

ANNALES CONFEDERATIONIS EUROPAEAE MYCOLOGIAE MEDITERRANENSIS

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Preface

The 31st Congress of the Confederation of European Mediterranean Mycology (C.E.M.M.) was held in the municipality of Iglesias, Sardinia, Italy, from 24 to 30 November 2025. The event was organized by the Italian Mycological Union (UMI-APS), the “Paolo Fantini” Sardinian Truffle Hunters’ Association, the Bresadola Mycological Association (Gruppo di Cagliari), and the Municipality of Iglesias.

This edition served as an international scientific meeting and a forum for research, education, and the study of Sardinia’s fungal diversity. At the same time, the Congress provided an opportunity to showcase the rich cultural, historical, and environmental heritage of the territories involved in the event.

The Congress brought together mycologists belonging to the C.E.M.M.-affiliated mycological societies, researchers, and fungal enthusiasts from several European countries, including Belgium, Czech Republic, Estonia, Finland, France, Germany, Greece, Italy, Norway, and Spain as well as participants from non-European countries such as Guatemala and Australia. The scientific and field activities focused on the extraordinary fungal biodiversity of Sardinia, fostered by the island’s highly diversified forest ecosystems, varied soil conditions, and remarkable range of habitats.

Numerous mycological excursions were conducted throughout the Congress, resulting in the recording of **338 fungal species**, all of which were documented in the PlutoF biodiversity platform. Among these were several species of particular scientific interest, including *Agaricus luteomaculatus* (F.H. Møller) F.H. Møller, *Alessioporus ichnusianus* (Alessio, Galli & Littini) Gelardi, Vizzini & Simonini, *Calonarius vesterholtii* (Frøslev & T.S. Jeppesen) Niskanen & Liimat., *Entoloma bloxamii* (Berk. & Broome) Sacc., *Hygrocybe aurantiosplendens* R. Haller Aar., *Hygrophorus roseodiscoideus* Bon & Chevassut, *Rubroboletus rhodoxanthus* (Krombh.) Kuan Zhao & Zhu L. Yang, *Xerocomellus sarnarii* Simonini, Vizzini & U. Eberh., *Xerocomus moravicus* (Václ. Vacek) Herink. At the conclusion of the Congress, the collected specimens were displayed in a mycological exhibition hosted by the “Giorgio Asproni” Mining Institute, which was open to both participants and the local community.

The scientific programme featured **8 scientific presentations and invited lectures**, whose abstracts are included in these Proceedings. Together, they provide valuable insights into current research on fungal taxonomy, ecology, conservation, biodiversity, and applied mycology, reflecting the breadth and vitality of contemporary mycological studies.

Participants also had the opportunity to discover the unique character of Iglesias, located in south-western Sardinia. Formerly known as *Villa di Chiesa*, this medieval town owes much of its historical development to mining activities. Its remarkable cultural heritage includes the Cathedral of Santa Chiara, Salvaterra Castle, the medieval Pisan walls, and the Church and Cloister of San Francesco. Visitors were also able to explore the Museum of Mining Art and the Mineralogical Museum, both of which preserve and celebrate the town’s distinctive mining history and identity.

The organizers wish to express their sincere gratitude to all participants, speakers, volunteers, sponsors, and local institutions whose commitment and collaboration contributed to the success of the 31st C.E.M.M. Congress. We hope that these Proceedings will serve as a lasting record of an inspiring week of scientific exchange, friendship, and discovery in one of the most fascinating regions of the Mediterranean.

The Organizing Committee

31st C.E.M.M. Congress, Iglesias 2025

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- **Mirco Iotti** — University of L'Aquila
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- **Enrico Lancellotti** — Sardinian Truffle Hunters Association
- **Ariadne N. M. Furtado** — University of Cagliari

Scientific Programme

Monday, 24 November 2025

- **9:30 p.m.** – Presentation of the **FunDive Project** and brief introduction to the mycological excursion areas.
Simone Graziosi (*The FunDive Project: mapping European fungal biodiversity*)

Tuesday, 25 November 2025

- **6:30–7:30 p.m.** – Invited lecture by **Giampaolo Simonini** (Independent Researcher, Italy):
“Boletus erythropus, B. luridiformis and B. praestigiator: Nomenclatural and Taxonomic Issues”

Wednesday, 26 November 2025

- **6:30–7:30 p.m.** – Invited lecture by **Elias Polemis** (National and Kapodistrian University of Athens, Greece):
“Red-listed, Rare and Other Interesting Mediterranean Macrofungi Recently Recorded in Greece”
- **9:30–10:30 p.m.** – Meeting of the **C.E.M.M. Board of Directors**

Thursday, 27 November 2025

- **6:00–7:30 p.m.** – **C.E.M.M. General Assembly**

Friday, 28 November 2025

- **6:30–7:30 p.m.** – Invited lecture by **Roberto Flores** (Universidad de San Carlos de Guatemala, Guatemala):
“They Seem Mediterranean but Are Neotropical: The Diversity, Taxonomic and Cultural History of Fungi in Guatemala”

Saturday, 29 November 2025

- **6:30–7:30 p.m.** – Scientific lectures and presentations:
 - **Simone Buratti** (University of Pavia, Italy) *“Let's be clear: how can lignicolous fungi help tackle the environmental problem of dyes?”*
 - **Martina De Mattheis** (University of L'Aquila, Italy) *“Genomic variability of Tuber borchii between Sardinian and continental populations”*
 - **Carolina Elena Girometta** (University of Pavia, Italy) *“Preliminary insights on fungal diversity associated to Pinus mugo Turra in a relict Apennine population”*
 - **Mirco Iotti** (University of L'Aquila, Italy) *“Tuber spp.: a food source for an unexpected number of arthropods”*
- **7:00 p.m.** – Official opening of the **Mycological Exhibition**, featuring fungi collected during the Congress excursions.

