungi-verification-consultation/.

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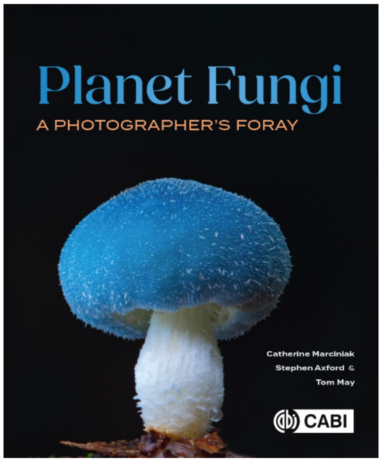
Book reviews

Planet Fungi

Catherine Marciniak, Stephen Axford & Tom May

CSIRO Publishing, March 2025
ISBN: 978-1-83699133-5
Hardback 280 x 240 mm, 310 pp.
£35 from CABI Books and other booksellers



This is simply the ultimate in fungal coffee table books. This isn't meant in any way disparagingly. It comes at a very reasonable price complete with the one indispensable attribute needed these days by any fungi book aimed at a wide readership: an endorsement from Merlin Sheldrake. He writes: "A stunning exploration of a hidden world. These are among the most remarkable images of fungi I've ever seen." I can only agree.

The spectacular species on the front cover is in a well known genus, but you won't guess which! Answer revealed below. There is also a subtitle 'A photographer's foray'. The photographer, Stephen Axford, and his two co-authors are all Australian. The book reflects his spectacular use of the stacking techniques now available with digital cameras (as discussed by Jens Petersen in the last issue of FM). By happy chance he developed his expertise coincident with his 'discovery' that fungi provide a beautiful and inexhaustible range of suitable subject matter. The combination rapidly became a highly productive obsession taking over and renewing his life.

The first author is Axford's partner, a documentary film maker and journalist who provides the text. The third is Tom May, a distinguished professional mycologist, e.g. co-author of the latest 'Madrid' edition of the Code of Nomenclature. Help is acknowledged from a dozen other mycologists, but presumably it was May who had the last word in ensuring that the known species were as far as possible correctly named, and the numerous unknowns admitted to be unknown.

Those same stacking techniques that give depth of focus to a single photo also form the basis of time lapse photography. Some of Axford's sequences were used in Attenborough's Planet Earth II, echoed here in the title Planet Fungi. This in turn opened the door to invitations to join fungal expeditions to exotic places, thus leading to chapters on some very poorly forayed regions such as the Eastern Himalayas, where 232 species were photographed in four weeks, with 34 proving new to science. Accounts of several such expeditions are interspersed with chapters focussing on subject areas rather than regions, e.g. one on lichens (including unexpected detail revealed under UV light) and one on luminous fungi. This reader is left feeling that our western European fungi, here ignored, are in general far less dramatic than those to be found in abundance almost anywhere else on earth!

A chapter on 'New Discoveries' is largely taken up with Axford's one favourite species among all the many novelties now named and the many more as yet unnamed. This is the one on the cover, found in one of the few remaining areas of tropical forest on Australia's East coast, and immediately felt to be something different when first seen. On the cover it is greatly magnified (about ×7 I would guess, judging by a picture elsewhere in the book of Axford photographing it). But you still wouldn't guess that DNA analysis has found it to be a strange Coprinopsis. Being beautiful and blue, Latin scholars shouldn't be surprised to learn that it has been named C. pulchricaerulea. It presents as little blue blobs, with the stem usually entirely concealed by the in-rolled cap. Surprisingly a previous unnamed fungarium specimen was located, collected on the tiny World Heritage Site of Lord Howe Island, 700 km North East of Sidney. The authors felt compelled to visit. They duly found it still present there but also another surprise: a fungus which DNA showed to be this same species in a bright scarlet colour form as yet known nowhere else. The blue form is now also known in New Caledonia.

The final chapter is built round the slogan 'Fauna, Flora and Funga' bemoaning that the Funga still come a very poor third in this trio. The familiar gulf is cited between the 150,000 described species and the estimated undescribed millions. Moreover only 10% of those 150,000 have had any DNA sequencing. Also less than 1% of all Red List evaluations carried out to date have been of fungal species. On a more upbeat note we read that 20,000 new fungal species have been described in the last five years.

I find it impossible to leaf idly through the pages of this book and not feel overwhelmed by the sheer diversity and beauty that our planet has to offer to those who seek it out.

