Fungi FOUNDATION

Protecting and restoring the UK's fungi

January 2026

Executive Summary

Most fungi live hidden from view, yet they form an immensely diverse kingdom that underpins and sustains nearly all life on earth. The UK Government and Chile have demonstrated ground-breaking international leadership to protect this kingdom, launching a 'Fungal Conservation Pledge' at the UN biodiversity conference in Cali, Colombia in 2024. The pledge highlighted how "fungi provide us with a range of possibilities to address [...] climate change, biodiversity loss, and pollution".

Domestically, the Fungi Foundation and others are working to build on this momentum to ensure the Government's commitment is delivered through effective UK policies. Bold action is required to protect fungi and the huge value they provide for our economy, environment and society, including for carbon sequestration and food production.

Today, iconic UK fungi such as Waxcaps and the distinctive Hazel Gloves currently lack the policies, funding and specific legal protections needed to safeguard them. Indeed, Nature Minister Mary Creagh has noted that fungi "are often overlooked in our focus to protect life on earth". As a result, with increasing threats including habitat loss, poor farming practices, and extreme weather, many species are at risk of extinction.

The Fungi Foundation are calling on the UK Government to deliver a new Policy Strategy for Fungal Conservation and action in three key areas, so the UK enacts the principles of the Fungal Conservation Pledge. In short, we recommend that the UK Government acts to ensure that:

1. The Fungi Kingdom is properly protected by key international agreements and in future domestic legislation
2. The most important sites for fungi are safeguarded from harm across the country
3. The country's fungi-rich yet degrading soils are more effectively managed.

By implementing a suite of fungi-friendly policies, the UK can deliver on the international Pledge and protect this vital and overlooked kingdom of life. These actions will support soil health, food production, carbon sequestration, and the resilience of the UK's ecosystems with their unique biodiversity and beauty.

The Importance of the UK's Fungi

In 2024, the UK Government and Chile co-led the launch of a 'Fungal Conservation Pledge' at the United Nations Convention on Biological Diversity (CBD) conference in Cali, Colombia. The Pledge highlighted how "fungi provide us with a range of possibilities to address [...] climate change, biodiversity loss, and pollution".[1]

› Former Defra Secretary of State Steve Reed MP and Minister Rojas of Chile co-launch the Pledge for fungal conservation at COP16 in Cali.

Fungi are vital ecosystem engineers that sustain the living world, but the benefits they provide to the UK are too often neglected.

BIODIVERSITY

The diversity, resilience, and beauty of the natural world depend on fungi. For example, most plants depend on mycorrhizal fungi which supply plants with crucial nutrients and help them withstand drought and disease. Other fungi play vital roles in the creation of soils and cycling of nutrients through decomposition. Fungi, including lichens, are also key indicators of ecosystem health, including for the Government's legally binding Extinction Risk target for England.[7] Recognisable fungi, such as the edible Chanterelle mushroom and the distinctive Chicken of the Woods, are as emblematic of the UK's countryside as the red robin or barn owl. Their contribution to our environment was recently celebrated in a unique set of Royal Mail stamps.[8]

CLIMATE

Meeting the UK's climate target of net zero emissions by 2050 requires a greater appreciation of fungi across the country, both above and below the ground. Through fungal activity, carbon floods into the soil, where it supports intricate food webs; about 25% of all the planet's species live underground. Much of this carbon remains in the soil, making underground ecosystems the stable store of 75% of all terrestrial carbon.[2] Globally, approximately 13 Gt of CO_2e move into the soil each year through fungal channels; around 36% of current annual emissions from fossil fuels (in the UK, around 59 Mt of CO_2e per km^2 per year enter the soil in this way).[3,4] Importantly, grasslands are a major soil carbon sink, due in part to the activity of soil fungi, and in some cases restoring grasslands can result in higher fungal carbon drawdown gains than planting woodland.[5,6]

SOIL HEALTH AND FOOD PRODUCTION

Our food systems depend on fungi. For example, without yeasts, a type of single-celled fungi, there would be no bread, beer, wine, chocolate or coffee. On our farms, woodlands, and grasslands, plants depend on underground mycorrhizal fungi which supply them with crucial nutrients and help them withstand drought and disease. Extensive underground mycorrhizal fungal networks increase the volume of water that the soil can absorb, forming a sticky, living seam that holds soil together. Soil degradation from intensive agriculture and industry has resulted in enormous costs. For example, damage from compaction and loss of soil organic matter costs the UK around £1.2 billion every year[9] and the contribution of degraded soils to flooding events cost around £233m per year.[10] Action to protect and restore the health of underground fungal communities is an essential part of any effort to secure the integrity of our soils: a natural resource on which so much of the UK's economy depends, from agriculture to forestry.

The wording of the Fungal Conservation Pledge clearly calls for domestic action on fungi, committing to "the recognition of fungi as an independent kingdom of life in national and international legislation, policies and agreements".[11]

However, meaningful UK policy change has not caught up with our international ambition and the UK's fungi have not yet been granted the same protections as animals or plants. For example, only four fungal species are protected from certain harms under Schedule 8 of the Wildlife and Countryside Act 1981,[12] despite over 15,000 fungal species being recorded in the UK.[13] In December 2025, the UK Government rejected the advice of the Joint Nature Conservation Committee and others that around 20 additional endangered fungi species be added to Schedule 8, including the Critically Endangered Pepper Pot fungus.[14, 15]

Weak protections for fungi are a problem: the destruction of fungal communities undermines the resilience of our ecosystems and accelerates both climate change and wider biodiversity loss. ***The Fungi Foundation are therefore calling for a UK Government fungal conservation strategy, to convert the UK's positive international action into bold domestic policies.***

Solutions: Our Asks to Government

In its recently revised Environmental Improvement Plan (EIP), the UK Government committed to "conserving and recovering plants, animals and fungi".[16] The previous EIP published in 2023 contained no reference to fungal conservation[17] and we commend this positive step forward. We are now asking the UK Government to set out how they will meet their commitment to fungi outlined in the 2025 EIP in a manner informed by the latest evidence.