Throughout the week, participants took part in daily mycological excursions in selected areas of south-western Sardinia, allowing the study and documentation of the island's rich fungal biodiversity. Specimens collected during the fieldwork were identified, catalogued, and subsequently displayed in the Mycological Exhibition open to both Congress participants and the general public.

Investigated Areas

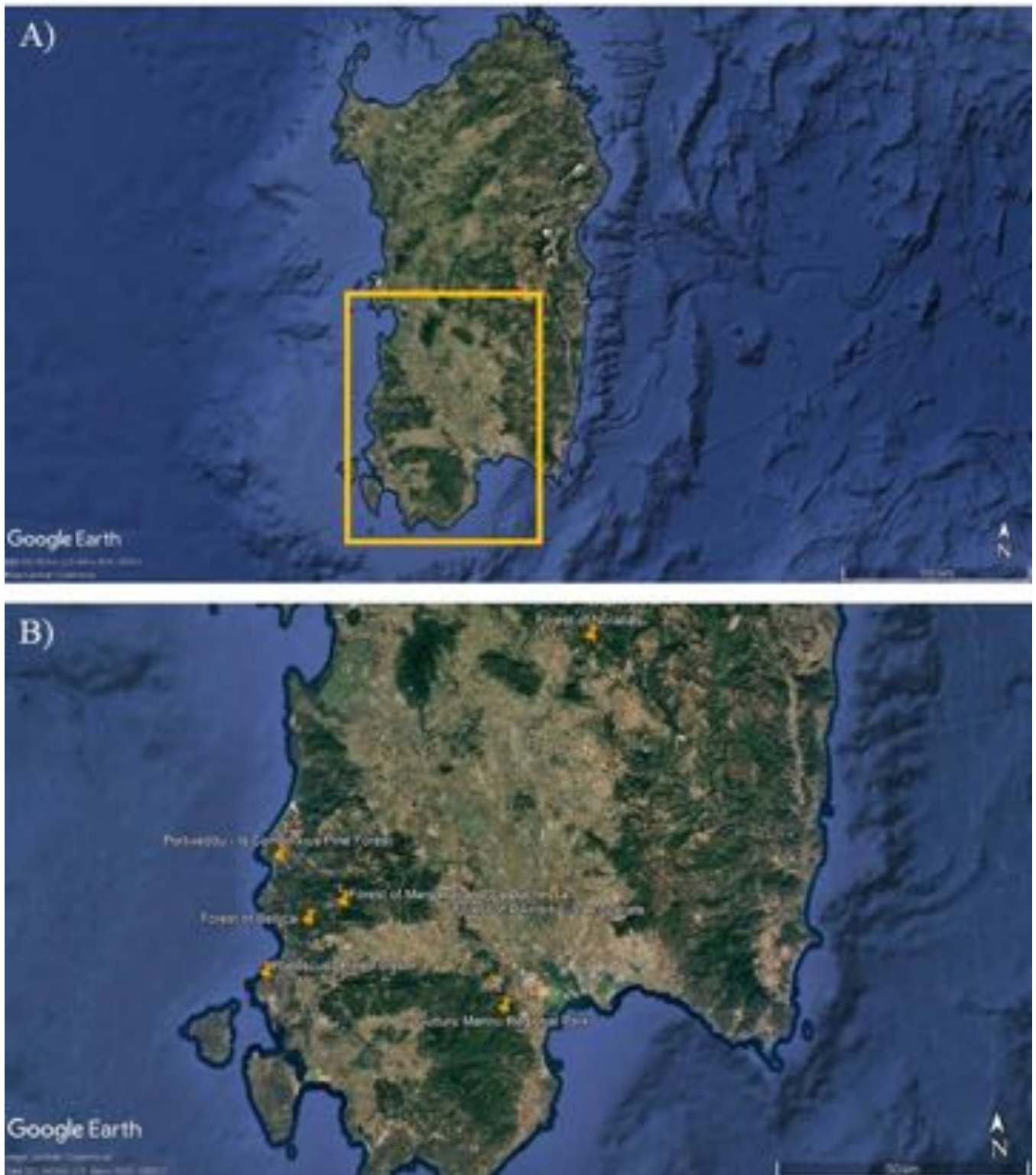


Figure 1 Geographical location of the investigated sites in southern Sardinia, Italy. (A) Location of the study region within Sardinia, highlighted by the orange rectangle. (B) Distribution of the seven investigated sites, indicated by orange markers: Forest of Bellicai, Forest of Marganai e Sa Duchessa, Forest of Nurallao, Forest Pixinortu–San Sperate, Gutturu Mannu Regional Park, Portoscuso Pine Forest, and Portixeddu–Is Compinxius Pine Forest (<https://earth.google.com>).

