International Society for Fungal Conservation

University of Parakou, Research Unit on Tropical Mycology and Plant-Soil Fungi Interactions (MyTIPS)

Mainstreaming Fungal Conservation

FOURTH INTERNATIONAL CONGRESS ON FUNGAL CONSERVATION

Cotonou, Republic of Benin

3–7 November 2025

PROGRAMME & ABSTRACTS

Credits

Organizing Committee. **Chair**: Nourou S. Yorou. **Deputy Chair**: Ramón Batista García. **Congress Secretary**: Olyvia Fadeyi. **Committee Members**: Elizabeth Barron, Greg Mueller, Cathy Sharp, David Minter [President ISFC, ex officio].

Honorary Committee (Hosts & Patrons). Congress President: David Minter [ISFC, UK]. **Hosts**: Nasser Baco [Vice-Rector, University of Parakou, Benin], Bertrand Sogbossi [Rector, University of Parakou, Benin], Valerien Zinsou [Dean, University of Parakou, Benin]. **Patrons**: Paul Cannon [UK], Giuliana Furci [Fundación Fungi, Chile], Meike Piepenbring [Germany], Alison Pouliot [Australia], Cathy Sharp [Zimbabwe], Merlin Sheldrake [UK], James Westrip [IUCN, UK].

Advisory Committee (chairs of IUCN fungal specialist groups). **Chair**: Greg Mueller [IUCN, USA]. **Committee Members**: Mayra Camino [Chytrids, Downy Mildews, Myxomycetes & Zygomycetes; Cuba], Teodor Denchev [Rusts & Smuts; Bulgaria], Irmgard Greilhuber [Mushrooms, Brackets & Puffballs; Germany], Melissa Mardones [Cup Fungi, Truffles & Allies; Costa Rica], Rebecca Yahr [Lichen-forming Fungi; UK].

Congress Administration (Parakou). **Chair**: Nourou Yorou. **Secretaries**: Olyvia Fadeyi, Boris Olou, Affoussatou Tabé. **Team Members**: Wilfred Adjimoti, Abdoul-Azize Boukary, Taibatou Chabi Bogo, Ramdan Dramani, Apollon Hegbe, Basile Hounwanou, Gilles Nago, Francine Toha.

Thanks

Financial support of the Meeting: British Mycological Society; Darwin Initiative; Cybertruffle; Faculty of Agronomy, University of Parakou; Fundación Fungi; IUCN; Mohamed bin Zayed Species Conservation Fund; MyTIPS, SPUN; University of Parakou.

Welcome

Dear Friends and Colleagues,



Nourou Yorou
Chair, *Organizing Committee*



David Minter
President, *International Society for Fungal Conservation*

Welcome to Benin, and the vibrant city of Cotonou, and welcome to the *Fourth International Congress on Fungal Conservation* [**ICFC4**]. This event, held under the auspices of the *International Society for Fungal Conservation*, is hosted by the *University of Parakou* through its *Research Unit on Tropical Mycology and Plant-Soil Fungi Interactions (MyTIPS)*. What an exciting moment it is! And not just a first for Africa. From almost nothing twenty years ago, fungal conservation has mushroomed! It's now mainstream, and widely recognized as the equal of animal and plant conservation. Africa is rich in enthusiastic, highly motivated educated young people with a burning desire to protect what's left of the natural world. We welcome them.

We are grateful to the Organizing Committee and all who have put so much effort into making this meeting a success. We also acknowledge with thanks the generous financial support of our donors, listed on the inside front cover. Finally, we wish you all a very successful meeting.

PROGRAMME

Sunday 2 November

Registration. The Congress Registration Desk, located in the foyer of the Benin Atlantic Beach Hotel, will be open from 16:00 to 19:00.

Evening

19:30-21:00. Ice-breaker party.

Monday 3 November

The Congress Registration Desk, located in the foyer of the Benin Atlantic Beach Hotel, will be open from 08:00 to 09:00.

Plenary Opening of Congress

09:00–09:30. Welcome. David Minter [Congress President and President of the *International Society for Fungal Conservation*] and Nourou Yorou [Congress Chairman and Representative of Hosts].

09:30–10:30. Introduction to red-listing: why, how, and ideas for using the information. Greg Mueller [USA, IUCN].

10:30–11:00. Refreshments.

Parallel Morning Sessions (11:00–13:00).

Workshop. Red-listing *Meliola* species: producing DRAFT red list assessments by computer. Leader: David Minter [UK, Cybertruffle]. Supported by the Mohamed Bin Zayed Species Conservation Fund.

Workshop. Red-listing *Termitomyces* species: assessing the extinction risk of Africa's *Termitomyces* mushrooms. Leader: Greg Mueller [USA, IUCN] & Ricardo Drechsler Santos [Brazil, IUCN]. Supported by the Mohamed Bin Zayed Species Conservation Fund.

13:00–14:00. Lunch.

Parallel Afternoon Sessions (refreshments, 15:30–16:00).

Workshop. Red-listing *Meliola* species: producing DRAFT red list assessments by computer. Leader: David Minter [UK, Cybertruffle]. Supported by the Mohamed Bin Zayed Species Conservation Fund.

Workshop. Red-listing *Termitomyces* species: assessing the extinction risk of Africa's *Termitomyces* mushrooms. Leader: Greg Mueller [USA, IUCN] & Ricardo Drechsler Santos [Brazil, IUCN]. Supported by the Mohamed Bin Zayed Species Conservation Fund.

Evening

19:30–20:30. Remote meeting: round table discussion with CBD National Focus Points. Leader: Nourou Yorou.

Tuesday 4 November

Parallel Morning Sessions (refreshments, 11:00–11:30).

Workshop. GROW: Gender, Rights and Opportunities for Women - through fungi. Leader: Elizabeth Barron [Norway, IUCN]. Supported by the International Institute for Environment and Development [IIED] through IUCN.

Workshop. Red-listing *Meliola* species: producing DRAFT red list assessments by computer. Leader: David Minter [UK, Cybertruffle]. Supported by the Mohamed Bin Zayed Species Conservation Fund.

Workshop. Red-listing *Termitomyces* species: assessing the extinction risk of Africa's *Termitomyces* mushrooms. Leader: Greg Mueller [IUCN] & Ricardo Drechsler Santos [Brazil, IUCN]. Supported by the Mohamed Bin Zayed Species Conservation Fund.

13:00–14:00. Lunch.

Parallel Afternoon Sessions (refreshments, 16:00–16:30).

Workshop. GROW: Gender, Rights and Opportunities for Women - through fungi. Leader: Elizabeth Barron [Norway, IUCN]. Supported by the International Institute for Environment and Development [IIED] through IUCN.

Workshop. Red-listing *Meliola* species: producing DRAFT red list assessments by computer. Leader: David Minter [UK, Cybertruffle]. Supported by the Mohamed Bin Zayed Species Conservation Fund.

Workshop. Red-listing *Termitomyces* species: assessing the extinction risk of Africa's *Termitomyces* mushrooms. Leader: Greg Mueller [IUCN] & Ricardo Drechsler Santos [Brazil, IUCN]. Supported by the Mohamed Bin Zayed Species Conservation Fund.

Evening

20:00–21:00. Posters.

Wednesday 5 November

Parallel Morning Sessions (refreshments, 11:00–11:30).

Workshop. GROW: Gender, Rights and Opportunities for Women - through fungi. Leader: Elizabeth Barron [Norway, IUCN]. Supported by the International Institute for Environment and Development [IIED] through IUCN.

Workshop. Red-listing *Termitomyces* species: assessing the extinction risk of Africa's *Termitomyces* mushrooms. Leader: Greg Mueller [USA, IUCN] & Ricardo Drechsler Santos [Brazil, IUCN]. Supported by the Mohamed Bin Zayed Species Conservation Fund.

Offered papers. Chair: Susanne Schmidt.

09.00–09:20. Conservation status of some Japanese and African mushrooms and conservation of ethnomycological knowledge in some West African and Caribbean countries. Hosaka Kentaro [Japan, Keio University]

09:20–09:40 Phylogenetic diversity of wild *Agaricus* (button mushrooms) in Kenya, and conservation efforts. Susan N. Kabacia [Kenya, National Museums of Kenya].

09:40–10:00 Nutritional potential of three edible mushroom species of the genus *Termitomyces* from ecological zone II in Togo. Essossimna Magamana [Togo, University of Lomé].

10:00–10:20 Knowledge of fungal biodiversity, an essential element for conservation, and a tool for identifying priority sites for biodiversity conservation in Gabon. Prudence Yombiyeni [Gabon, Institut de Recherche en Écologie Tropicale du CENAREST].

10:20–10:40 Study and comparison of nutritional profiles of some wild edible species of *Termitomyces* and *Pleurotus* of Cameroon. Romuald Oba [Cameroon, University of Bertoua].

10:40–11:00 Economic importance of wild edible fungi and their role in women's empowerment in northern Benin. Wilfred Adjimoti [Benin, University of Parakou].

Offered papers. Chairs: Affoussatou Tabé & Apollon Hegbe.

11:30–12:00 Conservation of wild edible mushrooms [WEMs] in Africa: the case of Kenya. Joyce Jefwa [Kenya, Pwani University].

12:00–12:30 Comparative analysis of naming criteria for wild edible mushrooms across linguistic families in Benin. Olyvia Gwladys Fadeyi [Benin, University of Parakou].

12:30–13:00 Impact of applied fertilizers on improving agronomic performance, soil properties, and rhizosphere mycorrhizal community in *Xanthosoma sagittifolium* (L.) Schott PIF plants in the field. Astride Carole Djeuani [Cameroon, University of Yaoundé].

13:00–14:00. Lunch.

Parallel Afternoon Sessions (refreshments, 15:30–16:00).

Workshop. GROW: Gender, Rights and Opportunities for Women - through fungi. Leader: Elizabeth Barron [Norway, IUCN]. Supported by the International Institute for Environment and Development [IIED] through IUCN.

Workshop. Red-listing *Termitomyces* species: assessing the extinction risk of Africa's *Termitomyces* mushrooms. Leader: Greg Mueller [USA, IUCN] & Ricardo Drechsler Santos [Brazil, IUCN]. Supported by the Mohamed Bin Zayed Species Conservation Fund.

Offered papers. Chair: Ngolo Koné.

14:00–14:20 New findings on rust fungi (Pucciniales, Basidiomycota) from Benin. Affoussato Tabé [Benin, University of Parakou].

14:20–14:40 Diversity of arbuscular mycorrhizal fungi associated with the rhizosphere of some plants from different levels of vegetation on the southwestern slope of Mount Cameroon. Astride Carole Djeuani [Cameroon, University of Yaoundé].

14:40–15:00 Safeguarding fungal diversity through fungarium specimens: strategic tools for conservation in tropical Africa. Boris Olou [Benin, University of Parakou].

15:00–15:20 Diversity of useful mushrooms and ethnomycological knowledge of native people in the Adamaoua region of Cameroon. Zouberou Njiaghait Mouanfon [Cameroon, University of Ngaoundere].

15:20–15:30 Questions and discussion.

Offered papers. Chairs: Ramdan Dramani & Wilfred Adjimoti.

16:00–16:20 Spatial distribution and influence of microclimate on natural production of *Amanita masasiensis* in the Soudano-Guinean exozone (West Africa). Hance Muriel N. Aboua [Benin, University of Parakou].

16:20–16:40 Characterization of endophytic fungi from fragments of rhizomes (seeds) of *Xanthosoma sagittifolium* (L.) Schott collected in agro-ecological zone V of Cameroon. Astride Carole Djeuani [Cameroon, University of Yaoundé].

16:40–17:00 Diversity and abundance of arbuscular mycorrhizal fungal spores associated with eggplant (*Solanum aethiopicum*) in four major production areas in Ivory Coast.

17:00–17:20 Substratum dynamics and species diversity of macrofungi in Ngel Nyaki Forest Reserve, Mambilla Plateau, Taraba State, Nigeria. Ajiya B. Cleophas [Nigeria. Gombe State University].

17:20–17:30 Questions and discussion.

Evening Session: Citizen science in fungal conservation. Chair: Susana Gonçalves.

19:30–20:00. Harnessing citizen science for fungal conservation [remote presentation]. Danny Haelewaters [Czech Republic, Czech Academy of Sciences, Biology Centre].

20:00–20:30. Bio-informatics meets community science: connecting big data and local mycologists [remote presentation]. Amy Honan [USA, Oregon State University] & Scott Bates [USA, Purdue University Northwest].

20:30–21:00. An introduction to iNaturalist for conservation mycologists. Susana Gonçalves [Portugal, European Council for Conservation of Fungi].

Thursday 6 November

Plenary Morning Session. Strategies & Policies. Chair: Nourou Yorou.

09.00–09:30. From commitment to action: advancing the Pledge for Fungal Conservation. Oscar Betanzo [Chile, Fundación Fungi].

09.30–10:00. Micheli evaluations: objective evidence of a need for change. Apollon Hegbe [Benin, University of Parakou].

10:00–10:30. Towards a Global Fungal Conservation Strategy. Greg Mueller [USA, IUCN].

10:30–11:00. Information and scientific advice for policy-makers. David Minter [UK, Cybertruffle].

11:00–11:30. Refreshments.

Plenary Morning Session. Funds & Profile-raising. Chair: Oscar Betanzo.

The session explores finding support for fungal conservation. Brief presentations from a panel of selected speakers will review past efforts, highlighting successes and analysing reasons for failure. The audience will be invited to ask questions, followed by discussion, a summary of lessons learned, and identification of approaches most likely to be successful.

11:30–11:50. Getting politicians to listen [remote presentation]. Lyn Allison [Australia, FungiMap].

11:50–12:10. Getting the media to listen: how mycologists can better communicate with, and get covered by, the press. Whitney Bauck [USA, Journalist].

12:10–12:30. Rufford small grants for fungal conservation in Africa: reviewing a success story. Sydney Ndolo Ebika [Republic of Congo, Brazzaville, Ngouabi University].

12:30–12:50. The work of SPUN [remote presentation]. Catia Canteiro [Society for the Protection of Underground Networks].

12:50–13:00. Discussion.

13:00–14:00. Lunch.

Plenary Afternoon Session. Education, livelihoods and uses of fungi. Chair: Olyvia Fadeyi.

14:00–14:20. Conservation of fungi through awareness then education. Cathy Sharp [Zimbabwe].

14:20–14:40. Sustainable uses and livelihoods. Elizabeth Barron [Norway, IUCN].