- **We recommend that the Government works with key partners and stakeholders – for example, the Network for Fungal Conservation – to publish a new Policy Strategy for Fungal Conservation in which Ministers' domestic plans for protecting and restoring fungi are outlined in full.**

This would support action across our three core goals:

1. **Ensure the UK's international Pledge to protect the Fungi Kingdom is implemented domestically and internationally**
2. **Ensure that the most important sites for fungi are protected from harm across the country**
3. **Effectively manage and restore the health of the country's fungi-rich yet degrading soils, according to the latest scientific evidence.**

1. Ensure the UK's international Pledge to protect the Fungi Kingdom is implemented domestically and internationally

The Fungi Foundation's 3F Proposal aims to ensure that 'funga' is added to nature policy and discussions to sit alongside "flora and fauna": Fauna-Flora-Funga.[18]

We therefore welcome Defra Minister Baroness Hayman's recent commitment that the UK is "leading a proposal to ensure fungi are better recognised within the Convention on International Trade in Endangered Species (CITES) at this year's Conference of the Parties (CoP20)".[19] However, further action is required to embed fungal conservation into domestic law and international agreements.

Fungi continue to receive limited recognition in global environmental agreements:

- Prior to the 2024 Fungal Conservation Pledge, fungi were largely absent from international environmental agreements such as the Convention on Biological Diversity (CBD).
- Despite the groundbreaking leadership shown by the governments of the UK and Chile in launching the 2024 Fungal Conservation Pledge, to date only 13 countries have signed up to the Pledge.
- Fungi remain insufficiently acknowledged under the global climate framework (UNFCCC), despite their important roles in carbon sequestration and climate mitigation. There was no reference to fungi in the UK's latest Nationally Determined Contribution (NDC) submitted to the UNFCCC.[20]

Domestically, across the nations of the UK, fungi are not recognised as a distinct Kingdom of Life in legislation:

- They are referenced only under 'plants' in the Wildlife and Countryside Act.[21]
- The Environment Act refers only to 'flora and fauna', with no reference to the third F - funga - over the 279 pages of the Act.[22]

These two Acts underpin nature protection across much of the UK, which means that in many arenas our working definition of nature is fundamentally incomplete. The UK's Nature Minister Mary Creagh has acknowledged that fungi "are often overlooked in our focus to protect life on earth".[23] This is a problem because language - especially in legislation - creates reality, shapes decisions and guides Government priorities.

The UK Government therefore must:

a) ***Continue diplomatic efforts to secure greater international support for the Fungal Conservation Pledge – aiming for the support of at least 50 nations by CBD COP17 in October 2026.***

b) ***Continue to lead international efforts to integrate fungi into international agreements such as the UNFCCC, including the UK's next NDC, and CITES.***

c) ***Ensure that there are explicit references to "fungal diversity" and "fungi" on the statute book, to embed the principles of the Fungal Conservation Pledge into law.***

2. Ensure that the most important sites for fungi are protected from harm across the country

Fungi are ubiquitous across the UK, but some sites require additional safeguarding to protect rare and endangered fungal communities and the many benefits they provide. Sadly, fungi-rich habitats have been severely depleted and degraded over many years:

- Many ancient grasslands are key habitats for fungi, yet species-rich grasslands now cover just 1% of our land.[24]
- Although there are over 4000 SSSI[25] protected sites in England, only 16 of these protected sites (less than 0.5%) include fungi as a designated feature.[26] Natural England has identified important gaps in the SSSI network with regards to fungi,[27] and their latest programme for future designation includes four additional sites with important fungal populations.[28]
- Many protected sites are not effectively managed: across all sites in England only 34.67% of SSSIs are in good condition for nature.[29] Among the sites protected for fungi in England, less than a third of sites (only 5 out of 16) are recorded as in a favourable condition.[30]

There is an urgent need to identify the most important sites of fungal diversity in the UK. The central reference for fungal diversity across the country - *the Important Fungal Areas* (IFA) report - is now 25 years out of date.[31] Consequently, it does not reflect huge changes to fungi sites over the previous 2 decades, including the impacts of a changing climate and new developments. The UK IFA system is currently being reviewed and updated by Plantlife to support the delivery of a new Global Strategy for Fungal Conservation. However, greater UK Government support is required to ensure the full success of this critical update; creating a resource which will inform other vital initiatives such as Local Nature Recovery Strategies.

This highlights a more general pattern: fungi are a kingdom of life that do not receive a kingdom's worth of attention. For example, within Natural England, the body responsible for maintaining and protecting England's natural environment, fungal conservation represents a disproportionately small share of its conservation budget: Natural England's Species Recovery Programme has spent less than 1.5% of its budget on fungi projects since 2006.[32]

The UK Government therefore must:

a) ***Ensure that all SSSIs designated for their fungi are in a favourable condition by 2030.***

b) ***As a first step to increase protections for fungi, boost the number of English protected fungi sites by 25%, through designating the additional sites with rare fungi populations already identified by Natural England and their partners.***

c) ***Increase the number of recognised fungal species assemblages and the number of SSSIs with fungi as designated features.***

d) ***Provide additional funding and support for the new Important Fungal Areas report to ensure the rapid delivery of a fully comprehensive map of the UK's Fungi.***

3. Effectively manage and restore the health of the country's fungi-rich yet degrading soils according to the latest scientific evidence

Industrial agriculture, pollution, and land management decisions have reduced the health and integrity of the UK's soils, and damaged vital underground fungal communities that sustain plants and sequester carbon. This is a problem because soils are made and maintained by living organisms like fungi. More biodiverse soils contain more nutrients and carbon and have better physical structure and integrity, which together enhance plant growth and health.