1 – FOREST OF MARGANAI AND SA DUCHESSA

The Forest of Marganai and Sa Duchessa covers an area of 3,650 hectares and is part of the proposed "Monte Linas, Marganai-Orida, Montimannu Natural Park" (Regione Autonoma della Sardegna, 2012). The substrate consists of limestone, dolomite, and dolomitic limestone (Angius et al., 2009; Carmignani et al., 2001). The predominant vegetation is holm oak forest (Pollastrini et al., 2018; Triberti et al., 2011), along with secondary maquis formations, rockrose scrub (*Cistus* communities), and garrigue (Bacchetta et al., 2004).



Figure 2 Panoramic view of the Marganai Forest and the surrounding mountainous landscape (a). Sa Duchessa Forest, dominated by *Quercus ilex* visited during the mycological excursion (b, c). Images of Andrea Rinaldi and Simone Graziosi.



Figure 3 Fungal species found in the Marganai (a, b) and Sa Duchessa (c, d) forests. *Clavulina cinerea* (Bull.) J. Schröt. (a), *Lactarius atlanticus* Bon (b), *Paxillus involutus* (Batsch) Fr., *Rubroboletus satanas* (Lenz) Kuan Zhao & Zhu L. Yang (d). Images of Andrea Rinaldi.



Figure 4 Remains of ancient lime kilns in the Marganai–Sa Duchessa forest. External view of a partially collapsed kiln integrated into the forest slope (a); interior view of a well-preserved circular stone structure used for limestone calcination (b). Images of Andrea Rinaldi.

2 – GUTTURU MANNU REGIONAL PARK

Located in the Sulcis region of southwestern Sardinia, Gutturu Mannu Regional Park encompasses an extensive and largely continuous area of Mediterranean forest (Regione Autonoma della Sardegna, 2014). Its landscape is characterized by rugged granitic and metamorphic relief crossed by a dense hydrographic network (Carmignani et al., 2001). The forest vegetation is dominated by holm oak (*Quercus ilex* L.) and cork oak (*Quercus suber* L.) woodlands, interspersed with Mediterranean maquis comprising strawberry tree (*Arbutus unedo* L.), tree heath (*Erica arborea* L.), mastic tree (*Pistacia lentiscus* L.), and common myrtle (*Myrtus communis* L.) (Bacchetta et al., 2004, 2009). Owing to the extent and continuity of its forest habitats, the area is of considerable conservation importance and provides a refuge for several endemic and threatened taxa, including the Corsican red deer (*Cervus elaphus corsicanus* Erxleben) (Regione Autonoma della Sardegna, 2014). Its mature oak woodlands also provide potentially suitable habitats for diverse saproxylic and ectomycorrhizal fungal assemblages.



Figure 5 Mediterranean forest landscape of the Gutturu Mannu Regional Natural Park. The park is characterized by extensive evergreen Mediterranean vegetation, dominated by holm-oak (*Quercus ilex*) forests and Mediterranean maquis. Image of Parco Naturale Regionale di Gutturu Mannu (www.parcogutturumannu.it).

3 – FOREST OF NURALLAO

The Forest of Nurallao, nestled in the Sarcidano region of central Sardinia, is renowned for hosting one of the island's largest and best-preserved climax holm oak forests (*Q. ilex*), a biotope of exceptional scientific interest (Bacchetta et al., 2004, 2009). Rising across hills that reach altitudes of around 760 meters, the habitat features dense mesophilic vegetation alongside impressive formations of juniper (*Juniperus oxycedrus* L. and *Juniperus turbinata* Guss.), strawberry tree, and green olive tree (*Olea europaea* L.) (Bacchetta et al., 2009). The landscape is rendered unique by numerous natural springs and picturesque streams forming waterfalls deep within the woods (Ministero della Cultura, 2021), set against a backdrop rich in Nuragic archaeological sites (Regione Autonoma della Sardegna, 2012).



Figure 6 Forest environment of Funtana Is Arinus Park, Nurallao. The area is characterized by Mediterranean woodland dominated by oaks and holm oaks and is crossed by the Rio Sarcidano, which forms a series of waterfalls within the park. Image of Andrea Rinaldi.

4.1 – PORTOSCUSO PINE FOREST

Located along the southwestern coast of Sardinia in the Sulcis region, the Portoscuso Pine Forest is a coastal reforestation ecosystem established to stabilize sandy substrates and protect coastal soils. The site is characterized by dominant stands of Aleppo pine (*Pinus halepensis* Mill.), frequently growing alongside Mediterranean coastal shrubs such as mastic, phillyrea (*Phillyrea angustifolia* L.), and sea juniper (*Juniperus macrocarpa* Sm.). The habitat represents a crucial ecological barrier against marine aerosols and wind erosion, hosting specific psammophilous and coastal fungal and plant communities (Bacchetta et al., 2009; Regione Autonoma della Sardegna, 2012).