14:40–15:00. A database for uses of fungi. Wilfred Adjimoti [Benin, University of Parakou].

15:00–15:20. Fungal conservation in Bolivia: a Darwin Initiative project. Gihan Soliman [UK, Permaculture Association].

15:20–15:30. Questions; discussion; summary.

15:30–16:00. Refreshments.

Plenary Afternoon Session. Site Management for Fungi. Chair: Boris Olou.

16:00–16:40. Protecting fungi through forest restoration: multi-faceted Darwin Initiative work in Benin. Fati Sambo [Benin, Papatia Village Collective], Ramdan Dramani [Benin, University of Parakou] & Gihan Soliman [UK, Permaculture Association].

16:40–17:00. Reverse the Red, a global movement to reduce biodiversity loss. Greg Mueller [USA, IUCN].

17:00–17:20. From deserts to volcanoes, glaciers and the deep sea: conserving extremophilic fungi in a changing world. Ramón A. Batista García [Mexico, Universidad Autónoma del Estado de Morelos].

17:20–17:30. Questions and discussion.

Evening

20:00–20:30. Vivek Menon, the new Chair of IUCN's Species Survival Commission, will deliver a talk entitled "SSC as the premier network for conserving species – the power of collective action in reversing the decline of biodiversity."

Friday 7 November

Plenary Morning Session. Science in fungal conservation. Chair: Joyce Jefwa.

09.00–09:30. Diversity, use, and conservation of insect-associated fungi in tropical Africa. Michael Poulsen [Denmark, Copenhagen University].

09:30–10:00. Culturable fungi from a Portuguese karst cave ecosystem reveal hidden diversity. Luka Civa [Denmark, Copenhagen University].

10:00–10:20. Tropical *Russula* diversity: implications for conservation and ecosystem functioning. Cathrin Manz [Germany, Goethe University].

10:20–10:40. Taxonomy as the first step towards fungal conservation in Madagascar. Anna Ralaiveloarisoa [UK, Royal Botanic Gardens Kew].

10:40-11:00 Ecology, distribution, threats and conservation strategies for fungus-growing termites and their fungal symbionts: a case study from Côte d'Ivoire. Ngolo Koné [Côte d'Ivoire, Université Nangui-Abrogoua].

11:00–11:30. Refreshments.

Plenary Morning Session: Science in fungal conservation. Chair: Sydney Ndolo Ebika.

11:30–11:50. Optimised by evolution: nutritional profiling of the fungal crop cultivated by termites for 30 million years. Suzanne Schmidt [Denmark, Copenhagen University].

11:50–12:10. Predicting fungal species distribution and abundance responses to climate change: a case study of the stinking milk-cap mushroom in West Africa. Boris Armel Olou [Benin, University of Parakou].

12:10–12:40. Conservation of wild edible mushrooms: the case of Kenya. Joyce Jefwa [Kenya, Pwani University].

12:40–13:00. Use and promise of novel environmental DNA sources for fungal detection and conservation. Kasun Harshana Bodawatta [Denmark, Copenhagen University].

13:00–14:00. Lunch.

Plenary Afternoon Session. Fungal conservation across the world. Chair: Georgina Pereira.

The session reviews the state of fungal conservation in each of the world's main regions, with presentations for some of them by selected representative. This will be followed by discussion and analysis of future directions and priorities.

14:00–14:20. Fungal conservation in Sub-Saharan Africa. Joyce Jefwa [Kenya, Pwani University].

14:20–14:40. Fungal conservation in South America. Ricardo Drechsler Santos [Brazil, Universidade do Santa Catarina].

14:40–15:00. A snapshot into the current landscape of fungal conservation in Europe. Susana Gonçalves [Portugal, European Council for Conservation of Fungi]

15:00–15:20. Fungal conservation in the Caribbean. David Minter [Cuba, National Academy of Sciences].

15:20–15:30. Discussion; future directions; priorities.

15:30–16:00. Refreshments.

Plenary Afternoon Session. Outcomes of this Congress

16:00–16:30. Reports on the workshops. Elizabeth Barron [GROW Workshop], David Minter [*Meliola* Workshop] & Greg Mueller [*Termitomyces* Workshop].

16:30–17:15. Discussion and proposed adoption of a new Declaration on Fungal Conservation. Nourou Yorou.

Plenary Closing of Congress

17:15–17:30. David Minter. Awards, summary of Congress results, thanks, and close of Congress.

Evening

19:30–22:00. Congress Dinner.

WORKSHOPS

GROW. Gender, Rights, and Opportunities for Women through fungi

Workshop leader: Elizabeth Barron

The Fungal Use Group (FUse) of the IUCN Sustainable Use and Livelihoods Group (SULi) is hosting a two-day workshop on fungal conservation and gender (the GROW meeting) as part of the Fourth International Congress on Fungal Conservation (Cotonou, Benin).

The workshop will consist of a mix of presentations, round-table discussions, and brainstorming sessions. Our aim is to bring together researchers and practioners working at a range of career stages on topics including fungal resource use, ethnomycology, gender equality, public health, women's reproductive health care, and development issues. While the focus of the workshop will be on Sub-Saharan Africa, attendees from other regions are also very welcome.

At the workshop we will:

- discuss opportunities, risks, threats and assumptions regarding fungal sustainable use and women's livelihoods;
- identify genera for which source data on harvest methods and scales of harvesting need to be prioritized;
- examine the link between fungal livelihoods, gender and public health;
- consider various strategies for sharing scientific data, ethnobiological data, and traditional ecological knowledge, to improve mushroom conservation practices while following and supporting fair practices regarding the protection and safeguarding of cultural heritage and intellectual property rights of indigenous and local communities;
- introduce the Population, Health, and Environment (PHE) framework developed to bridge health, conservation, and sustainable livelihoods as a foundation for developing and planning future work at the intersection of fungal conservation and public health.

RED-LISTING *MELIOLA* SPECIES

A workshop to produce DRAFT red list assessments by computer

Workshop leader: David Minter

IUCN Red list evaluations require many different pieces of information from many different sources. They must be gathered together, sorted and presented in a closely defined format. These collated facts must then be combined with opinion. The inferences and judgement required for that stage are highly dependent on the experience of the evaluator. The objective of this workshop is to explore the

possibilities offered by computers to facilitate the preparation of such evaluations for fungi. We will consider sources of information, and how computers can be used to gather, sort and present that information in the right format. We will also ask whether a machine can mimic inference and judgement - the opinion component - sufficiently reliably to be useful. As a first stage, using software, we will attempt to generate completely mechanized evaluations which reliably allocate the conservation status of each species to one of three categories: Data Deficient, Least Concern, or human attention required.

For this exercise, we will work with the ascomycete genus *Meliola*. More than 2500 species of this genus have been described and, of these more than 1700 are currently accepted. They are mostly tropical, being found usually on leaves, sometimes also other green parts of plants. With few exceptions, individual species are found on only one or a small number of very closely related host genera. Morphologically the species are very uniform, making identification by traditional methods impractical unless there is a name for the host plant. Their ecological role is incompletely understood, but most are thought to be weakly parasitic, not or only rarely producing mild disease symptoms. Heavy infestation may reduce photosynthesis of the host leaf. Their economic significance, if any, is not known. They are thought to be sensitive to disturbance. Many are themselves parasitized by other fungi.

Programme

The workshop will comprise the following principal topics:

A review of information sources for red-listing these species

- nomenclature & taxonomy
- records of occurrence
- significance of each species
- threats
- other information

Practical work

- manual evaluation of example species with small data sets
- lessons learned
- warehousing
- warehouse structure
- warehousing software
- editing

Analysis

- analysis software
- comment and inference which can be incorporated into output software

Output

- output software

The human element

- comment and inference which must be added manually
- reality checks.

RED-LISTING TERMITOMYCES SPECIES

Assessing the extinction risk of Africa's *Termitomyces* mushrooms

Workshop leaders: Greg Mueller & Ricardo Drechsler Santos

The objectives for this workshop are to evaluate the extinction risk of African *Termitomyces* species for publication in the IUCN Red List, and to provide training and capacity building for African mycologists, especially young scientists, in undertaking extinction risk analyses and interpreting these data for developing conservation actions.

Termitomyces and its termite associates are inseparable mutually beneficial symbionts restricted to Africa and Asia. As traditionally defined, many *Termitomyces* species appear to occur in both continents. Recent studies, however, suggest that African and Asian populations are in reality taxonomically distinct. The present workshop adopts this new perspective, and will work only with the approximately 40 species now recognized as endemic to Africa.

No *Termitomyces* species have been globally assessed to date, but preliminary assessments indicate that at least some are threatened by a combination of habitat loss / degradation, unsustainable harvesting, and climate change, particularly through altered rainfall patterns and higher ambient temperatures. As all of these species are, together with their insect symbionts, important for natural recycling of woody materials, and many are important food resources and sources of income through marketing for local communities, conserving these species is important ecologically, economically, and culturally. This will be the first fungal red list workshop held in Africa, focused on African species, for African mycologists.

ABSTRACTS

SPATIAL DISTRIBUTION AND INFLUENCE OF MICROCLIMATE ON NATURAL PRODUCTION OF AMANITA MASASIENSIS IN THE SOUDANO-GUINEAN ECOZONE (WEST AFRICA) [1]

Abuoa, Hance Muriel N.[1*]; Badou, Sylvestre A.[1]; Houdanon, Roël D.[1]; Boukary, Abdoul-Azize[1]; Codija, Jean Evans I.[1,2,3]; Tchan, Kassim I.[1]; Olou, Boris A.[1]; Furneaux, Brendan[4]; Ryberg, Martin[5]; Yorou, Nourou S.[1]

[1]*Tropical Mycology and Plant-Soil Fungi Interactions (MyTIPS), Faculty of Agronomy, University of Parakou, BP 123 Parakou, Benin.* [2]*CAS Key Laboratory of Tropical Forest Ecology, Xishuangbanna Tropical Botanical Garden, Chinese Academy of Sciences, Menglun, Mengla, Yunnan, China.* [3]*CAS Key Laboratory of Tropical Plant Resources and Sustainable Use, Xishuangbanna Tropical Botanical Garden, Chinese Academy of Sciences, Kunming, Yunnan, China.* [4]*Department of Biological and Environmental Science, University of Jyväskylä, Jyväskylä, Finland.* [5]*Program in Systematic Biology, Department of Organismal Biology, Uppsala University, Uppsala, Sweden.*

**Corresponding author e-mail: abouahance94@gmail.com*

Amanita masasiensis is an edible ectomycorrhizal fungus widely harvested in Benin for its socio-economic importance. However, its natural production and response to climatic variations remain poorly understood. This study assessed natural production in Soudano-Guinean woodlands in relation to vegetation and microclimate. Three permanent plots (2500 m² each) were established in vegetation types dominated by *Isoberlinia doka*, *I. tomentosa*, and *Uapaca togoënsis*. The number of sporophores and fresh biomass were recorded twice weekly during each mycological season from 2015 to 2019, and climatic parameters were measured every 30 minutes. Seasonal and interannual production variations were analysed using time series curves and linear models. Effects of site and vegetation type on sporophore number and biomass were assessed using linear models, and the influence of microclimatic parameters was examined using mixed-effects models. All analyses were performed in R. Results showed that production peaked in July and decreased in September, with annual fresh biomass ranging from 0.16 to 4.05 kg/ha. Site significantly affected sporophore number and biomass, whereas vegetation type had no significant effect, suggesting that the species produces sporophores across various environments. Air and soil temperatures and relative humidity strongly influenced production, with optimal conditions of 24.4°C (air), 26.2°C (soil), and 95.5% humidity. These findings improve understanding of ecological factors governing *A. masasiensis* production

and provide insights for predicting yields and developing sustainable management strategies in tropical regions. **Key words**: *Amanita masasiensis*, fungal sporophore production patterns, environmental factors, phenology, mushroom productivity.

ECONOMIC IMPORTANCE OF WILD EDIBLE FUNGI AND THEIR ROLE IN WOMEN'S EMPOWERMENT IN NORTHERN BENIN [2]

Adjimoti, Wilfrid K.*; Yorou, Nourou S.

Tropical Mycology and Plant-Soil Fungi Interactions (MyTIPS), Faculty of Agronomy, University of Parakou, BP 123 Parakou, Benin.

**Corresponding author e-mail: wiladjimoti@gmail.com*

Wild Edible Fungi (WEF), as non-timber forest products (NTFPs), play a vital role in rural livelihoods across Sub-Saharan Africa, particularly in Benin. Despite their socio-economic importance, evidence of their contribution to household income and poverty reduction remains limited. This study assessed the economic significance of WEFs and their role in women's empowerment in four communes of northern Benin (Bemberekè, N'dali, Parakou, and Tchaourou). Between June and September 2025, a structured questionnaire was administered to 120 potential traders, selected through a snowball sampling approach in 12 villages, with participants' informed consent obtained for ethical considerations. Results show that all respondents (100%) engaged in WEF trade were women, underlining the gendered dimension of this activity. Seven species were identified as commercially important: *Agaricus volvatulus*, *Agrocybe sp.*, *Candolleomyces tuberculatus*, *Lactifluus edulis*, *Lactifluus flammans*, *Lactifluus gymnocarpoide*, and *Termitomyces shimperi*. Prices ranged from USD 0.36 to 0.90 per unit, generating an average monthly income of USD 64.26. Although modest in absolute terms, this income is substantial in a context where most households live below USD 4,390 PPA annually. However, challenges such as seasonal availability, limited market access, and insufficient value addition persist within the WEF value chain. These findings highlight that mushroom trade provides women with a reliable source of cash, particularly during lean agricultural seasons, thereby supporting food security and household expenditures. WEF commercialization thus represents more than a survival strategy; it constitutes a pathway for enhancing women's economic agency. By diversifying household income and creating market opportunities, mushroom trade contributes to poverty alleviation and gender equity. Strengthening value chains, improving storage technologies, and integrating WEFs into rural development policies could further amplify these benefits. **Key words**: wild edible fungi, women's empowerment, rural livelihoods, poverty alleviation.

GETTING POLITICIANS TO LISTEN [3]

Allison, Lyn

Australia, FungiMap. E-mail: lynallison4@gmail.com

This presentation looks at how Fungimap, down-under in Australia, is dealing with this issue. There have been some wins, and now is a particularly good time to bring scientists, citizen scientists, and particularly NGOs, together to persuade governments of the great importance of recognising and understanding fungi. Clarity is needed,with careful analysis of the problems, the barriers and the solutions. The approach needs to be strategic, committed, patient and persistent.