Soils represent a vast store of carbon: globally, approximately 13 Gt of CO_2e move into the soil each year through the activity of underground *mycorrhizal fungi*; around 36% of current annual emissions from fossil fuels.[33,34] Not only do healthy soils also offer valuable protections from flooding and other extreme weather linked to climate change, but the fungal populations of the UK's soils are living libraries of biological innovation. For example, the fungus used to make the meat-free alternative, Quorn, was isolated from a garden in Marlow, Buckinghamshire, in 1967 and is now responsible for £186.7m in sales annually.[35]

As Ministers develop the 25-Year Farming Roadmap, the Government must ensure that the UK's countryside is managed and farmed to maintain and regenerate the health of soils and the underground fungal communities that deliver so many benefits across so many sectors of society.[36]

In our woodlands, the Forestry Commission has outlined how "soil profiles in ancient woodland are often relatively undisturbed and are vitally important for their fauna, flora and particularly fungal communities". However, their *Managing Ancient and Native Woodland* policy document offers little practical guidance for woodland management with regards to fungi, whether those that live in the soil or the vital wood-decay fungi and lichens that live above-ground, impacting decisions around management plans and felling licences.[37]

The Government therefore must:

a) ***Promote activities which benefit fungi through well-funded Environmental Land Management (ELM) schemes, including Landscape Recovery and the Sustainable Farming Incentive (SFI) in England. The SFI could be reformed to drive ambitious, long-term improvements in soil health and underground fungi protection, for example through agroecological and regenerative farming practices.***

Key improvements for fungi friendly farming policies should include:

- ***Expanding soil standards to reward practices that enhance soil health, for example including the integration of legumes into crop rotations and the use of diverse herbal leys to promote mycorrhizal fungi and soil biodiversity.***
- ***Leveraging the SFI for implementation of Whole Farm Plans which establish soil health as fundamental to farm activity.***
- ***All entrants to the SFI should be required to undertake a soil health assessment, as well as other baseline activities.***

b) ***Revise Forestry Commission guidance on woodland management to include recognition of the function and conservation of woodland fungi.***

Case studies

Rydal Park, Cumbria - Protecting a treasured site for fungi

"I've been assessing the exceptional fungal diversity at Rydal Park in the Lake District, one of four potential new sites identified for their fungi in Natural England's programme for future SSSI designation. The parkland across this site is home to impressive ancient oaks and other veteran trees, whose lives are deeply intertwined with diverse communities of fungi.

Rydal Park is recognised as an important site for oak saprotrophs – fungi that decay dead wood, and in so doing drive vital nutrient recycling and engineer highly biodiverse habitats. Excitingly, Rydal is likely to become the first SSSI designated specifically for this group of fungi, as well as for its southern oceanic woodland lichens.

The UK hosts more ancient oak trees, and their rich fungal communities, than the whole of Europe combined, meaning we have a global responsibility for this iconic habitat. Government action to protect this site and others like it would secure benefits for future generations and protect the exceptional biodiversity the relationship between oak and fungi supports."

Rich Wright
Founder of Forever Fungi consultancy

Aileen Baird
Senior Conservation Officer for Fungi at Plantlife

Community action to conserve our fungi

"Across the UK, communities are leading the way on fungal conservation as more people discover the wonders of the Fungi Kingdom close to home.

Waxcaps are indicators of rare, species-rich grassland. Knowing where they thrive helps us pinpoint surviving fragments of ancient meadows so we can protect them for the future. Waxcap Watch, a community science project run by Plantlife, introduces beginners to fungal recording. Using an app, participants survey local grasslands, noting waxcap colours and key indicator species, including the rare Pink Waxcap. In just five years, over 4,000 surveys have revealed more than 300 new UK locations for this threatened species.

It's fantastic that the Government's Environmental Improvement Plan includes a commitment to conserve fungi. Now communities are calling for action to ensure our rare and precious fungi are genuinely protected and recovered".

The benefits of Fungi Friendly Farming

"In an era of extreme yield limiting weather, we're starting to fully appreciate the benefits of mycorrhizal fungi for food production. Many in the sector are realising that reaping the benefit of biological systems, such as underground fungal networks, may be one of the most powerful ways in which we can reduce costs and improve profitability.

At our farm in the Northeast of England, we introduced a no-till approach to crop management ten years ago, largely avoiding the need to disturb soils, and have seen little or no yield penalty. At local farm discussions we're often reminded that the price of chasing additional yield comes at great cost to the business. A more natural approach, aiming at what the farm can naturally produce seems to have both merit and margin.

From a farming perspective, we're beginning to understand how soil fungi may play an important part in extending the effective rooting area and depth of the plant, if soil conditions are managed appropriately. This may help to mobilise nutrients, making them more available to the plant and reduce the need for additional fertiliser.

A Government agenda to improve soil health, supporting farming practices which protect soil fungi, is vital for the future of sustainable food production."

Paul Flynn
East Durham College (Houghall Farm), part of the Defra Farm Business Survey