Alick Henrici

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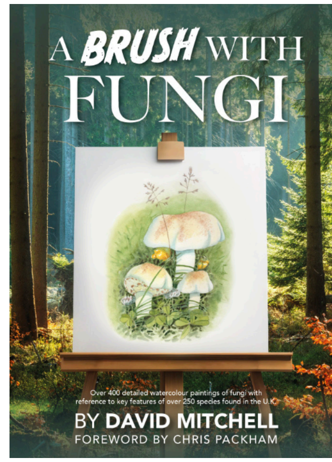
A Brush with Fungi

David Mitchell

Privately published, July 2025
ISBN: 9781036910440
Hardback, A4, 440 pp.
£69 from Summerfield Books



There is a long tradition of artists and naturalists creating collections of fungi paintings in Britain, going back to James Bolton in the 18th century with its heyday in the Victorian period with people like Mary Frances Lewis of Ludlow[i] and Beatrix Potter. The closest recent parallel is 'In Praise of Toadstools' by Suzanne Lucas, a two-volume collection of fungi paintings published in 1997. That there here have not been many examples of similar works since is a testament to what a difficult, expensive and time-consuming process this must be.

The latest addition to this genre is 'A Brush with Fungi' a substantial book, very well produced with excellent print quality, that accurately reproduces the watercolour paintings.

There are around 250 species represented. These are arranged in genera, starting with the milkcaps, boletes and brittlegills ending with what is described as a mixed selection of species including *Ascomycota*, microfungi and slime moulds. These are mostly common species that it would not be too surprising to encounter on a typical foray in the right habitat. The exception is *Lactarius ligniotus* which was the first record of this species in Britain and the story of this discovery is given a special section at the end.

Most species have between one and three full pages dedicated to them with a mixture of paintings of the same specimen including cross sections and views of the cap, gills and specimens at different stages of growth. Many fungi can vary dramatically over time, so this is particularly nice to see. Sometimes there is also a painting of the species in its habitat. Each painting is accompanied by notes highlighting key features or adding details of invisible characteristics. These are all based on the author's own observations. The identification of the species in the paintings seems to be accurate, and I haven't spotted any errors.

This is clearly the result of a lot of work by the author who has a deep fascination for fungi and an appreciation of their beauty. It is a beautiful exploration of fungi of these islands that will particularly appeal to anyone who appreciates fungal illustrations.

Lukas Large

[i] Mary Frances Lewis was author of 'Fungi collected in Shropshire and other neighborhoods', a collection of original fungal illustrations produced between 1860–1902. Available to view online via the Biodiversity Heritage Library (https://www.biodiversitylibrary.org/bibliography/171551) and published in a printed volume by Chronicle Books (2023), with a foreword from mycologist Dr. Patricia Ononiwu Kaishian.

Regulating the names of fungi

International Code of Nomenclature for algae, fungi, and plants (Madrid Code)

[Regnum Vegetabile No. 162.]

Authored by the Editorial Committee of the Madrid Code:

Nicholas J. Turland, John H. Wiersema, Fred R. Barrie, Kanchi N. Gandhi, Julia Gravendyck, Werner Greuter, David L. Hawksworth, Patrick S. Herendeen, Ronell R. Klopper, Sandra Knapp, Wolf-Henning Kusber, De-Zhu Li, Tom W. May, Anna M. Monro, Jefferson Prado, Michelle J. Price, Gideon F. Smith, and Juan Carlos Zamora Señoret

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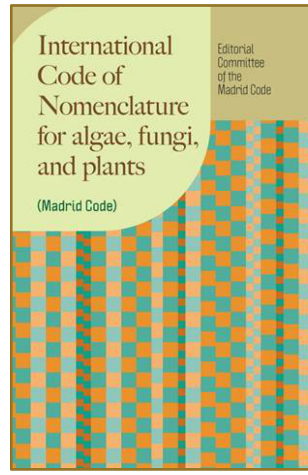

There are two aspects to the naming of fungi, taxonomy and nomenclature, which together form the discipline of systematics. Taxonomy is the classification or categorisation of objects or organisms into kinds, which in the case of organisms are the classes which research indicates merit recognition as species, genera, families, and higher ranks; i.e. as separate taxa. Different researchers can have divergent taxonomies, depending on how they interpret the available data. For example, some may wish to recognise a broad concept for the genus *Cortinarius*, while others prefer to accept a number of separate genera. Taxonomic schemes and concepts are in essence hypotheses open to challenge or re-interpretation. Taxonomy is therefore subjective and scientific, whereas nomenclature is objective and legalistic – and follows taxonomic opinions. Nomenclatural issues in mycology are the province of the Nomenclature Committee for Fungi (NCF) while taxonomic practice is the domain of the International Commission on the Taxonomy of Fungi (ICTF). Both the NCF and ICTF are now elected and report to International Mycological Congresses; the ICTF, established in 1982, publishes guidance on best practice and other matters, including lists of names for protection.