SUSTAINABLE USES AND LIVELIHOODS: INSIGHTS FROM G.R.O.W. [4]

Barron, Elizabeth S.

NTNU, Department of Geography and Social Anthropology, 7491 Trondheim, Norway. Email: elizabeth.barron@ntnu.no

The sustainable use of wild mushrooms and fungal resources is a critical topic for fungal conservation, and a broad one. How sustainable use is defined is important, but equally important and much less discussed in conservation circles is who defines sustainable use and why. This plenary talk challenges listeners therefore to consider the politics of sustainable use with regards to the power dynamics underlying discussions of sustainable use and livelihoods, with special attention to where knowledge originates, how knowledge is used, and who advocates for specific types of knowledge in different contexts. Key insights and take-aways from the GROW workshop, which proceeds the talk, will be included throughout to provide examples and additional insights. **Key words**: gathering, indigenous and local knowledges, women's health, food security, capacity building

FROM DESERTS TO VOLCANOES, GLACIERS AND THE DEEP SEA: CONSERVING EXTREMOPHILIC FUNGI IN A CHANGING WORLD [5]

Batista García, Ramón A.

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Extremophilic fungi thrive in the planet's most hostile environments—including glaciers, deep-sea sediments, hypersaline lakes, volcanic soils, and hyperarid deserts—where they have evolved extraordinary physiological, biochemical, and genomic adaptations to endure extremes of temperature, salinity, radiation, pH, and

nutrient scarcity. These fungi play essential ecological roles in nutrient cycling, primary colonization, and plant-microbe interactions under extreme conditions. However, despite their relevance, they remain largely overlooked in global fungal conservation frameworks and are absent from key tolos, such as the IUCN Red List. As climate change, mining, and tourism increasingly threaten extreme environments, the conservation of extremophilic fungi becomes both urgent and technically complex. This contribution discusses the need to integrate these organisms into conservation agendas by adopting tailored methodologies, including environmental DNA (eDNA) analyses, metagenomics, and the development of specialized fungal culture collections. We also highlight the value of exsitu conservation strategies and the critical importance of protecting in situ habitats that are being lost or altered at alarming rates. Using examples such as fungi inhabiting polar glaciers, chaotolerant halophiles from hypersaline environments, and thermotolerant strains from geothermal sites, we illustrate how these lineages represent reservoirs of unique genetic traits with potential applications in biotechnology, agriculture, and astrobiology. Conserving extremophilic fungi not only safeguards their evolutionary novelty and ecological function but also preserves critical knowledge about the limits of life and the resilience of organisms under environmental stress. Their inclusion in fungal conservation strategies is imperative for achieving a truly comprehensive and future-proof approach to protecting fungal biodiversity.

GETTING THE MEDIA TO LISTEN: HOW MYCOLOGISTS CAN BETTER COMMUNICATE WITH, AND GET COVERED BY, THE PRESS [6]

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The vast majority of the general public does not read scientific journals, and is more likely to encounter nonfiction science information via popular media. For mycologists, then, the best way to shape public opinion about and understanding of their field is to engage with the press directly. Scientific papers that receive more media attention tend to have higher citation counts within the scientific literature, and scientists who engage with the media self-report getting approached for more collaboration and funding opportunities after press coverage.

For mycologists interested in procuring more press coverage, there are a few steps to consider. First, make sure that a short summary of your work, alongside your contact information, is easy to find online. Second, understand the role and constraints of reporters: news media works with much quicker timelines than scientific journals, so respond to communications from journalists as promptly as possible; don't expect to proofread a journalists' article before publication, as that will likely violate their publication's ethics guidelines; and be prepared for

headlines that aren't exactly what you would have chosen. Third, communicate like a lay person: avoid jargon; come prepared with analogies to make tricky concepts clear; explain things like you're talking to a friend who doesn't work in your field; and don't be scared to let your personality or motivations for engaging in your area of research shine through – let reporters (and subsequently readers) see your "why". The goal is to help people outside your discipline understand why they should care about your work. Finally, if you want to go the extra mile, encourage your institution to start a newsletter highlighting new research, or consider starting one yourself. You can even hone your public science communication skills by trying your hand at sharing about your work on social media.

Journalists serve as a bridge between scientists and the public, and they can be great allies in shaping public opinion about science and even help researchers attract attention that can lead to greater funding. Thus, it's important for mycologists to engage with the press in order to help shape the narratives about their field. By making their work and contact information easy to find, understanding the role and norms of journalism, and speaking clearly and without jargon, mycologists can help pave the way for more press coverage of this crucial but chronically underreported-on field. **Key words**: science communication, mycology, funding, press coverage.

FROM COMMITMENT TO ACTION: ADVANCING THE PLEDGE FOR FUNGAL CONSERVATION [7]

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Fungi are essential to ecosystems, food systems, and human well-being, yet remain critically underrepresented in global biodiversity frameworks. The Pledge for Fungal Conservation, launched by the Governments of Chile and the United Kingdom with the collaboration of the Fungi Foundation and the Royal Botanic Gardens, Kew, represents a landmark step to elevate fungi within international conservation agendas under the Convention on Biological Diversity (CBD).

This presentation will explore the origins of the Pledge, its alignment with global biodiversity targets, and the pathways being developed for its implementation. Drawing on international negotiations and national-level actions, the session will highlight both the challenges and opportunities of embedding fungi into policy.

By showcasing concrete actions and future directions, this talk seeks to reaffirm the urgency and potential of integrating fungal conservation into global biodiversity governance. **Key words**: fungi, conservation, biodiversity, pledge, policy.

LOCAL KNOWLEDGE AND PERCEPTIONS OF EDIBLE MUSHROOM ABUNDANCE AND CONSERVATION IN THE CHANGING TTK FOREST RESERVE ECOSYSTEM [8, poster]

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Wild edible mushrooms play a central role in the livelihoods, food security, and cultural heritage of communities living around the TTK Forest Reserve in West Africa. Rich in proteins and micronutrients, they are primarily harvested by women and represent an important source of income. Their availability, closely linked to forest ecosystem health, is perceived as an early indicator of environmental degradation. This study aimed to examine local knowledge, perceptions of availability, and practices associated with the decline of edible mushrooms in the TTK Forest Reserve. Data were collected through 289 household surveys, semi-structured interviews, and ethnographic observations with surrounding communities. Statistical analyses, including Cramer's V test and Multiple Correspondence Analysis (MCA), were performed to explore relationships between ethnicity and interest in specific species. MCA, conducted using the *FactoMineR* and *ggplot2* packages, revealed dominant perceptions of abundance levels, temporal dynamics, and threats to different species. A total of 38 consumed species were documented, dominated by the genera *Termitomyces*, *Lactifluus*, and *Cantharellus*. Cramer's V and MCA results highlighted correlations between ethnicity and consumption preferences, with marked preferences for *Termitomyces schimperi* among the Lokpa and Nago, and for *Candolleomyces tuberculatus* among the Yom. Local perceptions indicate a marked decline in natural mushroom production over the past three decades, with 98.81% of respondents reporting a decrease, 1.05% an increase, and 0.14% stability. Regarding current abundance, 83.07% of species are perceived as rare, 9.67% as abundant, 6.35% as very abundant, and 0.91% as locally extinct, reflecting severe erosion of fungal resources. This decline is attributed to deforestation, climate change, poor agricultural practices, and erosion of traditional knowledge, with some taxa potentially extinct locally. The study recommends integrating ethnomycological knowledge into conservation policies, establishing community-based monitoring systems, and strengthening co-management. It underscores the complementarity between local knowledge and scientific monitoring to develop adaptive strategies for sustainable management. Preserving fungal diversity in the TTK Reserve thus emerges as a major ecological, cultural, and socio-economic challenge. **Key words**: *Termitomyces*, edible mushroom, diversity, abundance, extinct, fungal.

THE WORK OF SPUN [9]

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Soils play a vital role in regulating the planet's climate, holding 75% of terrestrial carbon. Mycorrhizal fungi are essential for retaining this carbon in the soil while also providing important nutrients to plants. Additionally, mycorrhizae enhance plants' ability to absorb water, increase their resilience to drought, and strengthen their defences against pests and diseases. However, these intricate and vital underground networks have been largely overlooked in conservation policy and action. The Society for the Protection of Underground Networks (SPUN) is a scientific research organization founded to map and advocate for the protection of the mycorrhizal fungal networks that regulate Earth's climate and ecosystems. In collaboration with global researchers and local communities, SPUN is developing tools that leverage fungi to preserve biodiversity and mitigate climate change. SPUN launched the 'Underground Atlas' in 2025, the first global high-resolution digital maps that predict mycorrhizal fungal biodiversity at a 1 km^2 scale. The 'Underground Atlas' was developed to help decision-makers identify underground hotspots of mycorrhizal biodiversity and endemism that are currently outside national protected areas. The maps also highlight areas with high uncertainty that require more soil biodiversity sampling and data. To address these knowledge gaps, SPUN developed an 'Underground Explorers Program', which provides funding, access to sequencing and mapping technologies, and opportunities for knowledge sharing among local researchers. Furthermore, SPUN is using geo-spatial data to identify and quantify the main external threats to soil biodiversity, creating a 'Soil Threat Index'. By overlaying this index with biodiversity maps, decision-makers can identify critically threatened areas that need urgent action. **Key words**: mycorrhizal fungi; soil; hotspots; conservation; expert networks.

CULTURABLE FUNGI FROM A PORTUGUESE KARST CAVE ECOSYSTEM REVEAL HIDDEN DIVERSITY [10]

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Caves are important subterranean ecosystems that harbour unique oligotrophic environments, known to have high levels of endemic biodiversity. Microbial ecology in caves is still underexplored, particularly when it comes to species richness and community interactions. Previous studies investigating culturable fungal diversity, have shown *Penicillium*, *Aspergillus*, and *Cladosporium* to be the most common genera. The aim of this study was to obtain and compare culturable fungal diversity across three cave compartments in the Vale Telheiro cave in Portugal. This karst cave is characterised by low oxygen- and high carbon dioxide levels and it is recognised as a biodiversity hotspot, comprising three compartments that differ in light input, ventilation, nutrient availability, and concentrations ofthe radioactive element radon. We isolated fungi using multiple media and a dilution series to obtain pure cultures that we then identified through DNA barcoding of the ITS gene. A total of 77 fungal cultures were obtained, dominated by *Penicillium*, *Aspergillus* and *Pseudogymnoascus*. Culture medium and dilution affected the diversity and identity of fungal isolates, but there was no significant effect of cave compartment on the number of isolates. Barcoding indicated the possibility of novel taxa, but further investigation is underway to robustly place the fungal isolates among known fungal diversity. Even so, our findings suggest that karst cave ecosystems are promising for the discovery of so far unknown microbial life and highlight the importance of cave ecosystem conservation to prevent the loss of hidden fungal biodiversity. **Key words**: speleology, culturomics, microbial ecology, fungal diversity, DNA barcoding.

SUBSTRATUM DYNAMICS AND SPECIES DIVERSITY OF MACROFUNGI IN NGEL NYAKI FOREST RESERVE, MAMBILLA PLATEAU, TARABA STATE, NIGERIA [11]

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Macrofungi play a significant role in terrestrial ecosystems. However, the drivers of their community assemblages remain unclear. We examined the effect of the state of decomposition on the diversity of macrofungi in the study area and tested the hypothesis that there is no relationship between stages of decomposition of deadwood and macrofungi diversity and abundance. The study revealed that *Microporus xanthopus* (Fr.) Kuntze was recorded at the early stage of decomposition, while *Trichoglossum hirsutum* (Pers.) Bound, was found to be associated with the substratum at later stages of decay. Higher numbers of species were recorded on fallen than on standing deadwood. Fifty-six (56) species were observed on fallen deadwood, eleven (11) on standing deadwood and five (5) on both standing and fallen deadwood. Results showed that the number of species was significantly higher (42) on hollow deadwood than on deadwood which was not hollow (26). Only four species [*Hemimycena candida* (Bres.) Singer, *Marasmius cris-equi* F. Muell, *Melanoleuca* sp, and *Trichoglossum hirsutum* (Pers.) Bound] were recorded on deadwood with deep hollows. The study suggests that substratum structural assortment is a major driver of macrofungi diversity, and shows that Ngel Nyaki Forest Reserve holds a vast diversity of macrofungi with potential for the discovery of new species. **Key words**: Ngel Nyaki Forest Reserve, macrofungi, substratum, composition, diversity.

IMPACT OF APPLIED FERTILIZERS ON IMPROVING AGRONOMIC PERFORMANCE, SOIL PROPERTIES, AND RHIZOSPHERE MYCORRHIZAL COMMUNITY IN *XANTHOSOMA SAGITTIFOLIUM* (L.) SCHOTT PIF PLANTS IN THE FIELD [12]

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The objective of this work was to evaluate the effect of applied fertilizers on the growth of *Xanthosoma sagittifolium* PIF plants while highlighting their potential influences on changes in soil quality and the nature of mycorrhizal life in the rhizosphere of plants in the field. The experimental design was a randomized complete block. Seeds of PIF plants and *X. sagittifolium* shoots were used. Four treatments were applied: Control (T), Oyster Shells (OQ), Phosphorus Solubilizing Bacteria (PSB), and the mixture of shell + phosphorus solubilizing bacteria (OQ + PSB). Agronomic growth parameters, analysis of some metabolites in the leaves, and determination of soil physicochemical parameters were evaluated. The mycorrhizal status of *X. sagittifolium* plants and a morphological characterization

of the mycorrhizal types were carried out. The results obtained showed, using the Student Newman and Keuls test, a significant variation in field growth parameters depending on the treatments applied, with an average plant height value of 48.60±8.47cm in plants from suckers fertilized with BSP. In the leaves of *X. sagittifolium* in sucker plants, high values of chlorophyll (1.03±0.58 $mg.g^{-1}$) (COQ), total soluble sugars (41.92±19.68 $mg.g^{-1}$) (COQ+BSP), and total soluble proteins (18.78±3.98 $mg.g^{-1}$) (COQ), respectively, were noted depending on the treatments applied. In PIF plants, a phenolic compound content of 8.82±0.00 $mg.g^{-1}$) (COQ) was noted. Physicochemical analysis of the soils showed an improvement in soil texture and an increase in available phosphorus in the presence of BSP. Mycorrhization indices were higher in the presence of the BSP treatment. Four AMF genera were identified depending on the treatments: *Acaulospora* sp., *Gigaspora* sp., *Glomus* sp., and *Scutellospora* sp. The genus *Glomus* sp. was the most prevalent in all plots. The fertilization applied influenced the abundance of AMF present. **Key words**: *Xanthosoma sagittifolium*, suckers, PIF plants, metabolites, soil, arbuscular mycorrhizal fungi.