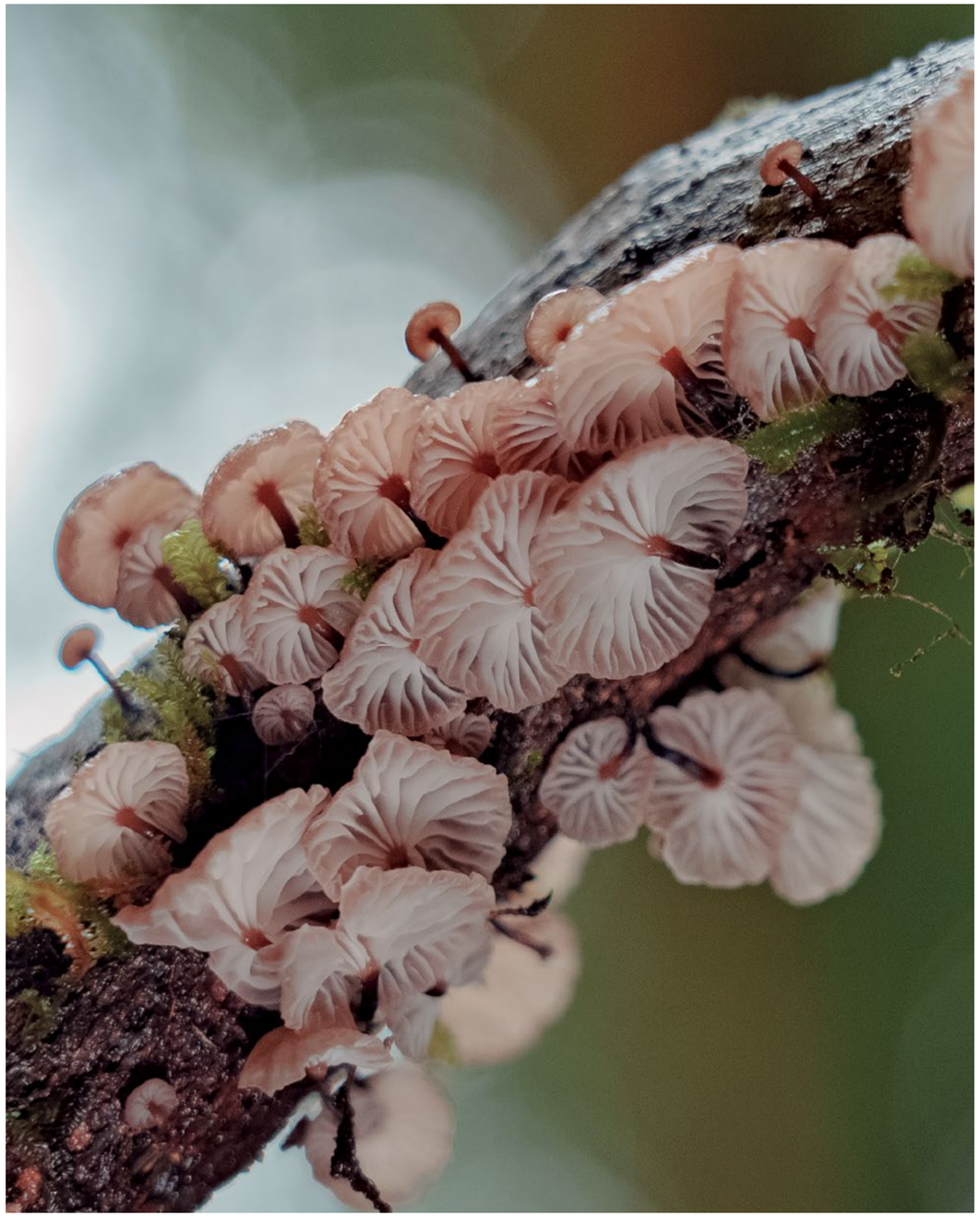
About

The Fungi Foundation is a global organisation that focuses on conserving the planet's fungi. It was founded by British/Chilean mycologist Giuliana Furci, OSI. Our UK Policy Lead is Dr. Merlin Sheldrake, biologist, speaker and author of the Sunday Times bestseller Entangled Life.

The Fungi Foundation has focused on advocating for fungi to be included in international and national environmental frameworks, recently and notably leading on the Fungal Conservation Pledge presented by the UK and Chile at the UN CBD COP16 in 2024. We work at the intersection of science, conservation, and culture.

The Fungi Foundation would like to especially thank Plantlife, Royal Botanic Gardens Kew, the Soil Association, Natural England, the Society for the Protection of Underground Networks, and the numerous other individuals who have offered advice and support in the production of this briefing. With thanks to Seahorse Environmental for their support in the drafting of this document.

For more information and to discuss how you can support the campaign's goals, please contact info@ffungi.org



Endnotes

1 https://assets.ffungi.org/FungalConservationPledge2024_EN.pdf

2 https://www.esa.org/esa/wp-content/uploads/2012/12/carbonsequestrationinsoils.pdf

3 Hawkins, Heidi-Jayne et al. Current Biology, Volume 33, Issue 11, R560 - R573. 202a3. https://doi.org/10.1016/j.cub.2023.02.027

4 Some fungal interactions including wood decomposition have also been shown to increase CO_2 released, making an understanding of the biological mechanisms and the fungal communities involved, of key importance to global climate science. See: Hiscox, J., Savoury, M., Müller, C. et al. Priority effects during fungal community establishment in beech wood. ISME J 9, 2246–2260 (2015). https://doi.org/10.1038/ismej.2015.38

5 Yongfei Bai, M. Francesca Cotrufo, Grassland soil carbon sequestration: Current understanding, challenges, and solutions. Science377,603-608(2022). DOI:10.1126/science.abo2380

6 SPUN - unpublished data

7 See https://www.legislation.gov.uk/uksi/2023/91/body/made

8 https://shop.royalmail.com/special-stamp-issues/mushrooms

9 https://www.sciencedirect.com/science/article/abs/pii/S0921800915003171

10 https://researchbriefings.files.parliament.uk/documents/POST-PN-0502/POST-PN-0502.pdf

11 https://assets.ffungi.org/FungalConservationPledge2024_EN.pdf

12 Non-lichenised fungi https://www.ukwildlife.com/index.php/wildlife-countryside-act-1981/schedule-8/

13 https://www.kew.org/read-and-watch/rare-british-fungi

14 https://www.gov.uk/government/publications/government-response-to-the-jncc-review-of-protected-species-under-the-wildlife-and-countryside-act-1981/government-response-to-jnccs-advice-following-the-seventh-quinquennial-review-of-species-protections-under-the-wildlife-and-countryside-act-1981--2

15 https://data.jncc.gov.uk/data/9ab12b30-cd41-4170-b0bb-689abcdbcc36/qqr-7-report-and-appendices-1-7.pdf

16 https://www.gov.uk/government/publications/environmental-improvement-plan-2025/environmental-improvement-plan-eip-2025

17 See https://assets.publishing.service.gov.uk/media/64a6d9c1c531eb000c64fffa/environmental-improvement-plan-2023.pdf

18 https://www.ffungi.org/en/conservation

19 https://questions-statements.parliament.uk/written-questions/detail/2025-11-11/HL11789/

20 https://unfccc.int/sites/default/files/2025-01/UK%27s%202035%20NDC%20ICTU.pdf

21 https://www.legislation.gov.uk/ukpga/1981/69

22 https://www.legislation.gov.uk/ukpga/2021/30/pdfs/ukpga_20210030_en.pdf

23 Ministerial letter to the Fungi Foundation, 16/09/25

24 https://www.gov.uk/government/news/nationally-important-wildflower-grasslands-get-increased-protection

25 Site of Special Scientific Interest (SSSI)

26 These figures refer to non-lichenised fungi sites based on data from Natural England https://designatedsites.naturalengland.org.uk/SiteSearch.aspx

27 See https://www.theoep.org.uk/report/review-implementation-laws-terrestrial-and-freshwater-protected-sites-england

28 The four listed sites are Creech Barrow and Valley, Dorset; Rydal Park, Cumbria; Pixton Park, Somerset; Tudeley Woods and Pembury Walks, Kent https://www.gov.uk/government/publications/natural-england-designations-programme-for-areas-sites-and-trails/natural-englands-designations-programme

29 https://www.wcl.org.uk/30x30-press-release-october-2024.asp

30 These figures refer to non-lichenised fungi sites based on data from Natural England https://designatedsites.naturalengland.org.uk/SiteSearch.aspx