Figure 7 Portoscuso Pine Forest. General view of the forest, showing the highly sandy soil associated with its proximity to the nearby coastline (a). Another area of the forest, characterized by a dense layer of pine needles covering the soil surface (b). *Russula torulosa* Bres., a common fungal species occurring in this habitat (c).
Images of Simone Graziosi.

4.2 – PORTIXEDDU–IS COMPINXIUS PINE FOREST

Lying along the northwestern boundary of the Iglesiasiente coast, the Portixeddu– Is Compinxius Pine Forest area encompasses a dynamic coastal dune system backed by a stabilized pine forest biotope. The coastal woodland, primarily composed of Aleppo pine and *Pinus pinea* L., was introduced to reinforce dune stabilization and prevent soil erosion over sandy Paleozoic and Quaternary sediments. The understory features a rich thermo-Mediterranean maquis and psammophilous vegetation, including *Juniperus macrocarpa* Sm., *Cistus* species, and *Helichrysum italicum* (Roth) G.Don subsp. *tyrrhenicum* (Bacch., Brullo & Giusso) Herrando, J.M.Blanco, L.Sáez & Galbany, making it a habitat of significant conservation interest (Angius et al., 2009; Bacchetta et al., 2004; Carmignani et al., 2001).



Figure 8 Portixeddu–Is Compinxius Pine Forest. A relatively open area of the pine forest, characterized by substantial sunlight penetration to the forest floor (a). Basidiomata of *Scleroderma meridionale* Demoulin & Malençon emerging from the highly sandy soil characteristic of this forest (b). Images of Simone Graziosi.

5 – FOREST OF BELLICAI

The Forest of Bellicai, located in the municipality of Iglesias, is part of the Marganai-Monte Linas silvo-pastoral complex in the Sulcis-Iglesiente region (Regione Autonoma della Sardegna, 2012). Stretching from the coastal plain to submontane ecoregions at an altitude of about 500–600 meters (Triberti et al., 2011), this Mediterranean habitat lies on terrain shaped by ancient mining activity and predominantly Paleozoic schistose substrates (Angius et al., 2009). It is dominated by cork oak and holm oak woodlands (Pollastrini et al., 2018), accompanied by a rich maquis of strawberry tree, mastic, and rockrose (Bacchetta et al., 2004).



Figure 9 Forest of Bellicai. General view of the cork oak (*Quercus suber*) woodland, characterized by an open understory and skeletal, stony soil. (a). Cork oak stand showing trees recently subjected to cork harvesting, recognizable by the exposed reddish trunks (b). Basidioma of a *Russula* species collected within the forest (c). Traditional ladder-like structures used to cross fences and facilitate access through the woodland (d). Images of Andrea Rinaldi.

6 – FOREST OF PIXINORTU–SAN SPERATE

Situated within the agricultural and alluvial plains of the Campidano region near San Sperate, Pixinortu features an anthropogenic and semi-natural landscape shaped by traditional agricultural practices and riverine dynamics. The area is characterized by riparian vegetation along stream beds—dominated by poplars (*Populus alba* L.), willows (*Salix* spp.), and tamarisk (*Tamarix gallica* L.), intermixed with remnant Mediterranean maquis patches (*P. lentiscus*, *Rhamnus alaternus* L.) and cultivated orchards. This anthropized biotope provides an essential ecological corridor within an intensively managed lowland landscape (Bacchetta et al., 2004, 2009).



Figure 10 Bosco di Pixinortu, San Sperate. The area represents a remnant of lowland forest in the Campidano plain, characterized by the presence of *Populus alba* and *Quercus ilex*, together with other woody species typical of the local wetland environment. Image of Comune di San Sperate (www.comune.sansperate.ca.it).