DIVERSITY OF ARBUSCULAR MYCORRHIZAL FUNGI ASSOCIATED WITH THE RHIZOSPHERE OF SOME PLANTS FROM DIFFERENT LEVELS OF VEGETATION ON THE SOUTHWESTERN SLOPE OF MOUNT CAMEROON [13]

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Mount Cameroon, a jewel of biodiversity located in Central Africa, is under pressure from anthropogenic activities and natural degradation, which are responsible for the destruction of its natural habitats and the loss of both above-ground and below-ground biodiversity. This study examines the impact of environmental factors on the diversity of arbuscular mycorrhizal fungi across different vegetation levels in Mount Cameroon. Sampling was carried out during the dry season using the SPUN method on the southwest slope of Mount Cameroon. At each sampling point, an assessment of the floristic background was carried out, as well as the collection of soil samples at depths between 0-20 cm and 20-40 cm. Analysis of the physicochemical parameters of these soils, the mycorrhizal status of the dominant plants of each floristic background, and a morphological characterization of the mycorrhizal spores were carried out. The results obtained show a dominance of Pteridophyta belonging to several families,

such as *Cyatheaceae*, *Dennstaedtiaceae*, and *Hymenophyllaceae*. The frequencies of mycorrhizations appear higher in submontane, montane, and subalpine forests and meadows, with 100% of the roots of *Vernonia amygdalina*, *Cyathea* sp., and *Dracaena afromontana* plants. The soils of the different vegetation levels are predominantly loamy-clayey, with acidic pH, with values between 4.5 and 6.4 for pH-water, then 4.1 and 5.2 for pH-KCL. The analyses of these soils showed a low assimilable phosphorus content. The C/N ratios are generally higher than 12, with a maximum of 71.67 at 1456 m altitude in the submontane forest. Extraction and enumeration of arbuscular mycorrhizal fungal spores yielded higher densities of 16 spores per gram of soil for samples taken between 0 and 20 cm and 25 spores per gram of soil between 20 and 40 cm depth at 1481 meters above sea level in the submontane forest. A total of 9 genera, including *Glomus, Gigaspora, Funneliformis, Acaulospora, Scutellospora, Rhizophagus, Septoglomus, Divespora*, and *Paraglomus*, were recorded, with a predominance of the genus *Glomus*, which appears in all vegetation types, followed by the genus *Gigaspora*, which is absent at 3772 m above sea level. This study demonstrates a diversity of AMF within the same vegetation type, between different vegetation levels, and depending on soil depth. **Key words**: arbuscular mycorrhizal fungi, Mount Cameroon, diversity, vegetation level, altitude.

CHARACTERIZATION OF ENDOPHYTIC FUNGI FROM FRAGMENTS OF RHIZOMES (SEEDS) OF *XANTHOSOMA SAGITTIFOLIUM* (L.) SCHOTT COLLECTED IN AGRO-ECOLOGICAL ZONE V OF CAMEROON [14]

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Xanthosoma sagittifolium (L.) Schott is a tropical plant cultivated for its edible leaves and tubers. Its principal problems in cultivation are the lack of improved varieties, soil fertility, post-harvest losses, and inadequate agronomic practices. This study determined diversity of endophytic fungi present in rhizome fragments in *X. sagittifolium*. To do this, rhizome samples of two *X. sagittifolium* cultivars were collected during the dry season in the East region of Cameroon, in 5 localities: Mboundel, Koso, Djouth, Bitouala and Nguelebok. The classic methodology of isolation and macro- and microscopic identification was used to characterize the endophytic fungal communities using morphological and microscopic identification keys. To assess this fungal diversity, diversity indices Shannon,

Simpson and Piélou, and specific richness indices were calculated. Results showed that rhizomes of the two cultivars harbour significant diversity of endophytes. Study of macroscopic and microscopic characteristics allowed identification of 6 fungal genera (*Aspergillus* sp., *Fusarium* sp., *Penicillium* sp., *Rhizopus* sp., *Trichoderma* sp., *Scytalidium* sp.) and one chromist genus (*Pythium* sp.) with a predominance of *Aspergillus* spp. (46.2%) and 3 other unidentified genera. Identified genera belonged to 3 phyla (Ascomycota, Chytridiomycota and Zygomycota). Isolation frequencies varied by cultivar, *Aspergillus* sp. being more frequent in the red cultivar (54.8%) than in the white one (34.4%). Diversity indices of fungi were greater for the white cultivar (H' = 1.89, D = 0.188, J = 0.91) than for the red (H' = 1.45, D = 0.341, J = 0.7), although both cultivars had equal species richness (S = 8). Fungal diversity also varied across harvest sites, with Djouth recording the highest values for Shannon index (H' = 1.83) and species richness (S = 8), while Nguelebok has the highest Piélou Equitability (J = 0.94). Realization of interaction of some of these endophytic fungi with Pif plants *of Xanthosoma sagittifolium* presented an improvement in growth with a significant impact on synthesis of some leaf metabolites. These differences reflect the impact of local ecological conditions on the composition of fungal communities. The results provide a basis for developing sustainable agriculture strategies, taking advantage of endophytic fungi to optimize productivity and resilience of these plant crops under varied conditions. **Key words**: *Xanthosoma sagittifolium*; diversity; endophytic fungi; rhizome fragments; agro-ecological zone.

PROTECTING FUNGI THROUGH FOREST RESTORATION: MULTI-FACETED DARWIN INITIATIVE WORK IN BENIN [15]

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Like other countries, Benin has experienced severe deforestation over the past few decades, losing about 28% of tree cover between 2001 and 2024. For ectomycorrhizal fungi (and Benin is a biodiversity hotspot for these organisms) the loss has been catastrophic. Many apparently endemic and certainly rare species are now restricted to tiny pockets of surviving natural woodland surrounded by cleared areas and plantations of exotic trees. One of the objectives of a current UK Darwin Initiative project, led by Benin's University of Parakou, is to address this problem.

A representative of one of the participating village collectives will describe the gathering of native tree seeds, and will recount how these are being used to

establish forest nurseries in or near surviving woodland. This proximity will enable native ectomycorrhizal fungi to colonize seedling roots and, from there, to be planted out in areas designated for regeneration. Since June 2023, the project has produced 5,700 ectomycorrhizal seedlings of *Afzelia africana*, *Isoberlinia doka* and *Isoberlinia tomentosa* across 20 beneficiary villages in the municipalities of Kouandé and Natitingou, northern Benin. The seedlings are being transplanted in community forests, sacred groves, and community gardens, contributing both to ecosystem restoration and to empowerment of rural people, with 327 households benefiting financially from the project's activities.

In the second part of the presentation, one of the University of Parakou mycologists will focus on the technical support needed to make this successful, and on some of the constraints and difficulties which have been encountered, for example from competing agricultual and mining activities.

Lastly, grass-roots sustainability and livelihood aspects will be explained from a permaculture perspective by the third speaker. A key lesson learned has been the importance of understanding local cultural norms and ensuring that initiatives of this sort are sensistive to cultural contexts. **Key words**: ecological restoration, fungal conservation, livelihood, Benin.

ECTOMYCORRHIZAL FUNGI IN BENIN: CONSERVATION CHALLENGES AND COMMUNITY PERCEPTIONS OF NATURAL PRODUCTION DYNAMICS [16, poster]

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Ectomycorrhizal (EcM) fungi play a vital role in forest ecosystems by enhancing tree growth, maintaining soil fertility, and supporting local livelihoods through their edible fruiting bodies. However, they are increasingly affected by global change and local anthropogenic pressures. Understanding both the ecological dynamics and local community perceptions is crucial for developing effective conservation strategies. This study combined social surveys and field observations to assess threats and perceived changes in EcM fungi natural production in the sacred forest of Kpéroussogbé and the Ouémé Supérieur Forest Reserve (Benin) over the past decade. Semi-structured interviews were conducted with 150 randomly selected local residents aged 25 years and older to document their perceptions of productivity trends and drivers of change. In parallel, direct observations were carried out on fruiting sites to record environmental conditions and threats to fungal habitats. Results indicate that communities widely perceive a

decline in EcM fungi productivity. More than 60% of respondents estimated a reduction greater than 50%, including 20% who reported a decline exceeding 75%. About 29.3% perceived a reduction between 25 and 50%, while only 11.7% considered the decline to be less than 25%. Major threats identified include logging of EcM host trees (53.7%) and grazing (32.3%), while bushfires (11.7%) and the use of chemical inputs in agriculture (2.3%) were also reported. In addition, field observations revealed that gold mining contributes to habitat destruction in the sacred forest of Kpéroussogbé. Climate variability and accelerated urbanization were further cited as indirect drivers of this decline. The combined insights from community perceptions and field observations demonstrate a consistent and alarming decline in EcM fungi habitats, highlighting their vulnerability to both direct and indirect anthropogenic pressures. These findings underscore the urgent need for community-based conservation, including raising awareness and restoring degraded habitats with EcM trees, to safeguard EcM fungi and the vital ecosystem services they provide. **Key words**: natural habitat, ectomycorrhizal, global change, conservation, Benin.

BRAZIL AS A GLOBAL PLAYER IN FUNGAL CONSERVATION: FROM NEGLECT TO ACTION [17]

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Brazil harbours one of the highest levels of fungal diversity worldwide, much of still undocumented and historically neglected in conservation policies. Over the past decade, however, significant progress has been achieved. Since 2019, 123 Brazilian species have been assessed for the IUCN Red List, including 67 endemics. These could serve as a foundation for the country's first official National Red List of Fungi. In 2024, a landmark federal decree formally recognized fungi in Brazil's environmental legislation, enabling their integration into biodiversity policies alongside fauna and flora. This breakthrough has catalyzed further initiatives, such as proposals for the official recognition of threatened endemic species by the Ministry of the Environment and Climate Change, establishment of the IUCN SSC Brazil Fungal Specialist Group, and the launch of the Brazilian Threatened Fungi Collection (CFAB/MIND.Funga), the first ex situ conservation initiative for threatened fungi in the country. Together, these actions represent a rapid transition from neglect to action, positioning Brazil as a global reference for inclusive conservation. This talk will present Brazil's path, highlight current challenges, and discuss how these advances can inspire other megadiverse countries to embrace fungal conservation in their plans.

AN ANALYSIS OF FUNDING SUPPORT PROVIDED BY THE RUFFORD FOUNDATION FOR FUNGAL CONSERVATION IN AFRICA [18]

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Efforts to conserve biodiversity require several stakeholders ranging from governments, state and private institutions, international and national NGOs, local communities and indigenous peoples. To organize a meeting, local or international, or to conduct *in situ* biodiversity conservation actions, the role played by stakeholders, donors or sponsors, cannot be ignored. In this presentation, we examine fungal conservation projects funded by the Rufford Foundation across Africa to draw lessons on the impact of funds in the country where the grants have been provided. The Rufford Foundation website was screened using two words namely Africa and fungi. Results shows that from 2010 to July 2025, 38 projects from seven countries received financial support from the Foundation for projects on conservation of fungal species habitats, conservation status of species, raising awareness, reinforcing forest conservation law, sustainable management, fungal domestication and tree planting to cite a few. We will discuss how grants have contributed to increasing capacity and capability in mycology and how much has been in fungal conservation, with recommendations for future actions to be taken by Rufford Foundation grantees to increase effort in fungal conservation.

COMPARATIVE ANALYSIS OF NAMING CRITERIA FOR WILD EDIBLE MUSHROOMS ACROSS LINGUISTIC FAMILIES IN BENIN [19]

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Conservation biology and ethnobiological studies commonly rely on traditional sorting of samples into recognizable taxonomic units, such as morphospecies or morphotypes. However, understanding criteria used for traditional nomenclature of fungi, particularly wild edible mushrooms across linguistic groups, remains limited, leading to frequent errors in species recognition. This study assesses how linguistic

affiliations influence local naming of useful wild mushrooms. It is the first of its kind in Benin. To understand how local people recognize, classify and name mushrooms which develop in or close to their villages, 2234 respondents from five socio-linguistic groups across three geographical areas were interviewed. Structured and semi-structured interviews were conducted to gather data on local naming criteria for edible wild mushrooms. Citation scores were recorded for both nomenclature criteria and species, considering variables such as linguistic groups, age, and language. Twenty-two nomenclature criteria were used by local people to name edible wild species. Strong similarity in classification and naming of species was shown in 97% of the languages, while 3% showed differing classification criteria. The Gur, Atlantic, and Mande linguistic groups demonstrated more comprehensive traditional taxonomic and nomenclatural knowledge, sharing six common criteria: texture, taste, size, kingdom (Fungi), form, and substrate. Overall, local populations possess extensive knowledge of the diversity of wild edible mushrooms in their environment. **Key words**: ethnomycology, naming criteria, linguistic groups, edible mushrooms, Benin

AN INTRODUCTION TO INATURALIST FOR CONSERVATION MYCOLOGISTS [20]

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iNaturalist is a globally accessible platform designed to promote public participation in documenting biodiversity through citizen science. Here, I introduce conservation mycologists new to iNaturalist to what it is, how it works, how contributed data is used to protect fungi, and how it helps build personal relationships with nature, the foundation of all conservation work. **Key words**: citizen science, species identification, nature connectedness, data sharing, GBIF.

A SNAPSHOT INTO THE CURRENT LANDSCAPE OF FUNGAL CONSERVATION IN EUROPE [21]

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Although the European Commission has yet to fulfill its promise to prioritize a Red List of European fungi, several initiatives aimed at the conservation of fungi

are underway in Europe, ranging from the local to the continental scale. In this talk, I will present an overview of some of these initiatives, including the inclusion of fungi in Vienna's environmental protection law, the reactivation of the British network for the conservation of fungi, the first Red List of fungi in the Iberian Peninsula, and the continental initiatives FunDive and JoNeF. While certainly not exhaustive, these examples demonstrate the variety of approaches being taken to address the many challenges of safeguarding European fungi. **Key words**: Vienna's environmental protection legislation, UK network for Fungal Conservation, SIM Red List working group, FunDive, JoNeF.