31 See https://www.plantlife.org.uk/wp-content/uploads/2024/11/ImportantFungusAreasBook1-1.pdf

32 Unpublished, refers to non-lichenised fungi projects

33 Hawkins, Heidi-Jayne et al. Current Biology, Volume 33, Issue 11, R560 - R573. 2023. https://doi.org/10.1016/j.cub.2023.02.027

34 Some fungal interactions including wood decomposition have also been shown to increase CO_2 released, making an understanding of the biological mechanisms and the fungal communities involved of key importance to global climate science. See https://www.nature.com/articles/ismej201538

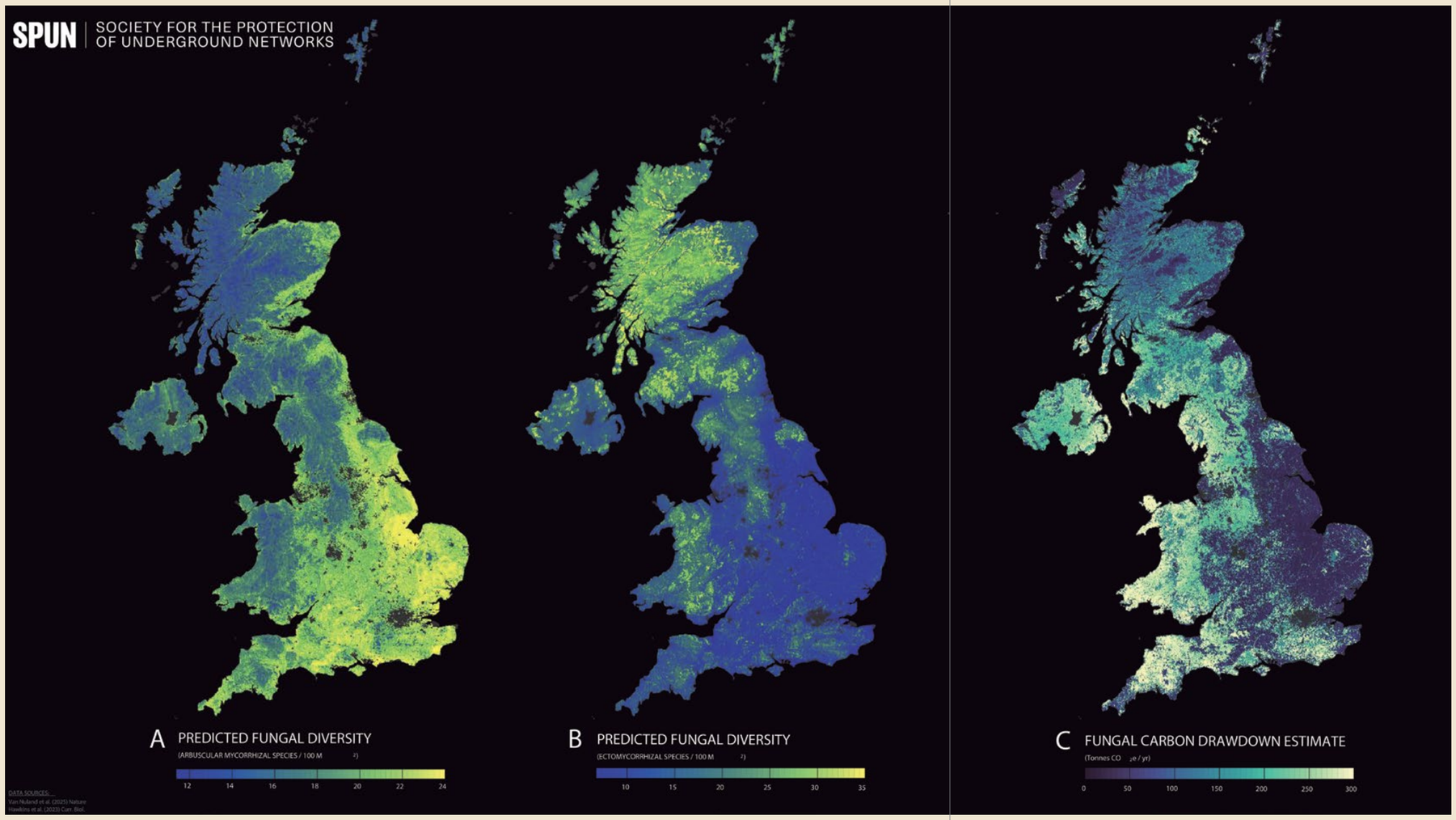
35 https://www.greenqueen.com.hk/quorn-marlow-foods-cauldron-sales-losses-kfc-greggs-meat-free/

36 https://sustainablefoodtrust.org/news-views/fungi-thing-about-soil/

37 https://assets.publishing.service.gov.uk/media/5b35fa57ed915d0b53021ae1/FCPG201.pdf

Appendix

Predictions of mycorrhizal fungal diversity and mycorrhizal fungal carbon drawdown across the UK



Diversity maps divide mycorrhizal fungi into the two main types: arbuscular mycorrhizal (AM) fungi – Map A – and ectomycorrhizal (ECM) fungi – Map B. The carbon drawdown capacity of mycorrhizal fungal networks is a largely overlooked tool for nature-based climate solutions. Mycorrhizal fungal biodiversity predictions are from SPUN's global machine-learning geospatial model trained on 2.8 billion fungal sequences and 25,000+ samples. Currently, the UK's total mycorrhizal C drawdown potential is estimated to be approximately 59 Mt CO_2e km-2 yr-1 [interquartile range = 18-79 Mt CO_2e km-2 yr-1].[1,2]

1 Van Nuland, M. E., Averill, C., Stewart, J. D., Prylutskyi, O., Corrales, A., van Galen, L. G. et al. (2025). Global hotspots of mycorrhizal fungal richness are poorly protected. Nature, 645(8080), 414-422. https://www.nature.com/articles/s41586-025-09277-4

2 SPUN unpublished data

Pledge for Fungal Conservation

> “Towards the recognition of fungi as an independent kingdom of life in national and international legislation, policies and agreements, in order to advance their conservation and to adopt concrete measures that allow for maintaining their benefits to ecosystems and people in the context of the triple environmental crisis.”