Collected Species List

Species	Collection Areas
<i>Agaricus arvensis</i> Schaeff.	1
<i>Agaricus augustus</i> Fr.	1
<i>Agaricus biberi</i> Hlaváček	6
<i>Agaricus boisseletii</i> Heinem.	1
<i>Agaricus brunneolus</i> (J.E. Lange) Pilát	1, 4
<i>Agaricus essettei</i> Bon	1
<i>Agaricus luridus</i> Pers.	3
<i>Agaricus luteomaculatus</i> (F.H. Møller) F.H. Møller	2
<i>Agaricus moelleri</i> Wasser	1, 2, 6
<i>Agaricus phaeolepidotus</i> (F.H. Møller) F.H. Møller	2
<i>Agaricus sylvaticus</i> Schaeff.	3, 4
<i>Agaricus xanthodermus</i> Genev.	1, 5
<i>Alessioporus ichnusanus</i> (Alessio, Galli & Littini) Gelardi, Vizzini & Simonini	5
<i>Amanita caesarea</i> (Scop.) Pers.	2
<i>Amanita citrina</i> Pers.	1, 3, 5
<i>Amanita fulva</i> Fr.	2
<i>Amanita muscaria</i> (L.) Lam.	4
<i>Amanita ovoidea</i> (Bull.) Link	1, 3, 4
<i>Amanita pantherina</i> (DC.) Krombh.	1, 2, 5
<i>Amanita phalloides</i> (Fr.) Link	2
<i>Amanita rubescens</i> Pers.	2, 5
<i>Armillaria mellea</i> (Vahl) P. Kumm.	1, 2, 5
<i>Arrhenia spathulata</i> (Fr.) Redhead	3
<i>Astraeus telleriae</i> M.P. Martín, Phosri & Watling	4
<i>Auricularia auricula-judae</i> (Fr.) Quél.	3, 6
<i>Auricularia mesenterica</i> (Gray) Pers.	6
<i>Boletus aereus</i> Bull.	2, 4, 5
<i>Boletus lepidus</i> H. Bouchet ex Essette	1, 2, 3
<i>Boletus sardous</i> Belli & Sacc.	4
<i>Byssomerulius corium</i> (Pers.) Parmasto	1, 2
<i>Calonarius vesterholtii</i> (Frøslev & T.S. Jeppesen) Niskanen & Liimat.	1
<i>Cantharellus alborufescens</i> (Malençon) Papetti & S. Alberti	1
<i>Cantharellus ferruginascens</i> P.D. Orton	1, 3
<i>Cantharellus pallens</i> Pilát	3
<i>Catatrampa furnacea</i> (Letell.) Cons. & Setti	1, 4, 6
<i>Chaetocalathus craterellus</i> (Durieu & Lév.) Singer	1
<i>Chlorophyllum brunneum</i> (Farl. & Burt) Vellinga	5
<i>Chlorophyllum rhacodes</i> (Vittad.) Vellinga	1
<i>Chroogomphus mediterraneus</i> (Finschow) Vila, Pérez-De-Greg. & G. Mir	4, 5
<i>Clathrus ruber</i> P. Micheli ex Pers.	2, 6
<i>Clavaria fragilis</i> Holmsk.	2
<i>Clavariadelphus pistillaris</i> (L.) Donk	3, 5
<i>Clavariadelphus truncatus</i> (Quél.) Donk	3
<i>Clavulina cinerea</i> (Bull.) J. Schröt.	1, 2, 5

<i>Clavulina</i> sp.	4
<i>Clavulinopsis corniculata</i> (Schaeff.) Corner	3
<i>Clitocybe amarescens</i> Harmaja	6
<i>Clitocybe cistophila</i> Bon & Contu	4
<i>Clitocybe mediterranea</i> (Vizzini, Contu & Musumeci) E. Ludw.	1, 2, 5
<i>Clitocybe truncicola</i> (Peck) Sacc.	6
<i>Clitopilus cystidiatus</i> Hauskn. & Noordel.	1
<i>Clitopilus geminus</i> (Paulet) Noordel. & Co-David	2, 5
<i>Clitopilus melleopallens</i> (P.D. Orton) Noordel. & Co-David	4
<i>Clitopilus prunulus</i> (Scop.) P. Kumm.	3
<i>Collybia nuda</i> (Bull.) Z.M. He & Zhu L. Yang	1, 2, 3, 4, 5, 6
<i>Collybia odora</i> (Bull.) Z.M. He & Zhu L. Yang	1, 3
<i>Collybia rivulosa</i> (Pers.) Z.M. He & Zhu L. Yang	2, 4
<i>Collybia sordida</i> (Schumach.) Z.M. He & Zhu L. Yang	1, 6
<i>Coprinellus domesticus</i> (Bolton) Vilgalys, Hopple & Jacq. Johnson	3
<i>Coprinopsis melanthina</i> (Fr.) Örstadius & E. Larss.	5
<i>Coprinopsis picacea</i> (Bull.) Redhead, Vilgalys & Moncalvo	2, 3, 6
<i>Coprinus comatus</i> (O.F. Müll.) Pers.	3
<i>Coriolopsis gallica</i> (Fr.) Ryvarde	6
<i>Coriolopsis trogii</i> (Berk.) Domański	6
<i>Cortinarius cedretorum</i> var. <i>bergeronii</i> Melot	1
<i>Cortinarius croceus</i> (Schaeff.) Gray	3
<i>Cortinarius dryosolor</i> Armada, Bidaud, Bellanger & Loizides	2, 3
<i>Cortinarius elatior</i> Fr.	2, 5
<i>Cortinarius infractus</i> (Pers.) Fr.	1, 2, 3, 4
<i>Cortinarius leproleptopus</i> Chevassut & Rob. Henry	3
<i>Cortinarius trivialis</i> J.E. Lange	1, 2, 5
<i>Crepidotus applanatus</i> (Pers.) P. Kumm.	6
<i>Crepidotus calolepis</i> (Fr.) P. Karst.	2
<i>Crepidotus ehrendorferi</i> Hauskn. & Krisai	6
<i>Crinipellis scabella</i> (Alb. & Schwein.) Murrill	1
<i>Cuphophyllus virgineus</i> (Wulfen) Kovalenko	2, 3
<i>Cyanoboletus pulverulentus</i> (Opat.) Gelardi, Vizzini & Simonini	5
<i>Cyanosporus subcaesius</i> (A. David) B.K. Cui, L.L. Shen & Y.C. Dai	3
<i>Cyclocybe cylindracea</i> (DC.) Vizzini & Angelini	6
<i>Daldinia concentrica</i> (Bolton) Ces. & De Not.	6
<i>Dendrocollybia racemosa</i> (Pers.) R.H. Petersen & Redhead	2
<i>Echinoderma asperum</i> (Pers.) Bon	1
<i>Entoloma bloxamii</i> (Berk. & Broome) Sacc.	2
<i>Entoloma corvinum</i> (Kühner) Noordel.	2
<i>Entoloma lividoalbum</i> (Kühner & Romagn.) Kubička	2
<i>Entoloma nidorosum</i> (Fr.) Quél.	2
<i>Entoloma rhodopolium</i> (Fr.) P. Kumm.	1, 6
<i>Entoloma serrulatum</i> (Fr.) Hesler	3
<i>Entoloma sinuatum</i> (Fr.) P. Kumm.	5
<i>Entoloma undatum</i> (Gillet) M.M. Moser	3
<i>Fomes fomentarius</i> (L.) Fr.	6
<i>Fomitiporia rosmarini</i> (Bernicchia) Ghob.-Nejh. & Y.C. Dai	2