HARNESSING CITIZEN SCIENCE FOR FUNGAL CONSERVATION [22]

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This presentation will introduce the Laboulbeniomycetes, a class containing fungi are obligately associated with arthropods, either as ectobionts, ectoparasites, or for dispersal. These fungi have traditionally been regarded as enigmatic or understudied, but what does it mean to be "understudied"? And how does being understudied affect conservation efforts? Four knowledge gaps or shortfalls that were analyzed quantitatively will be presented: the Linnean (knowledge gaps in species diversity), Wallacean (knowledge gaps in distributions), Latimerian (knowledge gaps in species persistence), and Scottian (knowledge gaps in species conservation assessments) shortfalls. One approach to help close these knowledge gaps across temporal and spatial scales that cannot be achieved by researchers on their own is to involve citizen scientists. And so to close the presentation, challenges and solutions will be discussed for working with citizens and the data they generate.

MICHELI EVALUATIONS: OBJECTIVE EVIDENCE OF A NEED FOR CHANGE [23]

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Fungi are universally recognized to be a key component of biological diversity. As such they are included in the 1992 Rio Convention on Biological Diversity [**CBD**], which set standards to protect all biodiversity worldwide. Each country signatory to the Convention commits to producing a National Biodiversity Strategy and Action Plan [**NBSAP**] and periodically reports on progress. The documents are

available online. Using the 'Micheli' method, a scoring system developed by the International Society for Fungal Conservation [www.fungal-conservation.org/micheli.htm], we looked at coverage of fungi in over 278 of these documents from Sub-Saharan countries.

In more than 50% of the documents, fungi were not mentioned. In the remainder, fungi were often confused with plants or even insects. Most documents treated fungi either as a resource to be exploited or a threat to be eradicated. None had specific strategies for fungal conservation. Fungal habitats were almost completely overlooked. The prevailing lack of information about fungi was acknowledged by a few, but none proposed any remedy. A keyword search showed approximately 73% of hits related to animals (mainly fish), with 26% to plants, and only 1% to fungi. There were startling gaps: none, for example, mentioned yeast. The presence of many additional animal-related terms not included in the keyword list suggests coverage of animals was significantly underestimated.

This study reveals a significant gap in conservation coverage for fungi of Sub-Saharan Africa. Despite extensive published evidence these organisms, the **CBD** has completely neglected them. Further evaluations we have made confirm that this neglect is not restricted to Africa: it is global. We conclude that, for fungi, the **CBD** is failing in its mission. This failure needs to be addressed urgently. **Key words**: CBD, NBSAP, fungi, biodiversity assessment, Sub-Saharan Africa.

BIOINFORMATICS MEETS COMMUNITY SCIENCE: CONNECTING BIG DATA AND LOCAL MYCOLOGISTS [24]

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Fungi are foundational to biodiversity and ecosystem function, yet their conservation status has been historically overlooked. Recent efforts by the IUCN and NatureServe frameworks have begun to address this gap, but progress has been hindered by data complexity, inconsistent taxonomy, and the sheer scale of fungal diversity. To help bridge this divide, we developed an automated bioinformatic pipeline that processes large-scale biodiversity datasets – including both specimen- and observation-based records – to generate conservation status assessments for macrofungi. Using Colorado, USA as a test case, our pipeline processed over 117,000 biodiversity records into a curated dataset of ~36,000 macrofungal occurrences, from which we identified more than 2,400 unique taxa and calculated the number of occurrences of each taxa. Building on this framework and using our pipeline, we are creating rapid assessments of fungal biodiversity for

every state across North America for conservation purposes. These assessment lists are next distributed to conservation professionals as well as amateur mushroom clubs, where local mycologists can help to validate species occurrences, prioritize taxa of conservation concern, and contribute to NatureServe assessment rankings. This collaborative process not only strengthens dataset accuracy but also empowers regional experts to shape fungal conservation priorities. Ultimately, the integration of automated data processing with grassroots validation provides a scalable pathway for incorporating fungi into natural heritage programs and broader biodiversity monitoring efforts. **Key words**: community science, natureserve, conservation, bioinformatics.

CONSERVATION STATUS OF SOME JAPANESE AND AFRICAN MUSHROOMS AND CONSERVATION OF ETHNOMYCOLOGICAL KNOWLEDGE IN SOME WEST AFRICAN AND CARIBBEAN COUNTRIES [25]

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Boninogaster phalloides (*Sclerogastraceae*, *Geastrales*) had been listed as "CR+EN" in the Japanese Red List until 2019, as it was thought to be endemic to Chichijima Island in the Bonin Islands, Japan. However, since 2009, extensive surveys across the Bonin Islands have consistently yielded numerous collections each year from both Chichijima and Hahajima, and other regions in Japan. Consequently, the species has been excluded from the Japanese Red List since 2020.

During our recent survey in Benin, we discovered a sequestrate species of *Aroramyces* (*Hysterangiaceae*, *Hysterangiales*), likely new to science, occurring under *Uapaca* and *Isoberlinia*. To date, only two species of *Aroramyces* have been formally reported from Africa: *A. radiatus* from Zimbabwe and *A. bonobo* (as *Hysterangium bonobo*) from the Democratic Republic of Congo. While this species may eventually be considered for inclusion in the IUCN Red List, further surveys could reveal a wider distribution and frequent fruiting, as seen in the case of *Boninogaster* in Japan.

We are also conducting ethnomycological surveys in West African and Caribbean countries to document the culinary use of small mushrooms in the genus *Candolleomyces* (*Psathyrellaceae*, *Agaricales*). In Haiti, these mushrooms are well

known as “djondjon,” and we hypothesize that this culinary tradition originated in West African countries such as Côte d’Ivoire, Benin, and Nigeria. Our initial survey in Benin (August–September 2025) revealed marked differences in the culinary use of *Candolleomyces* between Benin and Haiti. These differences may reflect significant transformations in culinary practices over the past two centuries, either in Benin, in Haiti, or in both. Broader surveys across Benin and neighbouring countries may uncover more direct parallels in the culinary use of *Candolleomyces* between West Africa and Haiti.

A CONSERVATION PRIORITY INDEX FOR FUNGI USING A LOCAL ECOLOGICAL KNOWLEDGE-BASED APPROACH: A CASE STUDY FROM NORTHERN BENIN [26, poster]

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Assessing conservation priorities for fungi is a challenge in developing countries, not only due to the biological complexity of these organisms but especially because of the data and expertise requirements of the IUCN Red-List system. This study established a Conservation Priority Index (CPI) for fungi, applicable with the Local Ecological Knowledge (LEK). Data on species vulnerability were collected from semi-structured surveys with 180 mushroom harvesters in villages surrounding three forests (Kota, Bassila, and "Trois rivières") in northern Benin. After performing a Principal Component Analysis (PCA) on the seven initial variables using R, the index was computed by the linear combination of the variables with the highest contribution. Species were then grouped according to their vulnerability level. From a total of 36 species assessed, 11 species belonging to termitomycetes and ectomycorrhizae stand out in high vulnerability group. The index indicates that species with highly threatened habitat, preferable for food by local people and frequently collected are the most vulnerable. Six of the most threatened species in this study are on the country Red-List of fungi, while four are ranked less conservatively. The findings set conservation priorities in wild useful fungi of Benin and suggest the habitat-based approach for their sustainable management. The CPI developed here demonstrates the acuity of LEK in conservation research and offers a complementary method to the IUCN Red List system in data-deficient contexts. **Key words**: wild useful fungi, *Termitomycetes*, ectomycorrhizal fungi, indigenous knowledge, vulnerability index.

CONSERVATION OF WILD EDIBLE MUSHROOMS [WEMS] IN AFRICA: THE CASE OF KENYA [27]

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Mushrooms have long been valued as nutritious food and traditional medicine, yet in Kenya their full potential remains underutilized. While exotic species such as Pleurotus (Oyster), Agaricus bisporus (Button), and Lentinula edodes (Shiitake) dominate cultivation, indigenous wild mushrooms continue to be sourced directly from forests by rural communities. These species, including Termitomyces, Cantharellus spp., Auricularia spp., Volvariella are highly prized for their taste, nutritional quality. However, rapid habitat degradation, climate change, and unsustainable harvesting practices threaten their existence. A report by UNEP in 2009, indicates rapid degradation increased by 200% from 1900 - 1990 with over 50% of the original forest is gone.

The study, conducted between 2020 and 2023 by a multidisciplinary consortium of Kenyan institutions, aimed to conserve wild edible mushrooms through systematic documentation, germplasm collection, and capacity building and domestication efforts. Kenya has diverse biogeographical regions from sea level to 5199 m asl. Surveys were carried out across diverse biogeographic regions including , the equatorial rainforests of Kakamega and Nandi, the easternmost and only remaining remnant of the Guineo-Congolian rainforest near the equator; the tropical montane forest of Cherangany hills complex; the high altitude tropical moist afromontane forest Mt. Kenya and the Kikuyu escarpment; Loita hills forest, an Afromontane dry upland forest, transition zone between the more expansive savanna grasslands of the Maasai Mara and the higher elevation highland area; Endao Hills, a mist forest at the hill top surrounded by dryland located between the central highlands and the lowland coastal forests; and the Muthaa dry land forest in eastern Kenya. The high endemism critically endangered biodiversity hotspot coastal forest of Kenya part of the northernmost part of phytoregion from southern Somalia to Mozambique. Using a combination of field excursions, indigenous knowledge, and stakeholder engagement, 1,212 mushroom specimens representing 622 species were collected, of which 106 were presumed edible and 36 were confirmed edible. Seven priority species are currently under domestication trials.

Findings revealed species to be patchy in occurrence in all biogeographical regions with *Pleurotus* spp, *Termitomyces* spp., *Agaricus* spp., *Auricularia* spp. the most commonly important in high altitude regions and the over fifty (50) edible ectomycorrhizae and Volveriella spp. mushrooms common in the lowland coastal forests. Two species of Morchella were reported for the first time in the tropical montane forests. There were several minor species to be validated for safe consumption.

Termitomyces spp,, *Auricularia* spp., and *Cantharellus* spp are the most economically important species in local markets, while *Auricularia, Pleurotus, Volveriella* and *Agaricus* species demonstrate high cultivation potential. Communities rely heavily on indigenous knowledge to identify edible mushrooms, often using animal behavior as indicators of edibility. Women and youth play a central role in harvesting and marketing, underlining the potential of mushrooms as a tool for inclusive livelihoods.

Conserving wild edible mushrooms is therefore both an ecological and socio-economic priority. In-situ conservation means safeguarding mushroom-rich habitats within and outside forests; ex-situ strategies ensure germplasm availability for future research and domestication. Sustainable harvesting guidelines, coupled with supportive policies, are essential to prevent exploitation, habitat degradation. This study demonstrates that integrating indigenous edible mushrooms into Kenya's food security agenda can diversify diets, and provide resilient income streams, while contributing to conservation of forest biodiversity. **Key words**: biodiversity and hotspots, culture and livelihoods, threats and conservation.

FUNGAL CONSERVATION IN SUB-SAHARAN AFRICA [28]

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Africa's phytogeographical regions are defined by their distinct vegetation, climate, and plant life, which vary significantly. Each of the 54 countries may, like Kenya, host seven or more of these categories. Vegetation types strongly influence fungal communities, providing unique habitats and energy sources for fungi. The diverse woody plant communities also play a crucial role in shaping fungal communities, as noted for truffles in the Mediterranean and Kalahari deserts, the ectomycorrhizal fungi of the Zambezian region of endemism (Miombo woodlands) and the West Africa Guineo-Congolian region, the unique fungi of the Fynbos in South Africa and the unique afromontane regions across Africa.

Africa's habitat is severely degraded by changes in land use, such as urbanization and development, settlements, intensive farming, and reafforestaion, and by pollution. A UNEP report in 2009 indicated a 200% increase in degradation from 1900–1990, with over 50% of original forest gone.

A study, conducted between 2020 and 2023 by a multidisciplinary consortium of Kenyan institutions, aimed to conserve wild macrofungi through systematic documentation, germplasm collection, capacity building and policy interventions. Kenya seven biogeographical regions, ranging from sea level to 5199m asl were surveyed. These included: equatorial rainforests remnants of the Guineo-Congolian region near the equator; tropical montane forest; high altitude tropical moist afromontane forest and dry upland forest afromontane transitional zone between the more expansive savanna grasslands and the higher elevation highland area; mist forest at the hill top surrounded by dryland located between the central highlands; lowland coastal forests most northward remnant representing the larger Miombo ecosystem; dry land forest in the savanna of eastern Kenya. The northern Kenya arid and semi-arid desert region was, however, not included in this study. Using a combination of field excursions, indigenous knowledge, and stakeholder engagement 722 species representing saprophytic and ectomycorrhizal macrofungi were documented, with specimens preserved in the National Herbarium (fungal reference collection).

Findings revealed macrofungi to be patchy in occurrence in all biogeographical regions with unique distribution patterns emerging. They found macrofungi were becoming scarcer and endangered by shrinking habitats, severe habitat degradation; lack of knowledge of fungi was also a factor. The genera *Agaricus*, *Pleurotus* and *Auricularia* were common in high altitude phytoregions, the genus *Termitomyces* was common in Guineo-Congolian zones and 90% of the ectomycorrhizal macrofungi were restricted to lowland coastal forests and widely threatened by illegal harvesting and death of *Brachystegia* trees. The Polyporales also showed distinct distribution patterns across the phytoregions. Two very rare species of *Morchella* were reported for the first time in the tropical montane forests. Most species were rare and encountered only once during the study period.

Conservation of wild mushrooms faces a realm of challenges ranging from lack of knowledge among communities and professionals in other disciplines, lack of human and institutional infrastructural capacity, habitat disruptions, and supportive policies. In-situ conservation requires safeguarding mushroom-rich habitats within and outside forests, while ex-situ strategies should ensure germplasm availability for future research in restoration and domestication.. Trans-disciplinary approaches are essential to address challenges and mitigate loss of critically rare fungal species. A phytoregional approach as opposed to single country focus brings unique opportunities to address specific challenges and strongly define Centres of Fungal Endemism [**CFE**] and Important Fungi Areas [**IFA**]. Capacity building in mycology is crucial for documentation and monitoring habitats of rare and endemic species. **Acknowledgements**: I acknowledge the NACOSTI-National Commission for Science, Technology & Innovation. **Key words**: Africa, biodiversity, fungi, ecosystems, conservation.