Co-launched by the Republic of Chile and The United Kingdom of Great Britain and Northern Ireland.

TARGETS OF THE KUNMING-MONTREAL GLOBAL BIODIVERSITY FRAMEWORK (KMGBF)

The Pledge for Fungal Conservation is closely aligned with the global targets for 2030 of the Kunming-Montreal Global Biodiversity Framework (KMGBF)

a. REDUCING THREATS TO BIODIVERSITY

It emphasizes the importance of fungi in the restoration of degraded ecosystems and in bioremediating pollutants. By recognizing fungi as an independent and vital kingdom for ecosystems, the goal is to promote their protection and conservation.

Targets 2, 4, 5, 6, 7 and 8

b. MEETING PEOPLE’S NEEDS THROUGH SUSTAINABLE USE AND BENEFIT-SHARING

It highlights the economic and cultural value of fungi, promoting their sustainable use in food, medicine, and other industries. This aligns with the goals of the GBF, which aim to ensure that biodiversity is used sustainably and that the benefits derived from genetic resources are shared equitably.

Targets 9, 10, 11 and 13

c. TOOLS AND SOLUTIONS FOR IMPLEMENTATION AND MAINSTREAMING

It calls for integrating concrete measures to protect fungi into national biodiversity strategies and encouraging the development of mycology to better understand and study the potential of fungi.

Targets 17 and 20

DO YOU KNOW THAT FUNGI

- Play multiple ecological roles that are essential for ecosystem health and human well-being.
- Most plants depend on fungi for survival, while many animals rely on them for food.
- Act as decomposers and serve as carbon sinks.
- Are important to the economy, generating local income and being essential to the food and pharmaceutical industries.
- Face the same threats as plants and animals, putting them at risk of extinction.
- Over 40% of the fungal species included in the IUCN Red List are categorized as threatened.

Following the **3F initiative (Fauna Flora Funga)**, which aims , which aims to elevate the status of fungi in the realm of conservation and environmental protection, **the Republic of Chile and The United Kingdom of Great Britain and Northern Ireland** call on the Parties to the Convention on Biological Diversity (CBD) to:

1. **Prioritize the conservation of fungi, recognizing them as an independent biological kingdom** essential for the functioning of ecosystems and the conservation of biodiversity, **in multilateral environmental agreements, national frameworks and local conservation instruments.**
2. **Promote mycology as a key science** to understand the diverse potential of fungi to address **the triple environmental crisis (Climate Change, Biodiversity Loss and Pollution).**
3. Request the **Secretariat of the Convention on Biological Diversity to develop a work agenda** within the framework of the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) to address **the conservation of macroscopic and microscopic fungi globally within the framework of the CBD.**

At the 2024 UN Convention on Biological Diversity (CBD) COP16, the governments of Chile and the United Kingdom, in collaboration with the Fungi Foundation, launched the Fungal Conservation Pledge — a groundbreaking step toward securing a future for fungi. This is reproduced in full below.

"Towards the recognition of fungi as an independent kingdom of life in national and international legislation, policies and agreements, in order to advance their conservation and to adopt concrete measures that allow for maintaining their benefits to ecosystems and people in the context of the triple environmental crisis"

Wild fungi play a fundamental role in the functioning of natural ecosystems and in human well-being. They maintain soil fertility through the decomposition of organic matter and facilitate the absorption of water and nutrients via mycorrhizal associations with plant roots, which improves carbon sequestration. Additionally, the collection, use, and trade of wild fungi are essential economic and cultural activities, contributing to livelihoods and providing food and medicinal ingredients for people[1]. Fungi are so relevant to our lives that they have been used for thousands of years in the production, flavoring, and preservation of food[2]. Without them, there would be no bread, soy products, meat, cheese, wine, beer, or even penicillin, to name just a few of the products we consume and use in our daily lives.

Fungi provide us with a range of possibilities to address **the challenges of the triple environmental crisis**, specifically in terms of climate change, biodiversity loss, and pollution. Given their fundamental role in breaking down organic matter so that nutrients can be reincorporated into the soil, fungi can be employed in bioremediation processes to degrade pollutants in the environment, opening significant possibilities for mitigating the pressures that affect ecosystems and their biodiversity. In this sense, by restoring a degraded ecosystem, it is possible to recover its structure and functions, providing habitat for species, improving the state of biodiversity, and the ecosystem services it offers, such as climate regulation. An example of this is white rot fungi, which can decompose lignin and other complex organic pollutants (ABS Fact Sheet, Secretariat of the Convention on Biological Diversity, 2011).[3,4]

Despite the great functionality and adaptability of fungi, they have received only a small fraction of the attention they deserve. It is estimated that there are between 2.2 and 3.8 million species of fungi, all of which perform diverse and critical ecological roles[5]. Like other species of flora and fauna, funga are threatened by habitat loss and degradation, overexploitation, changes in land use, and the effects of climate change[6].

1 (Oyanedel et al, 2022).
2 (Prescott et al, 2018).
3 https://www.cbd.int/abs/infokit/revised/web/factsheet-uses-es.pdf
4 (Cui et al, 2021).
5 (Hawksworth y Lücking, 2017; Wu et al., 2019).
6 (Heilmann-Clausen et al., 2015).

In 2018, Kuhar et al.[7] published a document that defines the term "funga," recognizing the need to adopt a collective term equivalent to "fauna" and "flora" specifically for the Kingdom Fungi. From this, the Fauna, Flora, Funga (3F) initiative was created, which aims to elevate the status of fungi in the realm of conservation and environmental protection.

In this regard, following the 3F initiative, this declaration considers the urgent call to advance the recognition of fungi as an independent kingdom of life in national and international legislation, policies and agreements, in order to begin taking concrete steps towards including fungi in agricultural and conservation policy frameworks, along with raising funds to increase research, studies, and programs related to mycology, and ultimately to move towards the effective conservation of funga as key to protecting nature's contributions to people.