<i>Fuscoporia torulosa</i> (Pers.) T. Wagner & M. Fisch.	1, 2, 4
<i>Galerina marginata</i> (Batsch) Kühner	5
<i>Ganoderma applanatum</i> (Pers.) Pat.	6
<i>Ganoderma lucidum</i> (Curtis) P. Karst.	1, 2, 5
<i>Geastrum fimbriatum</i> Fr.	3, 6
<i>Geastrum michelianum</i> W.G. Sm.	3
<i>Geoglossum</i> sp.	3
<i>Gymnopilus junonius</i> (Fr.) P.D. Orton	4
<i>Gymnopilus sapineus</i> (Fr.) Murrill	4
<i>Gymnopus brassicolens</i> (Romagn.) Antonín & Noordel.	3, 4, 6
<i>Gymnopus dryophilus</i> (Bull.) Murrill	3, 4
<i>Gymnopus erythropus</i> (Pers.) Antonín, Halling & Noordel.	1, 5
<i>Gymnopus foetidus</i> (Sowerby) J.L. Mata & R.H. Petersen	2
<i>Gymnopus fusipes</i> (Bull.) Gray	1, 2
<i>Gymnopus impudicus</i> var. <i>graveolens</i> (G. Poirault ex Boud.) Vila & Llimona	4
<i>Gyroporus castaneus</i> (Bull.) Quél.	4, 5
<i>Hebeloma cistophilum</i> Maire	3, 4
<i>Hebeloma laterinum</i> (Batsch) Vesterh.	3
<i>Hebeloma sinapizans</i> (Paulet) Gillet	1
<i>Helvella atra</i> Oeder	3
<i>Helvella crispa</i> (Scop.) Fr.	1, 3
<i>Helvella juniperi</i> M. Filippa & Baiano	3
<i>Helvella lacunosa</i> Afzel.	3
<i>Hemileccinum impolitum</i> (Fr.) Šutara	1, 4
<i>Hemimycena cucullata</i> (Pers.) Singer	3
<i>Hexagonia nitida</i> Durieu & Mont.	1
<i>Hohenbuehelia atrocoerulea</i> (Fr.) Singer	3
<i>Hohenbuehelia petaloides</i> (Bull.) Schulzer	2, 3, 4
<i>Hortiboletus bubalinus</i> (Oolbeek. & Duin) L. Albert & Dima	2, 5
<i>Hortiboletus engelii</i> (Hlaváček) Biketova & Wasser	1, 2, 3, 6
<i>Hortiboletus rubellus</i> (Krombh.) Simonini, Vizzini & Gelardi	1, 2
<i>Humaria hemisphaerica</i> (F.H. Wigg.) Fuckel	1
<i>Hydnellum conrescens</i> (Pers.) Banker	4
<i>Hydnellum ferrugineum</i> (Fr.) P. Karst.	4
<i>Hydnellum ioeides</i> (Pass.) E. Larss., K.H. Larss. & Kõljalg	3
<i>Hydnocystis piligera</i> Tul. & C. Tul.	2
<i>Hydnum albidum</i> Peck	3
<i>Hydnum pallidum</i> Raddi	3
<i>Hydnum repandum</i> L.	3
<i>Hydnum rufescens</i> Pers.	3
<i>Hygrocybe acutoconica</i> (Clem.) Singer	1, 2, 3, 4
<i>Hygrocybe aurantiosplendens</i> R. Haller Aar.	1
<i>Hygrocybe chlorophana</i> (Fr.) Wünsche	3
<i>Hygrocybe colemanniana</i> (A. Bloxam) P.D. Orton & Watling	3
<i>Hygrocybe conica</i> (Schaeff.) P. Kumm.	2, 3
<i>Hygrocybe conica</i> f. <i>pseudoconica</i> (J.E. Lange) Arnolds	3
<i>Hygrocybe glutinipes</i> (J.E. Lange) R. Haller Aar	3
<i>Hygrophorus eburneus</i> (Bull.) Fr.	6