PHYLOGENETIC DIVERSITY OF WILD *AGARICUS* (BUTTON MUSHROOMS) IN KENYA, AND CONSERVATION EFFORTS [29]

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The genus *Agaricus* L. is a group of mushroom species in the Kingdom fungi, phylum Basidiomycota, class Basidiomycetes and family Agaricaceae. It is a large genus with more than 500 species that are valuable economically, nutritionally with most species being edible and a few toxic. Among the most valuable species are *A.bisporus* Imbach and *A. subrufescens* Peck, which are commercially cultivated mushrooms for food and medicine respectively across the world. However, despite the importance associated with the species in the genus *Agaricus,* data on species and their distribution is scanty and conservation status is yet to be established in Kenya. Also, habitats that support the growth and survival of all fungi are rapidly disappearing before documentation has been done and their conservation status assessed. Therefore, the aim of this study was to determine the distribution of the species under various habitats in Kenya and their phylogenetic diversity using morphological and molecular methods. Determination of species distribution and habitats is critical in forming the basis for informing on conservation assessment, conservation status and advocacy on conservation strategies for fungi. The study was carried out in 2020-2023 during the rainy seasons using random and opportunistic sampling methods. During the study, 69 *Agaricus* species were collected from a low altitudinal level (118m a.s.l) at the coastal region to high altitude (2500m a.s.l) at the central region in Kenya. The highest percentage (60%) occurred in indigenous forest, 40% along paths and lowest (1%) on farms in association with dung. Out of 69 specimens, 33 were analyzed using morphological methods which were based on macro and micro-morphological characters while molecular analysis targeted the Interscribed spacer (ITS) and the Large Subunit ribosomal DNA (LSUrDNA) gene regions. Based on phylogenetic analysis, the results yielded 26 species distributed in 5 regions and over 10 localities in Kenya whose phylogenetically were distributed in 7 sections and 5 subgenera namely Sect. *Agaricus* subgenus *Agaricus*, Sect. *Amoeni* Subgenus *Spissicaules*, Sect. *Arvensis* subgenus *Flavoagaricus*, Sect. *Minores* subgenus *Minores*, Sect. *Brunneopicti*, Sect. *Trisulphurati* and Sect. *Xanthodermatei* in the subgenus *Pseudoctonia*. Based on morphological and

molecular methods, 8 species were identified as *A. aff. volvatulus*, *A. brunneolus*, *A. flocculosipes*, *A. kivuensis*, *A. punjabensis*, *A. sparsisquamosus*, *A. subsaharianus* . *A.volvatulus*. The eight species are new records in Kenya and 18 are proposed to be new to science requiring further evaluation. This study adds to the number of *Agaricus* species known in Kenya and their distribution which was limited to only two regions before. The indigenous forest and along the path (under fences) were suitable habitats for wide range of *Agaricus* species. More sampling efforts are required to sample all regions in Kenya under various habitat types and to assess the conservation status of species over time. The phylogenetic analysis revealed valuable species with culinary and domestication potential and species with potential toxicity, wide genetic distribution, information that was lacking in Kenya. Thus, this study contributes to the additional information and sequence data on the diversity and distribution of *Agaricus* species from the tropical regions which have been inadequately sampled. **Key words**: *Agaricus*, habitats, species, tropical, conservation.

ECOLOGY, DISTRIBUTION, THREATS, AND CONSERVATION STRATEGIES OF FUNGUS-GROWING TERMITES AND THEIR FUNGAL SYMBIONTS: A CASE STUDY FROM CÔTE D'IVOIRE [30]

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Fungus-growing termites (Macrotermitinae) and their fungal symbionts of the genus *Termitomyces* play a pivotal ecological role in West African ecosystems. Through their mutualistic association, they contribute significantly to organic matter decomposition, soil fertility, and the regulation of landscape dynamics. The products of this symbiotic mutualism also enhance the livelihoods of rural populations. However, these organisms are increasingly threatened by deforestation, agricultural intensification, climate change, and overharvesting for human consumption. Such pressures jeopardise not only their diversity and distribution but also the ecosystem services upon which rural communities depend. This presentation will synthesise available data on the ecology and spatial distribution of fungus-growing termites and their symbionts in West Africa, highlighting the environmental and anthropogenic factors that shape their

occurrence. It will further examine the major threats facing this unique symbiosis and propose integrated conservation strategies, including sustainable habitat management, the local valorisation of resources, and the incorporation of these organisms into biodiversity conservation and climate change adaptation policies.
Key words: symbiotic interaction, sustainable conservation, Macrotermitinae, fungi, ecosystem services.

THE USE AND PROMISE OF NOVEL ENVIRONMENTAL DNA SOURCES FOR FUNGAL DETECTION AND CONSERVATION [31]

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Biodiversity monitoring is critical to assess ecosystem health, identify shifts in species distributions, and guide effective conservation strategies. Recent advances in environmental DNA (eDNA) techniques offer non-invasive and efficient monitoring tools that enable the detection of biodiversity across a wide range of organisms and ecosystems. Here we evaluate the potential for eDNA trapped in moss (Bryophytes) to detect biodiversity across the tree of life, including fungi. By applying amplicon sequencing to samples of moss patches in Denmark and the Côte d'Ivoire, we show that moss-accumulated eDNA can capture fungal communities that are unique to the respective habitats. Compared to traditional survey approaches, moss-detected fungal taxa are dominated by microfungi and allow more frequent identification of cryptic species. The application of this approach may thus complement traditional surveys to allow capturing a larger diversity of fungal taxa in a given ecosystem. The method can also easily be adapted for citizen science projects, given the cosmopolitan distribution of mosses

and the ease of sampling them with a simple swab. Overall, we show the applicability of moss-accumulated eDNA as a tool for monitoring fungal diversity in temperate and tropical ecosystems and contribute to the development of cost-effective, non-invasive approaches for conservation efforts in a changing World. **Key words**: conservation, eDNA, fungal diversity, ITS, moss.

NUTRITIONAL POTENTIAL OF THREE EDIBLE MUSHROOM SPECIES OF THE GENUS *TERMITOMYCES* FROM ECOLOGICAL ZONE II IN TOGO [32]

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This study evaluated nutritional potential of three edible species of the mushroom genus *Termitomyces* (*T. robustus, T. schimperi* and *T. striatus*), examined the relationships between the minerals and by species. Biochemical analyses revealed these mushrooms are rich in macronutrients and essential minerals. The main results per 100g of dry matter are: digestible carbohydrates (61.03±0.20 g), protein (13.03±1.11 g), lipids (3.53±0.57 g), phosphorus (1817.66±222.16 mg), magnesium (518.66±38.88 mg), calcium (315.66±11.55 mg) and iron (264.66±26.56 mg). Analysis also revealed high levels of dietary fibre (4.62±0.77 g), caloric energy (328.00±9.07 Kcal) and a high water content (84.00±2.97% fresh matter). Principal component analysis [**PCA**] was used to explore inter-species variability in mineral and macronutrient composition. The **PCA** biplot of minerals revealed a clear opposition between iron (Fe) and other essential minerals (Ca, Mg, K, P, Na), which are strongly positively correlated with each other. Zinc (Zn) showed independent behaviour, suggesting its content is governed by different factors. Each species had a unique mineral profile: *T. robustus* was rich in Ca, Mg, K, P and Na; *T. schimperi* had a high Zn content and *T. striatus* a high Fe content. **PCA** of macronutrients confirmed this specificity, showing that *T. striatus* is rich in carbohydrates and fibre, while *T. schimperi* is richer in protein and lipids. In conclusion, these results demonstrate that the three *Termitomyces* species studied are a significant source of essential nutrients. Their distinct nutritional profiles, characterised by complex mineral relationships, highlight their importance for food security and the importance of considering the specific nutritional values of each species. **Key words**: edible fungi, *Termitomyces*, nutritional potential, principal component analysis, Togo.

TROPICAL RUSSULA DIVERSITY: IMPLICATIONS FOR CONSERVATION AND ECOSYSTEM FUNCTION [33]

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Russula species (Basidiomycota) play a vital ecological role in tropical ecosystems through ectomycorrhizal symbioses with a wide range of tree species. However, their diversity and ecological adaptations remain poorly understood. The diversity, distribution and ecology of tropical *Russula* species in West Africa and Central America are outlined in this talk. In Benin, a distinct clade (*Afrovirescentinae*) was found to comprise at least ten species, five of which were newly described. Their morphological traits, such as basidiospore ornamentation and fruiting body morphology, indicate adaptations to different habitat types. Based on environmental sequence data, the diversity of *Afrovirescentinae* was estimated to 94 species globally. From Panama, four novel *Russula* species belonging to subsect. *Roseinae* were described, all putatively endemic to cloud forests of Western Panama and forming symbioses with *Oreomunnea mexicana* or *Quercus* species. In other systematic groups within the genus, populations of certain *Russula* species are distributed on either side of the Panama Isthmus and show clear genetic divergence, likely driven by the interrupted distribution of Fagaceae tree species in the region. The immense and often hidden diversity of *Russula* species in tropical regions is highlighted, along with strong ecological specializations. The results underline the importance of including ectomycorrhizal fungi like *Russula* species in conservation strategies, biodiversity assessments, and forest management plans.

FUNGAL CONSERVATION IN THE CARIBBEAN [34]

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Cuba can justifiably claim to be a cradle of fungal conservation. With support from the UK Darwin Initiative, a national strategy for fungal conservation was published and adopted in the early 2000s, with the Spanish version available on-line [*www.cybertruffle.org.uk/cubacons/index.html*]. It was the first national fungal

conservation strategy anywhere in the world, and was updated in 2023. Cuba's mycologists therefore have a perspective on conservation longer than most of their friends and colleagues in other countries. Fungal conservation in the Caribbean can build on that perspective.

Until recently, for fungal conservation, the Caribbean has generally been grouped with the countries of continental South America, Central America, and North America south of the USA, collectively often misleadingly referred to as 'Latin America'. This has not worked. Although Cuba, the Dominican Republic and, to some extent, Puerto Rico are Spanish-speaking, most Caribbean island states are not. Dutch is spoken in Aruba, Bonaire, Curaçao, Saba, Sint Eustatius and Sint Maarten (all part of the Kingdom of the Netherlands). English is spoken in Antigua and Barbuda, Bahamas, Barbados, Bermuda, Dominica, Grenada, Jamaica, St Kitts and Nevis, St Lucia, St Vincent and the Grenadines, Trinidad and Tobago, all of them independent countries. It is also spoken in the dependencies of Anguilla, Bermuda, the Cayman Islands, Montserrat, Turks and Caicos, and both the American and the British Virgin Islands. French is spoken in Haiti (an independent country) and in Guadeloupe, Martinique, St Barthélemy and St Martin (most of which are overseas parts of metropolitan France). Acknowledging this reality affects our work. Laws are important for conservation. English-speaking islands have a tradition of Anglo-Saxon law. Dutch-speaking islands and most of the French-speaking islands, in comparison, operate under European Union law. Haiti uses Roman law and, apart from Cuba and the Dominican Republic, US law applies in most of the remaining territories.

Separately, the Caribbean islands, which are undoubtedly a hotspot for fungi, have an additional strategic significance for fungal conservation. Being small, their administrations are more accessible. In many cases the national population is smaller than many modestly-sized cities. Those responsible for nature conservation are more easily contactable and are likely to be more flexible in attitude than in large and long-established countries where bureaucratic traditions may be more entrenched. They are more likely to listen and, because they are all separate signatories of the CBD, each has the same voting rights as a giant country like Brazil, Canada or China. Global fungal conservation would be well advised, at this stage of its development, to focus on these small islands.

INFORMATION AND SCIENTIFIC ADVICE FOR POLICY-MAKERS [35]

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Fundación Fungi achieved a wonderful success steering the Chilean and UK governments' fungal conservation pledge through to publication by the CBD. It means we are very significantly nearer to having listening ears among the

convention's national focus points. The fungal conservation community needs to be ready for this. When these policy makers ask for advice, what should we reply?

We need to give them two separate resources. One is a short concise clear document written in easily digested non-technical language with short sentences and a high readability index, all accessible to an intelligent educated lay person. That document should tell them how fungi are different from animals and plants, how they are phenomenally diverse, why they are important, how they are threatened, what needs to be done, and who can help them achieve it. Anything which takes more than fifteen minutes to digest is too long. The other should be like an annexe. It should contain clearly presented relevant evidence in a form which can be understood by non-specialists who need additional evidence.

The Global Fungal Conservation Strategy, now happily in the last stages of preparation, should be ideal as the first resource. Ensuring the second resource, the tailor-made evidence, is equally good is a challenge still to be addressed.

A good start would be a template listing the different pieces of information the second resource needs. A prototype of that template has been prepared as part of a current Darwin Initiative project. The information falls into two clear categories: part requires human attention; the other is the collation and output of computerized data. For the annexe to be of value, data quality is paramount, but unfortunately much of what we have is unusable without editorial attention. This presentation will review data sources, the editing most commonly needed, and prototype software for output. In general, the job is possible but challenging.

DIVERSITY OF USEFUL MUSHROOMS AND ETHNOMYCOLOGICAL KNOWLEDGE OF NATIVE PEOPLE IN THE ADAMAOUA REGION OF CAMEROON [36]

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The diversity of useful mushrooms and wealth of ethnomycological knowledge surrounding their cultivation and consumption are crucial elements in understanding the role of fungi in human societies. Various cultures have long recognized the value of mushrooms for nutritional, medicinal, and even spiritual properties, leading to development of traditional knowledge and practices passed down through generations. From the cultivation of gourmet mushrooms for

culinary purposes, to the utilization of medicinal mushrooms for their health benefits, the integration of ethnomycological knowledge into modern practices holds promise for both economic and ecological sustainability. This study aims to safeguard endogenous knowledge on the use of mushrooms from the Adamaoua region of Cameroun and to highlight the different importance of these biological resources for Gbaya, peuls, Mbororo, Mboum and others indigenous peoples. To do this, field missions, based on the collection and identification of mushrooms samples were carried out. In addition, individual interviews using a Semi-structured questionnaire were carried out with 500 people in the Vina and Mbéré divisions including men and women farmers, breeders, traders and ranch owners, from March to October 2024. In total, 312 samples of mushrooms divided into 67 species, 46 genera, 16 families and 6 orders were inventoried. The represented fungi groups are : Lignicolous (35,82%), Coprophilous (31,34 %), Ectomycorrhizal (25,37 %) and Termite mound fungi (7,46 %). Also, The represented families are : Polyporaceae (10 species), Agaricaceae (8 species), Amanitaceae (7 species), Russulaceae (6 species), Strophariaceae (6 species), Lyophyllaceae (5 species) and Boletaceae (4 species). Five species including *Termitomyces globulus, Termitomyces letestuii, Termitomyces microcarpus, Termitomyces umkowaani, Termitomyces striatus* are used in food and sales. *Chlorophyllum hortense* and *Chlorophyllum globosum* are the only coprophilous species used in food, sale and traditional medicine to treat indigestion and stomach ache. The results also show that there are several toxicity tests for fungi and they differ from one tribe to another. The use of several mushrooms remains unknown. The habitat of these species includes Shrubs and Trees Savannahs, Open Forests, Forest galleries and Meadows. **Key words**: endogenous knowledge, useful mushrooms, ethnomycological knowledge, Adamaoua region.