The Republic of Chile and The United Kingdom of Great Britain and Northern Ireland alongside the Republic of Colombia, the Republic of Benin, the Kingdom of Spain, the United Mexican States, the Republic of Costa Rica, the Republic of Peru, the Republic of Ecuador, the Kingdom of Cambodia, the Republic of Guinea, the Federal Republic of Germany and the Federal Democratic Republic of Ethiopia, call on the Parties to the Convention on Biological Diversity (CBD) to prioritize the conservation of fungi**, recognizing them as an independent biological kingdom of life in national and international legislation, policies and agreements, and as essential for the functioning of ecosystems and the conservation of biodiversity by integrating concrete measures for their protection into National Biodiversity Strategies and Action Plans (NBSAP's) and by promoting mycology as an essential science for future conservation measures.**

In accordance with the above, the Secretariat of the Convention on Biological Diversity is requested to develop a work agenda to be discussed at the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) to address the conservation of macroscopic and microscopic fungi globally within the framework of the Convention on Biological Diversity and to advance concrete measures in Biodiversity Conservation Plans and Strategies. This aims to highlight the importance of fungi for ecological and human well-being in international environmental treaties and frameworks, as well as in national agricultural and environmental laws and policies, and local environmental and conservation initiatives.

7 (Kuhar,Furci, Dreschler-Santos & Pfister, 2018).

Annex

Fungi as Key Players for Biodiversity Protection and in the Fight Against Climate Change

The challenge of achieving biodiversity protection goals requires a **holistic understanding of nature**. At the heart of this discussion is the recognition that fungi not only **constitute their own kingdom**, but also represent a completely distinct form of life. Unlike plants and animals—which often function as individual species—fungi exist in a state of intricate interdependence with the organisms around them. Therefore, ensuring their preservation inherently leads to the protection of nature as a unified whole.

The kingdom of fungi provides essential ecosystem services that strengthen biodiversity and ecological balance. Through nutrient cycling, mycorrhizal associations with plants, erosion control, and carbon cycling and sequestration, the contributions of fungi in nature are hard to overestimate. It is crucial to understand that this kingdom is distinct from animals and plants. Consequently, we emphasize that funga should be given the same importance as flora and fauna.

Fungi represent an extremely diverse kingdom of life, second only to animals, with an estimated 2.5 million species worldwide, of which only 155,000 have been described. This means that more than 90% are still unknown to science (Antonelli et al., 2023).

Fungi are key players in driving carbon and nutrient cycles (Terrer et al., 2016). Around ninety percent of all known terrestrial plant species form symbiotic interactions through their roots with fungi naturally present in the soil, creating mycorrhizae (Antonelli et al., 2023). Mycorrhizal fungi are at the entry point of carbon into soil food chains and sequester the equivalent of one-third of global fossil fuel emissions in CO_2 each year. Chemically, they are a cornerstone of the carbon cycle in our ecosystems, and in this process, they not only help sequester carbon in our soils but, by interacting in multiple ways with other organisms, they strengthen the resilience of entire networks of species and ecological systems.

The role of fungi in carbon sequestration is now widely recognized, with an estimated 5 billion tons of carbon retained in the soil each year (Frey, 2019). Therefore, their destruction leads to the abrupt release of carbon into the atmosphere, contributing to global warming. The release of just 1% of the carbon stored underground yearly is roughly equivalent to the emissions from 10 million cars in a year.

Therefore, fostering this relationship to support the mineral nutrition of trees is crucial. Mycorrhizal fungi increase the volume of soil that trees can explore with their roots by using their network of filaments (mycelium) to reach smaller pores, accessing water and nutrients that would otherwise be unavailable to the trees. Plants invest up to 20% of the carbon they fix through photosynthesis to sustain the fungi, and in return, the fungi facilitate up to 80% of their nitrogen needs and up to 100% of their phosphorus requirements. This mutual exchange of essential nutrients enhances the productivity and biomass of trees and strengthens their defenses against pests and diseases.

Current Impact of Fungi in the Industry

Food Industry

Yeasts and filamentous fungi, as genetic resources, are widely used in the food industry (Prescott et al., 2018). Fermentation is key in the production of alcoholic beverages such as beer, wine, and liquor, thanks to yeasts, particularly *Saccharomyces cerevisiae*, which ferment sugars. They are also essential in baking, where they leaven bread by producing carbon dioxide. In cheese production, molds like *Penicillium roqueforti* and *Penicillium camemberti* are crucial for making cheeses like blue cheese and Camembert, respectively (Ropars et al., 2015). Fungi also play a critical role in chocolate production, specifically in the fermentation of cocoa beans, where yeasts and other microorganisms develop the characteristic and essential flavors of high-quality chocolate.

The excellent nutritional properties of many macrofungi were recognized thousands of years ago. As a result, in today's global market, mushroom cultivation is valued at billions of dollars annually (Business Research Insights, 2024). Additionally, mycorrhizal fungi are vital for crop growth and are essential for global food security (Hristozkova & Orfanoudakis, 2023).

Pharmaceutical Industry

Fungi have become an increasingly valuable source of bioactive compounds, such as antibiotics, immunosuppressants, statins, and organic acids, for industry and medicine, thanks to their role as genetic resources (Niskanen et al., 2023). Since the accidental discovery of penicillin from *Penicillium rubens* in 1928, fungi have provided many valuable drugs. Among them are some of the most prescribed medications in the world: statins, which lower cholesterol. These are derived from various filamentous fungi, including strains of *Aspergillus terreus and Penicillium citrinum*. Additionally, the fungus *Tolypocladium inflatum* is used to produce the immunosuppressant cyclosporine, which revolutionized the success of organ transplants (Antonelli et al., 2023).

Mining Industry

Certain fungi are used in bioleaching processes in the mining industry, where they help extract metals like copper and gold from low-grade ores, utilizing biological processes that are more sustainable than traditional chemical methods (Dusengemungu et al., 2021). Different strains of *Aspergillus* are widely applied in the industry, with an average usage rate of 85% due to their powerful leaching agents, followed by *Fusarium*, *Penicillium*, and *Cladosporium*, each with 5% application across the three genera (Achahui et al., 2022).

Scientists from the VTT Technical Research Centre in Finland have developed a new method for extracting gold from discarded cell phone circuits using fungi, which can recover up to 80% of the metal in an environmentally friendly manner (Portal Minero, 2014).

Biotechnology

Fungi are used to produce industrial enzymes such as amylases, cellulases, lipases, proteases, and citric acid, which have applications in the food, textile, detergent, and paper industries. For example, *Aspergillus niger* is a key producer of enzymes like pectinase and glucoamylase. Additionally, certain fungi are employed in bioremediation processes to degrade environmental pollutants. White rot fungi in particular are unique microorganisms that show high capacities to degrade a wide range of toxic xenobiotic compounds (Torres-Farradá et. al., 2024).