<i>Hygrophorus eburneus</i> var. <i>cossus</i> (Sowerby) Quél.	2, 3, 5
<i>Hygrophorus glutinifer</i> Fr.	5
<i>Hygrophorus hypothejus</i> (Fr.) Fr.	3
<i>Hygrophorus leucophaeo-ilicis</i> Bon & Chevassut	3
<i>Hygrophorus limacinus</i> (Scop.) Fr.	1, 3, 5, 6
<i>Hygrophorus roseodiscoideus</i> Bon & Chevassut	3
<i>Hygrophorus russula</i> (Fr.) Bataille	2, 3
<i>Hypholoma fasciculare</i> (Huds.) P. Kumm.	1
<i>Hypomyces chrysospermus</i> (Bull.) Tul. & C. Tul.	6
<i>Hypomyces lateritius</i> (Fr.) Tul. & C. Tul.	4
<i>Infundibulicybe alkaliviolascens</i> (Bellù) Bellù	1
<i>Infundibulicybe meridionalis</i> (Bon) Pérez-De-Greg.	3, 5
<i>Inocybe fraudans</i> (Britzelm.) Sacc.	3
<i>Inocybe griseolilacina</i> J.E. Lange	3
<i>Inocybe mixtilis</i> (Britzelm.) Sacc.	4
<i>Inocybe rufuloides</i> Bon	4
<i>Inonotus</i> sp.	5
<i>Inosperma bongardii</i> (Weinm.) Matheny & Esteve-Rav.	3
<i>Laccaria laccata</i> (Scop.) Cooke	1, 2, 3
<i>Lactarius atlanticus</i> Bon	1, 2, 3, 6
<i>Lactarius chrysorrheus</i> Fr.	1, 2, 3, 5
<i>Lactarius cistophilus</i> Bon & Trimbach	2
<i>Lactarius deliciosus</i> (L.) Gray	4
<i>Lactarius hepaticus</i> Plowr.	4
<i>Lactarius mairei</i> Malençon	1
<i>Lactarius mediterraneensis</i> Llistos. & Bellù	2, 3
<i>Lactarius sanguifluus</i> (Paulet) Fr.	4
<i>Lactarius sanguifluus</i> f. <i>vinosus</i> (Quél.) Lalli & Pacioni	4
<i>Lactarius subumbonatus</i> Lindgr.	2
<i>Lactarius tesquorum</i> Malençon	3
<i>Lactarius zonarius</i> (Bull.) Fr.	5
<i>Lactarius zugazae</i> G. Moreno, Montoya, Band.-Muñoz & Heykoop	2, 5
<i>Lactifluus rugatus</i> (Kühner & Romagn.) Verbeken	2, 5
<i>Laternea pusilla</i> Berk. & M.A. Curtis	3
<i>Leccinellum corsicum</i> (Rolland) Bresinsky & Manfr. Binder	3
<i>Leccinum duriusculum</i> (Schulzer ex Kalchbr.) Singer	6
<i>Legaliana badia</i> (Pers.) Van Vooren	2
<i>Lentinellus micheneri</i> (Berk. & M.A. Curtis) Pegler	1, 4
<i>Lentinellus ursinus</i> (Fr.) Kühner	4
<i>Lentinus arcularius</i> (Batsch) Zmitr.	4, 5
<i>Lentinus brumalis</i> (Pers.) Zmitr.	3
<i>Leocarpus fragilis</i> (Dicks.) Rostaf.	2, 4
<i>Lepiota brunneolilacea</i> Bon & Boiffard	3
<i>Lepiota castanea</i> Quél.	2, 3
<i>Lepiota cristata</i> (Bolton) P. Kumm.	1, 3
<i>Lepiota echinella</i> Quél. & G.E. Bernard	2
<i>Lepiota felina</i> (Pers.) P. Karst.	3
<i>Lepiota griseovirens</i> Maire	1