TOWARDS A GLOBAL FUNGAL CONSERVATION STRATEGY [37]

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A relatively small but increasing number of countries have begun to include fungi in their National Biodiversity Strategies, within the framework of the Kunming–Montreal Global Biodiversity Framework, but many more need to do so. To address this, the governments of Chile and the United Kingdom (working with the Fungi Foundation) introduced a pledge at COP16 in Cali, 2025 calling on parties to recognize Fungi as an independent kingdom of life in national and international legislation, policies, and agreements. A growing number of countries are expressing an interest to do this, but there is a concern that the needed data and resources to include fungi in their initiatives are not available. The Global Strategy for Fungal Conservation (GSFC) is a parallel initiative aimed at helping countries include fungi into their initiatives. It provides a set of suggested voluntary actions that parties might incorporate into their efforts to achieve their goals for each for

the KMGBF targets. It also outlines a research agenda for the mycological and conservation community aimed at providing the data, suggested methodologies, and tools for effectively incorporating fungi into conservation initiatives. The GSFC is being developed and delivered by the Global Fungal Conservation Network, a broad and diverse network of mycologists and others committed to the conservation of fungi and their integration into conservation initiatives for the benefit of the planet and people.

REVERSE THE RED, A GLOBAL MOVEMENT TO REDUCE BIODIVERSITY LOSS [38]

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Reverse the Red is a global movement that drives strategic cooperation and action to ensure the survival of wild species and ecosystems and reverse the negative trend of biodiversity loss. It aims to ignite optimism and accelerate recovery-focused strategies to reverse the loss of species. The Coalition's goal is to halt extinctions, reverse declines shown on the IUCN Red List of Threatened Species, and restore populations. It does this by accelerating conservation action through collaboration, connections, and alignment of efforts locally, nationally, and globally. It organized last year's highly successful World Species Congress and sponsors and encourages individuals / organizations to make Species Pledges, among other initiatives. Reverse the Red is for everyone interested and committed to reversing biodiversity loss, please join the movement.

DIVERSITY AND ABUNDANCE OF ARBUSCULAR MYCORRHIZAL FUNGAL SPORES ASSOCIATED WITH EGGPLANT (*SOLANUM AETHIOPICUM*) IN FOUR MAJOR PRODUCTION AREAS IN IVORY COAST [39]

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Arbuscular mycorrhizal fungi [**AMF**] are important in agroecosystem function. In West Africa, and more particularly in Côte d'Ivoire, the African eggplant (*Solanum aethiopicum*) is a strategic vegetable crop for food security and its economic importance. Despite this importance, knowledge of **AMF** diversity associated with this species remains limited in the Ivorian context. The present study assessed diversity and spore density of **AMF** colonising the rhizosphere of *Solanum aethiopicum* in four major production areas of the country. Soil samples

were taken from sixteen plots divided into four zones, at a depth between 0 and 20 cm. These samples were used to analyse soil chemical properties and to identify the morphology and count the number of CMA spores. Species diversity was also assessed using ecological diversity indices. Results reveal significant variation ($p < 0.05$) in spore density between zones, with values ranging from 5.16 to 12.01 spores per gram of soil. The genera *Glomus* and *Acaulospora* appear to be predominant (21–45%). No significant correlation was established between soil chemical parameters and total spore density. The dominance of *Glomus* and *Acaulospora* corroborates observations made for other tropical vegetable crops, demonstrating their high adaptability. This study highlighted a significant diversity of **AMF** associated with *Solanum aethiopicum* in Côte d'Ivoire, dominated by the genera *Glomus* and *Acaulospora*. The correlation between soil chemical characteristics and the **AMF** community highlights the importance of promoting sustainable soil management practices in order to optimise mycorrhizal interactions and improve the productivity of African eggplant. **Key words**: arbuscular mycorrhizal fungi, *Solanum aethiopicum*, diversity, Côte d'Ivoire.

STUDY AND COMPARISON OF NUTRITIONAL PROFILES OF SOME WILD EDIBLE SPECIES OF *TERMITOMYCES* AND *PLEUROTUS* OF CAMEROON [40]

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Termitomyces and *Pleurotus* are among the mushroom species commonly consumed by people in Cameroon. To demonstrate their food value, the nutritional quality of eighteen (18) samples of different species of *Termitomyces* and seven (7) of *Pleurotus* were analyzed. Measurements were taken of ash, water, carbohydrate, crude fiber, lipid, protein and energy content. The results (dry matter [**DM**]) indicate that these mushrooms are rich in lipids (11.75 g/100 g **DM**), proteins (25.89 g/100 g **DM**), crude fiber (13.91 g/100 g **DM**), water (86.82 g/100 g **DM**), ash (6.51 g/100 g **DM**), carbohydrates (27.57 g/100 g **DM**) and energy (324.13 kcal/100 g). Highly significant differences ($P < 0.05$) were observed between

species. For example, *Termitomyces* sp. 5 (28.78 g/100 g **DM**) is rich in ash, while *P. pulmonarius* (28.52 g/100 g **DM**) stands out for its high lipid content and *T. griseiumbo* (49.38 g/100 g **DM**) has a remarkable level of protein. In terms of carbohydrates, *P. ostreatus* (55.51 g/100 g **DM**) stands out, while *P. tuber-regium* (26.79 g/100 g **DM**) has a notable proportion of crude fiber. In terms of energy, *P. pulmonarius* (459.76 kcal/100 g **DM**) still stands out. These results demonstrate the significant nutritional potential of these mushrooms, which are using to reduce nutritional deficiencies and facilitate intestinal transit due to their fiber content. The domestication of these mushrooms would appear to be a good alternative to both reduce the risks of depletion of this resource and also its sustainable management. **Key words**: mushroom, nutritional value, nutritional deficiencies, domestication, sustainable management.

PREDICTING FUNGAL SPECIES DISTRIBUTION AND ABUNDANCE RESPONSES TO CLIMATE CHANGE: A CASE STUDY OF THE STINKING MILK-CAP MUSHROOM IN WEST AFRICA [41]

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Understanding how climate change will alter distribution and abundance of fungi is essential for their effective conservation. In addition to shifting environmental conditions, climate change can affect species interactions, making accurate niche characterization crucial. This study focuses on *Lactarius foetens* (stinking milk-cap), aiming to (i) model its current distribution and (ii) predict impacts of future climate scenarios on its range. Presence records were obtained from the Global Biodiversity Information Facility (GBIF), while current and projected (2040–2080) bioclimatic variables were sourced from WorldClim at 30″ spatial resolution. Ensemble Small Modelling (ESM) was implemented under the flexsdm R package, combining Maxent Philips (Max.P), Generalized Linear Model (GLM), Artificial Neural Network (ANN), and Gradient Boosting Machine (GBM). Area of Occupancy (AOO) and Extent of Occurrence (EOO) from known records were 16 km² and 4,610.34 km², respectively, whereas model predictions indicated a potential habitat of 9,426.09 km². However, under the SSP2-4.5 and SSP5-8.5 scenarios of the HadGEM3-GC3.1 Global Circulation Model for the 2070s, this area is projected to decline by 87.8%. Currently, suitable habitats occur in

restricted patches of the Guineo-Sudanian zone in Benin, and in Guinean and Guineo-Sudanian zones of Togo, with only a small proportion overlapping national protected areas. These findings justify classifying *L. foetens* as "Endangered (EN) under criteria A3c, B1ab, B2ab,C1, and underscore the urgent need for targeted conservation measures, given that existing protected areas fail to cover much of the species' current potential range. The study highlights the urgency of conservation actions such as habitat protection, reforestation with local host trees, and adaptive management to address climate change. It recommends future research on its ecology, host specificity, and genetic diversity. **Key words**: *Lactarius foetens*, species distribution modelling, climate change, West Africa, fungal conservation.

SAFEGUARDING FUNGAL DIVERSITY THROUGH FUNGARIUM SPECIMENS: STRATEGIC TOOLS FOR CONSERVATION IN TROPICAL AFRICA [42]

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Fungarium specimens are irreplaceable archives of fungal diversity, preserving both morphological and genetic information essential for taxonomy, ecology, and conservation. In tropical Africa, where many species remain undescribed and habitats face increasing threats, fungaria are critical tools for safeguarding biodiversity. Properly curated collections provide verifiable records of species occurrence, enabling long-term monitoring, taxonomic revisions, and accurate conservation assessments. Dried and living-preserved specimens offer complementary value. Dried material ensures permanent reference samples for morphological study and DNA extraction decades after collection. Living-preserved specimens retain viability for potential re-culturing, allowing for further physiological or molecular investigations. Together, these materials form a robust *ex situ* safety net for rare and threatened taxa, supporting both current and future research needs. This contribution highlights the strategic role of fungaria specimens in conservation planning across tropical Africa. It outlines best practice in collection, documentation, preservation, and digitization, and the importance of centralizing scattered private and institutional collections into accessible, professionally managed facilities. In the face of rapid environmental change, fungaria are not passive repositories – they are dynamic resources linking past, present, and future knowledge, ensuring Africa's fungal heritage both preserved and available to science. **Key words**: fungal conservation, fungarium, *ex situ* preservation, biodiversity, taxonomy.

DIVERSITY, USE, AND CONSERVATION OF INSECT-ASSOCIATED FUNGI IN TROPICAL AFRICA [43]

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Globally, the collection of mushrooms holds significant nutritional and recreational value, particularly as the demand for sustainable, high-protein alternatives to meat continues to rise. This implies a growing interest in wild edible fungal products on the market. In tropical Africa, particularly in areas facing challenges related to food scarcity and malnutrition, mushroom collection provides an important source of nutrition, allowing access to essential nutrients, such as vitamins, minerals, and proteins. For local collectors, it also represents a significant source of income with important socio-economic implications. To clarify developments in current practices and future prospects for the sustainable use of insect-associated fungi, this presentation summarise the historical and current use of fungi associated with insects in tropical Africa. I focus on one of the most important fungi collected; species in the genus Termitomyces that are cultivated by farming termite hosts. This farming symbiosis has coevolved for 30 million years and more than 50 Termitomyces species have been described. I will then go on to describe our existing understanding of the symbiosis and highlight challenges and opportunities for utilizing Termitomyces fungi for human consumption. Lastly, I will discuss how research can help contribute to the sustainable management and conservation of this valuable natural resource. **Key words**: *Termitomyces*, mutualism, nutrition, Macrotermitinae, symbiosis.

TAXONOMY AS THE FIRST STEP TOWARDS FUNGAL CONSERVATION IN MADAGASCAR [44]

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Based on recent estimates, Madagascar may host between 80,000 and 100,000 species of fungi, yet fewer than 1,000 species have been formally described from the country to date (Index Fungorum, 2025). Many of these fungi are probably threatened, primarily due to widespread slash-and-burn agriculture, which affects nearly 4 million hectares of land annually. In addition, many mycorrhizal host

plants in Madagascar are already listed as Endangered or Critically Endangered on the IUCN Red List, indirectly placing their associated fungi at risk as well.

Currently, fungal conservation in Madagascar remains virtually unexplored. While the country has established over 100 protected areas, which offer indirect protection to fungi alongside plants and animals, these efforts are insufficient for safeguarding fungal diversity. Effective fungal conservation must begin with taxonomy, the foundational discipline that provides the basis for understanding, monitoring, and protecting biodiversity.

In this study, we collected around 600 fungal specimens from diverse ecosystems across Madagascar, including dry and humid forests in the North, South, East, and West of the island. Specimens were analyzed using a multigene approach (ITS, LSU, and Rpb2) combined with morphological analyses.

Of these, approximately 450 ITS sequences (75%) were of high quality. These represent 7 orders (Agaricales, Cantharellales, Geastrales, Gomphales, Russulales, and Polyporales), 40 families, 107 genera, and 327 species. BLAST analyses against GenBank and UNITE revealed that only 80 species correspond to taxa already described, while 247 species appear new to science and 8 genera remain unknown. Within the Agaricales, Agaricineae were the most diverse subgroup (136 species), followed by Marasmiineae and Hygrophorineae. Formal description and publication of these novel taxa are underway. All sequences will be deposited in GenBank, and corresponding photographs will be shared on iNaturalist to facilitate accessibility and community engagement.

Our results highlight the extraordinary richness of Malagasy fungi, while also demonstrating that the majority remain undescribed. Notably, fungal communities differ markedly between humid and dry forests, and even between humid forests across different regions, indicating strong ecological and biogeographic structuring. Many taxa appear to be restricted to Madagascar, though phylogenetic analyses show Malagasy fungi do not cluster into a single clade but are dispersed across multiple lineages. Importantly, numerous taxa are represented by long, isolated branches, suggesting substantial evolutionary distinctiveness. However, our study identified no new families and only a small proportion of new genera (7%), implying that fungal endemism at higher taxonomic levels may be less pronounced than in plants, where Madagascar harbors five endemic families and ~200 endemic genera. As this represents one of the first large-scale molecular surveys of Malagasy fungi, further research will be required to refine these patterns.

In conclusion, this study underscores both the taxonomic breadth and richness of Madagascar's fungal community and the vast knowledge gaps that remain. Our findings demonstrate the importance of molecular approaches, particularly ITS barcoding in combination with LSU and Rpb2, for unveiling fungal diversity. By depositing sequences in GenBank and linking morphological documentation to iNaturalist, we contribute valuable resources for the global scientific community, enabling taxonomic verification, ecological research, and conservation planning.

Ultimately, this work represents a critical step toward establishing a foundation for fungal systematics and conservation in Madagascar. **Key words**: Madagascar, molecular phylogeny, morphology, endemism.

OPTIMISED BY EVOLUTION: NUTRITIONAL PROFILING OF THE FUNGAL CROP CULTIVATED BY TERMITES FOR 30 MILLION YEARS [45]

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Termites, like all insects, require a balanced intake of macronutrients and amino acids to sustain growth, reproduction, and colony maintenance. To meet these nutritional demands, fungus-farming termites in the subfamily Macrotermitinae cultivate crop fungi in the genus *Termitomyces* within specialised fungus gardens. These fungal crops decompose lignocellulose-rich plant material and provide nutritious edible structures that form the dietary foundation of termite colonies. Despite extensive research on this 30-million-year-old symbiosis, it remains unclear how the nutritional composition of *Termitomyces* has been shaped by natural selection to match termite dietary requirements – particularly for protein and essential amino acids.