The small size of fungal genomes makes them a powerful target for genetic research on eukaryotic biology and an efficient microbial factory for biotechnology and bioengineering (Spribille et al., 2022).

Forestry

Mycorrhizal fungi play a crucial role in the forestry industry by forming symbiotic relationships with tree roots, significantly improving the absorption of nutrients like phosphorus and nitrogen (Delavaux et al., 2023). These mycorrhizal associations are essential for the healthy growth of forests, especially in nutrient-poor soils, and can be used in reforestation practices and sustainable forest management. Additionally, mycorrhizal fungi can increase trees' resistance to diseases and stress conditions, contributing to the sustainability and productivity of forest ecosystems (U.S. Forest Service, 2022).

The Potential of Fungi in Innovation and Sustainability

Sustainable Energy

The United Nations' Sustainable Development Goal (SDG) 7 aims to address the lack of access to electricity and cooking energy, ensuring affordable, reliable, sustainable, and clean energy for all. Fungi have great potential in the bioenergy sector, for example, by expanding their current use in the pretreatment of woody material. Fungal enzymes produced by species such as Trichoderma reesei, a filamentous fungus, break down plant organic matter and can be sustainably cultivated. These enzymes can enhance bioenergy recovery from plants and generate more energy from byproducts of bioenergy processes, such as residual glycerol from biodiesel production. Additionally, microbial fuel cells can operate using fungal enzymes, like those from baker's yeast (*Saccharomyces cerevisiae*), to generate electricity from plant biomass in the form of ethanol (Antonelli et al., 2023).

Environmental Remediation (Mycoremediation)

Various studies indicate that fungi can be used in the bioremediation of soils and water contaminated by mining activities, helping to degrade and detoxify toxic waste such as heavy metals and cyanide, thus contributing to the ecological restoration of areas affected by mining.

Mycoremediation harnesses the ability of certain fungi to break down pollutants such as oil, heavy metals, and pesticides, making them a valuable tool for cleaning contaminated soils and waters (Akpasi et al., 2023). Additionally, fungi are used in waste management to decompose organic material, such as agricultural byproducts, transforming them into valuable products like compost, which helps reduce landfill use and methane emissions (Llacza & Castellanos, 2020).

Food and Agriculture

Mycoprotein, derived from fungal biomass, is a meat substitute that is high in protein and low in fat, and it is gaining popularity as a sustainable food source (Wang et al., 2023).

Additionally, the ability of some fungi to combat pests and stimulate plant growth makes them useful as biopesticides and biofertilizers for sustainable agriculture (Odoh et al., 2020).

Mycofabrication and Biomaterials

Mycoleather, derived from fungal mycelium, is a sustainable alternative to traditional leather, as it is biodegradable, cruelty-free, and produced with a significantly lower environmental impact (Niskanen et al., 2023). Myco-composites, on the other hand, utilize the ability of fungal mycelium to bind agricultural waste and form strong, lightweight materials that can be used in packaging, insulation, and even furniture manufacturing (Hyde et al., 2019). Additionally, *mycoplastics*, made from fungi, are being developed as biodegradable alternatives to petroleum-based plastics, offering more sustainable options for packaging and single-use products.

Cultural Importance of Fungi in Indigenous Communities

Fungi play a fundamental role in the culture and knowledge of many Indigenous communities, who, as guardians of much of the world's biodiversity, have a crucial role in preserving these organisms and the ecosystems that depend on them (Nitah, 2021). Among the hundreds of documented relationships between fungi and Indigenous cultures throughout history, the practices of the Yanomami with the fungus *Marasmius yanomami* stand out. Its rhizomorphs are woven with raw lianas and painted to make baskets, integrating fungi into the daily life and practices of this community (Oliveira et al., 2014).

Additionally, the *Fomitopsis* genus holds a prominent place in various Indigenous cultures, where its species have been used for thousands of years due to their multiple properties. These fungi have been used to sharpen tools, stop bleeding, and as textiles for clothing. In some cases, they have been considered objects with supernatural powers, used in shamanic rituals and as guardians in graves. The presence of *Fomitopsis* as part of the equipment carried by "Ötzi the Iceman," a man who lived more than 3,000 years ago and was found in the Italian Alps, underscores its ancient use as an antiseptic and in infusions to strengthen the immune system (ABC Ciencia, 2019). The rich and diverse relationship of fungi with Indigenous communities not only reflects a deep ecological understanding but also a spiritual and cultural connection that has endured over centuries (Blanchette et al., 1992).

Conservation of Fungi as a Genetic Resource

Climate change is also having detrimental impacts on the conservation of these organisms. Since the overwhelming majority of fungal diversity depends directly on plants—whether as beneficial partners, decomposers, or parasites—climate-related habitat changes that harm plants also affect the fungi that coexist with them. Changes in temperature and humidity levels can directly impact fungi. Meanwhile, the overexploitation of economically valuable fungi poses a risk to some species, such as the caterpillar fungus (*Ophiocordyceps sinensis*) from the Himalayas, which has been used in traditional Chinese and Tibetan medicine (Antonelli et al., 2023).

Data presented in global and national Red Lists suggest that the current threats to fungal species largely mirror those faced by animals and plants. The primary threat comes from land-use changes that alter natural systems, such as conversion to forestry, agricultural activities, or residential and commercial development. Efforts to include fungi in Red Lists have led to the evaluation of 625 fungi under the criteria of the International Union for Conservation of Nature (IUCN), of which 352 (56%) are considered globally threatened or near-threatened. This means that only 0.4% of described fungi have had their global conservation status evaluated, which corresponds to 0.02% of the estimated existing species (Antonelli et al., 2023).

As relatively immobile and often long-lived organisms, fungi benefit from many of the actions taken to conserve plant and animal species, such as site protection and the maintenance of ecological processes within threatened habitats. However, Red List assessments show that the degradation of certain ecological environments particularly affects fungi. Therefore, conserving fungal diversity and function requires specific management practices. These include preserving mature trees as species reservoirs, maintaining supplies of dead wood in forests, and managing grasslands with low nutrient levels.

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