Nomenclature is concerned with how names are to be selected and applied to the taxa taxonomists consider justify recognition and naming. By the mid-19th century, authors varied in the criteria they adopted to arrive at and fix the name for a particular taxon. Chaos was on the horizon, zoologists had started to go a separate way in the 1840s, and in order to get a grip on the situation the International Botanical Congress held in Paris in 1867 adopted laws (or "lois", as they were called in French) to be followed for organisms studied by botanists, including algae, cyanobacteria, fungi, slime moulds, and some protists (for an authoritative historical account see Nicolson, 1991). The rules have since evolved to meet the changing requirements of the scientific community, with possible changes debated and voted on at the now normally six-yearly International Botanical Congresses, or since 2017 if applying only to organisms treated as fungi, the usually four-yearly International Mycological Congresses.

The new international code, the *Madrid Code* has just been published. This reflects the decisions made at both the 20th International Botanical Congress (Madrid, July 2024) and the 12th International Mycological Congress (Maastricht, August 2024) on 433 and seven proposals respectively. All rules come into effect immediately they are adopted by the relevant Congress unless a later date is specified. All mycologists working in taxonomy need to obtain and use the new *Madrid Code* right away to ensure they avoid making erroneous decisions.

The *Code* is a rather intimidating document, but there is now a decoding guide (Turland, 2019) . The processes it regulates, however, can be seen as a series of filters to be passed through to arrive at the correct name for a taxon (Fig. 1). Note that a single taxon can have several correct names depending on the taxonomy adopted. For example, the names *Boletus chrysenteron* and *Xerocomellus chrysenteron* are both correct depending on whether a broad or narrow generic concept is adopted.

Most of the changes made in Madrid relate to technical clarifications rather than adoption of new provisions. They include improvements in wordings and glossary definitions (Turland, 2025), and the addition of new examples by the Editorial Committee. One decision that attracted much publicity was to reject names proposed from 1 January 2026 that might be considered derogatory to a group of people. In the Preface, the Committee also encourages the practice adopted in the Code of placing scientific names at all ranks in *italics*, something already followed in key mycological journals. In Maastricht, procedures for the listing of protected names were clarified and two new recommendations relating to living cultures as types were adopted. The issue of naming fungi known only from environmental DNA sequences was debated at length, but no decisions were made, and this will be revisited at the 13th International Mycological Congress in Incheon, South Korea in 2027 (it is expected that a revised Chapter F, to replace that in the *Madrid Code*, will be published in *IMA Fungus* following the Incheon congress). The 21st International Botanical Congress is scheduled for Cape Town, South Africa, in 2029.

I have served on the Editorial Board of the *Code* since appointed by the Berlin Congress of 1987. I am indebted for all I have been able to learn from fellow members over the years. It has been a particular privilege to see previously destabilizing rules relating to fungal organisms eventually fundamentally modified or rejected, new procedures such as the compulsory registration of new names and the concept of protected names adopted. We have advanced to a situation where changes in established names due to nomenclatural nuances alone can generally be avoided.

David L. Hawksworth

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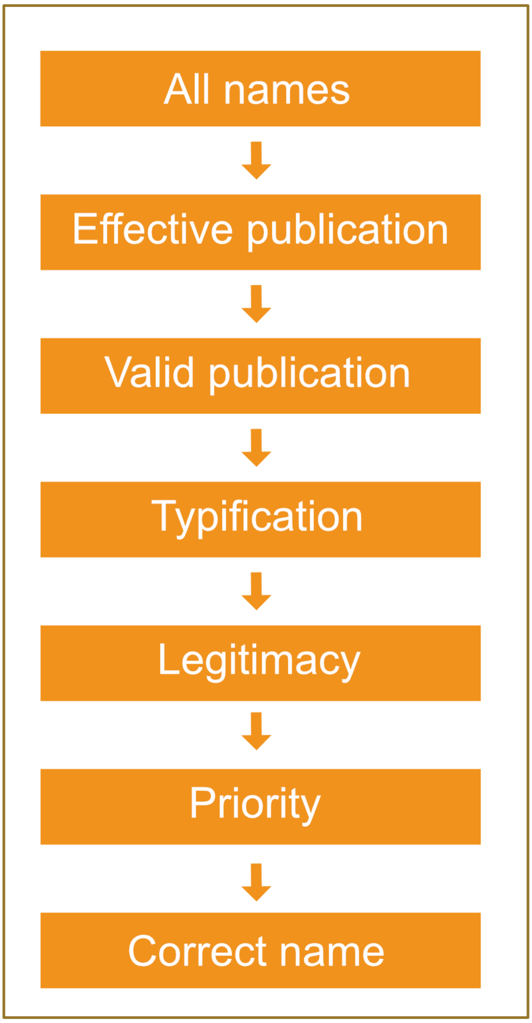

Fig. 1. The steps in the nomenclatural filter, illustrating the various stages to be passed through to arrive at a correct name for a taxon. The author is indebted to Mounes Bakhshi for preparing this graphic.

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