We quantified macronutrient (protein, lipid, carbohydrate) and amino acid compositions of *Termitomyces* mycelium in pure cultures and fungus gardens across at least six fungal species. Nutritional profiles were consistent across species, characterised by unusually high protein content that exceeds WHO/FAO recommendations with respect to essential and branched-chain amino acid. To test whether these profiles are nutritionally distinct and closer to termite dietary needs than other protein sources, we compared them to those of wood-decaying fungi commonly consumed by humans, animal-derived proteins, and insect nutritional requirements based on published data. Preliminary analyses suggest *Termitomyces* more closely resembles animal amino acid composition than other fungi.

Our results support the hypothesis that millions of years of farming have shaped the nutritional value of crop fungi to suit termite hosts. This underlines the value of *Termitomyces* for animal nutrition – including humans – and supports efforts to conserve this ecologically important and nutritionally valuable symbiosis. **Key**

words: *Termitomyces*, fungus-farming termites, nutrition, amino acid profiling, symbiotic coevolution.

CONSERVATION OF FUNGI THROUGH AWARENESS THEN EDUCATION [46]

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How can we conserve Fungi if we're not even aware of them? Outdoor classrooms are a perfect start. Armed with a magnifying glass, a walk into a natural habitat is the first step in opening eyes. Through that lens, the motto: "a mushroom in the hand is worth two in the book", ignites a flood of exclamations and questions. Interest has been awakened and education begins. Whatever age, a receptive mind will absorb the intricately complex world of Fungi through numerous, simple, fun-filled activities.

The next question is 'how aware of Fungi are the schoolchildren of Zimbabwe?' A National Survey was conducted over many interrupted years where a learner was asked to draw the first mushroom that came to mind. Over 27 000 drawings were collected from the country's main cultures. Results from 4000 samples involving only Ndebele and Shona cultures have been analysed. As expected, there was a distinct correlation between knowledge of mushrooms and the habitat of the respondent's home area. Similarly, rural children have a greater knowledge of Fungi than do urban children. Loss of indigenous knowledge of Fungi through urbanization is a global concern which calls for more focus on Fungi in all educational systems. **Key words**: outdoor classrooms, school activities, indigenous knowledge, culture, Zimbabwe.

FUNGAL CONSERVATION IN BOLIVIA: A DARWIN INITIATIVE PROJECT [47]

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Bolivia's altiplano forms an extensive plateau around 3500 m above sea level in the Andes. The climate is dry and cold, and the scenery characterized by extensive salt flats and saline lakes. Its fungi are poorly known. This harsh environment is home to quinoa (*Chenopodium quinoa*), Bolivia's signature and culturally significant grain crop. Quinoa has been cultivated there for centuries, mostly by smallholder households and mostly by women. With the recent discovery that it is a nutritionally complete 'superfood' cultivation has spread to more than 200

countries, resulting in strong competition. That, combined with climate change (the altiplano is on the front line), and strong international interest in the saline flats as a source of lithium for electric cars, has resulted in increased economic hardship for the smallholders.

Our Darwin Initiative project explores conservation of fungi (and bacteria – a first for this fund) on the altiplano and its extreme habitats, particularly those associated with quinoa. There are two objectives. One is to provide information about these organisms and their conservation in a format useful for Bolivia's CBD National Focus Point. The other is to evaluate the potential of selected species to enhance the local quinoa crop. The second objective forms part of a broader aspiration to ameliorate smallholder livelihoods. Achieving these objectives requires a team with wide-ranging skills, from mycology and bacteriology, through data management, molecular technology and bioproduct development, to diplomacy, expertise in community outreach and permaculture-based sustainable development. It also means walking a tightrope between different demands and pressures. Some of these are described in this presentation from a permaculture perspective. Key words: quinoa, altiplano, smallholder farmers, regenerative agriculture, fungal conservation.

NEW FINDINGS ON RUST FUNGI (PUCCINIALES, BASIDIOMYCOTA) FROM BENIN [48]

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Rust fungi (Pucciniales, Basidiomycota) represent the largest and most diverse group of phytopathogenic fungi, with some 7,000 to 9,000 species worldwide, many of economic importance. Despite their importance, information about their diversity in West Africa remains scarce, with only 11 species reported from, for example, Benin. This study presents new results from a recent survey in Benin, where 122 specimens representing about 28 species were collected. Identification was based on morphology and anatomy observed under the light microscope, and on molecular sequence data. Some host plants were identified by morphology. Others by molecular sequence data. These results provide valuable information on diversity, taxonomy and phylogenetic relationships of rust fungi in Benin. They highlight the need for further integrative taxonomic studies. Such research is essential for understanding the ecological roles of these fungi and for informing strategies balancing conservation with phytosanitary needs in the case of species

damaging economically valuable plants. **Key words**: Pucciniales, molecular data, taxonomy, West Africa, Benin.

KNOWLEDGE OF FUNGAL BIODIVERSITY, AN ESSENTIAL ELEMENT FOR CONSERVATION, AND A TOOL FOR IDENTIFYING PRIORITY SITES FOR BIODIVERSITY CONSERVATION IN GABON [49]

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In 2002, Gabon undertook to conserve 10% of its territory in the form of National Parks. Later, in 2024, 35 KBAs representing, 24% of Gabon's territory, were identified for biodiversity conservation (Texier, et *al*. 2024). KBAs are critical sites for the persistence of biodiversity on a global scale. These sites are used by governments to guide the expansion of protected areas and conservation zones in order to achieve the 30x30 targets and to develop land-use plans that support biodiversity (Texier, et *al*. 2024). The analysis of Gabon's KBAs focused on distribution and population data for nine taxonomic groups, including fungi. The standard KBA methodology (2016), based on a set of criteria with well-defined thresholds, was used. Studies on fungal diversity in Gabon have led to the identification and description of new taxa. To date, 15 species have been described using morphological, molecular, and phylogenetic approaches (Yombiyeni et *al*. 2014, 2017 ; Decock et *al.* 2021 ; Jerusalem et *al.* 2019, 2025) and are considered endemic to Gabon base on current data. These studies have helped improved knowledge of this taxonomic group, which remians largely understudied despite its key role in maintaining the equilibrium of forest ecosystems. To determine the KBA sites in Gabon, six fungal species with restricted distribution were assessed using the area of occupancy criterion (criterion B) : *Pachykystopora nanospora, Fomitiporia ivindoensis, Fomitiporia nobilissima, Phylloporia littoralis, Perenniporia nigra, and Haddowia longipes*. Only *Fomitiporia ivindoensis* supports the designation of Ivindo National Park as a KBA. It is a saprotrophic species, belonging to part of the wood decomposer group. The limited number of fungal species assessed is due to a lack of

inventory and knowledge of fungi, which are often overlooked in biodiversity assessments at both national and international levels. **Key words**: fungi, conservation, KBAs.

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DECLARATION OF COTONOU

Proposed text for an output of the Fourth International Congress on Fungal Conservation

Drafted by: Nourou Yorou, Ramdan Dramani & David Minter

Explanatory note. The first International Congress on Fungal Conservation was held in Córdoba, Spain, 10–16 December 2007. One key result of that Congress was the "Declaration of Córdoba", a pioneering call to the whole world to "preserve the unique and essential values for Life on Earth that the Fungi kingdom has to offer". A copy of this groundbreaking document is available on-line [www.cybertruffle.org.uk/whitbymycosynod/decofcor.pdf]. Much has change since then, and the DRAFT text of a possible new declaration, shown below, is presented to our fourth Congress. Participants are invited to review its contents, and to provide feedback and suggest improvements. Our aspiration is to issue a new declaration from Cotonou, renewing that original call in the context of everything which has happened since then.

<start of DRAFT text>

DRAFT Cotonou Declaration on Fungal Conservation

The representatives of conservation organizations, indigenous peoples, research institutions, scientific communities, and institutional partners gathered in Cotonou, reaffirm the crucial importance of fungi for ecosystem health, food security, traditional medicine, and carbon sequestration, and hereby adopt this declaration to guide and strengthen collective action for their conservation.

Fungi constitute a major and indispensable component of terrestrial biodiversity, playing an essential role in ecosystem functioning and the recycling of organic matter. Yet, they remain largely undervalued and under-protected in global environmental policies. Current inventories estimate the global diversity of fungi at between 2.2 and 3.8 million species, but less than 5% of that diversity has been scientifically described. Among known species, only about 1,300 have been assessed for their conservation status on the IUCN Red List, compared with more than 76,000 plant species and around 94,000 animal species. This disproportion highlights how fungi remain, from a conservation standpoint, the "Orphans of Rio", marginalized within the major international frameworks that emerged from the 1992 Convention on Biological Diversity [CBD]. Yet fungi face the same threats as animals and plants, including habitat loss and fragmentation, deforestation, changing land use, climate change, exploitation, persecution and pollution.

Over the past fifteen years, global initiatives have led to recognition of the essential ecological and socio-economic role of fungi. The most recent, and one of the the most significant, is the Fungal Conservation Pledge, brilliantly promoted by Fundación Fungi, and launched by the governments of Chile and the United

Kingdom during the CBD COP16. It is a historic milestone, with government-level recognition of fungi as an independent biological kingdom of life and as organisms essential for the functioning of ecosystems and the conservation of biodiversity. It has brought the first politically high-level calls to include them in National Biodiversity Strategies and Action Plans, and to introduce concrete measures in national and international legislation, policies and agreements to protect them.

Prior to this global pledge, the International Society for Fungal Conservation [ISFC], established in August 2010, laid the groundwork for coordinated international fungal conservation. As the first organization in the world entirely devoted to protecting fungi, it has been a driving force behind many global efforts now shaping the fungal conservation movement, with members from over 60 countries, representing scientists, conservationists, educators, and citizen mycologists. Its diverse activities ranging from public awareness campaigns, awards and conferences, to policy engagement and publications, have advanced recognition of fungi as an essential component of global biodiversity. Among its major initiatives, the ISFC organizes the International Congress on Fungal Conservation, a flagship event now in its fourth incarnation. These Congresses serve as a global platform for dialogue, collaboration, and strategic planning to promote fungal protection worldwide. The ISFC also works closely with the IUCN Species Survival Commission's Fungal Conservation Committee and its Specialist Groups to promote species assessments, develop conservation tools, and support integration of fungi into environmental legislation and biodiversity frameworks. By fostering collaboration across scientific, institutional, and community sectors, the ISFC continues to serve as a catalyst for the global fungal conservation movement, bridging the gap between science, policy, and society.

This growing movement has gradually stimulated interest and investment in fungal conservation, initially modest, but now gaining remarkable momentum. We acknowledge and commend organizations such as the Mohamed bin Zayed Species Conservation Fund [MBZ] and the Rufford Foundation for providing essential early-stage support, enabling local scientists and community-based organizations to document fungal diversity, assess threats, and promote sustainable management practices. Support from the UK Darwin Initiative has been similarly pivotal. Its project "Fungal Conservation in Sub-Saharan Africa: Sustainability and Livelihoods Implications" represents a major leap forward in addressing the existing knowledge gap in Africa. It brings together regional expertise, traditional ecological knowledge, and scientific innovation to strengthen protection of fungi and their habitats across biodiversity-rich landscapes. Beyond raising awareness and generating vital data, it demonstrates that fungal conservation can serve as a strategic lever for ecological sustainability, food security, green job creation, and the strengthening of local livelihoods in Africa, while supporting the objectives of the Kunming–Montreal Global Biodiversity Framework (2022).

The Global Strategy for Fungal Conservation, expected to be published this year, will provide a comprehensive framework to guide national and international efforts,

priorities, and partnerships in fungal protection. In parallel, citizen science programmes and field campaigns, including open-access databases, and educational initiatives, are contributing to a better understanding of fungal species while mobilizing local communities. Projects such as the Arab Society for Fungal Conservation, Fungimap (Australia), Mushroom Observer (USA), SPUN (the Society for Protection of Underground Networks), the iNaturalist platform, and regional, national and local groups collectively demonstrate the transformative power of public participation in collecting and disseminating mycological knowledge. At present, however, many of the resulting databases, including the largest ones, are unable to handle relations between associated organisms (they tell us where and when a plant has been seen, but cannot say what was, for example, pollinating it). We draw attention to this serious shortcoming, and specifically call on those responsible for them to explore remedies.

The IUCN Species Survival Commission's Fungal Conservation Committee and its various specialist groups have played a central role by coordinating species assessments, expert training, data sharing, and the development of strategic conservation recommendations. These efforts are complemented by the Global Fungal Red List Initiative, which provides a robust scientific foundation for extinction risk assessments and for guiding policy and conservation action. Likewise, international reference reports such as State of the World's Fungi and State of the World's Plants and Fungi from the Royal Botanic Gardens, Kew, have greatly enhanced scientific and public visibility for fungi, while offering practical recommendations for their inclusion in global biodiversity frameworks, including the Kunming–Montreal Global Biodiversity Framework (2022).

In accordance with the key orientations formulated during international assemblies and congresses, including the present Congress and congresses of the International Mycological Association, a collective commitment is made to implement a set of priority actions aimed at strengthening fungal conservation and promoting their sustainable use. Efforts should focus on consolidating taxonomy, reference collections, and genetic sequence databases, while supporting the training of mycologists, particularly in understudied regions. Priority should be given to accelerating IUCN assessments of fungal species through the development of standardized protocols for inventory and monitoring. National and regional fungal observatories should be established, supported by open-data platforms that facilitate information sharing and harmonization. The adoption of international guidelines fully recognizing fungi within multilateral environmental agreements should be promoted. Local knowledge and sustainable harvesting practices should be safeguarded and promoted, ensuring their intergenerational transmission. Moreover, local development projects linking fungal conservation with livelihood improvement should be supported, including the creation of sustainable harvest value chains. We particularly affirm that, for any work on biodiversity as a whole, mycologists should be involved as a matter of routine from the earliest stages.

States, international organizations, research institutions, donors, local communities,

and civil societies are therefore called upon to recognize the urgency of protecting fungi and their habitats, to support the commitments set forth herein, and to work together to implement them effectively.

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CHAMPIGNONS

les Orphelins de Rio



International Society for Fungal Conservation - www.fungal-conservation.org