<i>Lepiota ignivolvata</i> Bousset & Joss. ex Joss.	1, 3
<i>Lepiota subincarnata</i> J.E. Lange	6
<i>Lepista flaccida</i> (Sowerby) Pat.	1, 5, 6
<i>Lepista panaeola</i> (Fr.) P. Karst.	2, 3, 6
<i>Leucoagaricus sericifer</i> f. <i>sericatellus</i> (Malençon) Vellinga	1
<i>Leucoagaricus</i> sp.	6
<i>Leucoagaricus sublittoralis</i> (Kühner ex Hora) Singer	6
<i>Leucocoprinus cinerascens</i> (Quél.) Locq.	1
<i>Leucocoprinus ionidicolor</i> (Bellù & Lanzoni) Migl. & Donato	6
<i>Leucocortinarius bulbiger</i> (Alb. & Schwein.) Singer	6
<i>Leucopaxillus gentianeus</i> (Quél.) Kotl.	1, 2
<i>Leucopaxillus paradoxus</i> (Costantin & L.M. Dufour) Boursier	1
<i>Lycoperdon perlatum</i> Pers.	1, 2, 4, 5
<i>Lyophyllum amariusculeum</i> Clémenton	1
<i>Lyophyllum atratum</i> (Fr.) Singer	5
<i>Lyophyllum decastes</i> (Fr.) Singer	2
<i>Lyophyllum littoralis</i> (Ballero & Contu) Contu	1, 4
<i>Lyophyllum pseudosinuatum</i> Cons., Contu & Saar	4
<i>Macrolepiota mastoidea</i> (Fr.) Singer	1, 2, 3, 4, 6
<i>Macrolepiota procera</i> (Scop.) Singer	1, 2
<i>Macrotypophula juncea</i> (Alb. & Schwein.) Berthier	2
<i>Marasmius oreades</i> (Bolton) Fr.	2
<i>Melanoleuca melaleuca</i> (Pers.) Murrill	3, 4
<i>Melanoleuca rasilis</i> (Fr.) Singer	4
<i>Merulius tremellosus</i> Fr.	3
<i>Mycena arcangeliana</i> Bres.	1
<i>Mycena filipes</i> (Bull.) P. Kumm.	6
<i>Mycena flavescens</i> Velen.	2
<i>Mycena haematopus</i> (Pers.) P. Kumm.	5
<i>Mycena meliigena</i> (Berk. & Cooke) Sacc.	1
<i>Mycena polyadelpha</i> (Lasch) Kühner	3
<i>Mycena polygramma</i> (Bull.) Gray	1
<i>Mycena renati</i> Quél.	2
<i>Mycena rosea</i> Gramberg	1, 2, 3
<i>Mycena rubromarginata</i> (Fr.) P. Kumm.	5
<i>Mycena seynesii</i> Quél.	4
<i>Myriostoma coliforme</i> (Dicks.) Corda	6
<i>Naematelia aurantia</i> (Schwein.) Burt	2
<i>Neoboletus xanthopus</i> (Klofac & A. Urb.) Klofac & A. Urb.	2
<i>Neottiella rutilans</i> (Fr.) Dennis	5
<i>Omphalotus olearius</i> (DC.) Singer	1, 2, 4
<i>Otidea bufonia</i> (Pers.) Boud.	3
<i>Otidea cochleata</i> (L.) Fuckel	1
<i>Pallidohirschioporus biformis</i> (Fr.) Y.C. Dai, Yuan Yuan & Meng Zhou	5
<i>Parasola conopila</i> (Fr.) Örstadius & E. Larss.	1, 3
<i>Parasola plicatilis</i> (Curtis) Redhead, Vilgalys & Hopple	6
<i>Peziza varia</i> (Hedw.) Röhl.	6
<i>Phaeoclavulina myceliosa</i> (Peck) Fanchi & M. Marchetti	1

<i>Phaeomarasmium rimulincola</i> (Lasch ex Rabenh.) Scherff.	2
<i>Phallus impudicus</i> L.	6
<i>Phellodon niger</i> (Fr.) P. Karst.	3, 4
<i>Phlegmacium caligatum</i> (Malençon) Niskanen & Liimat.	1
<i>Phloeomana alba</i> (Bres.) Redhead	1
<i>Pisolithus arhizus</i> (Scop.) Rauschert	2
<i>Pleurotus dryinus</i> (Pers.) P. Kumm.	2
<i>Pleurotus ostreatus</i> (Jacq.) P. Kumm.	6
<i>Pluteus ephebeus</i> (Fr.) Gillet	6
<i>Pluteus salicinus</i> (Pers.) P. Kumm.	6
<i>Polyporus tuberaster</i> (Jacq. ex Pers.) Fr.	1
<i>Poria cerea</i> Hoffm.	1
<i>Pruinomycena acicula</i> (Schaeff.) K.L. Yang, Jia Y. Lin & Zhu L. Yang	3
<i>Prunulus pelianthinus</i> (Fr.) James E. Johnson, Vilgalys & Redhead	1
<i>Prunulus purus</i> (Pers.) Murrill	2, 3, 4
<i>Pseudosperma rimosum</i> (Bull.) Matheny & Esteve-Rav.	6
<i>Radulomyces molaris</i> (Chaillet ex Fr.) M.P. Christ.	2
<i>Ramaria</i> sp.	2
<i>Ramaria stricta</i> (Pers.) Quél.	3
<i>Rhizopogon roseolus</i> (Corda) Th. Fr.	4
<i>Rhodocollybia butyracea</i> (Bull.) Lennox	1, 3, 5
<i>Rickenella fibula</i> (Bull.) Raithelh.	5
<i>Rubroboletus rhodoxanthus</i> (Krombh.) Kuan Zhao & Zhu L. Yang	1
<i>Rubroboletus satanas</i> (Lenz) Kuan Zhao & Zhu L. Yang	1
<i>Russula acrifolia</i> Romagn.	2, 4
<i>Russula amoenicolor</i> Romagn.	2
<i>Russula cessans</i> A. Pearson	4
<i>Russula chloroides</i> (Krombh.) Bres.	1, 4
<i>Russula decipiens</i> (Singer) Svrček	1, 2
<i>Russula delicata</i> Fr.	2
<i>Russula fragilis</i> Fr.	2, 3, 4
<i>Russula galochroa</i> (Fr.) Fr.	2
<i>Russula globispora</i> (J. Blum) Bon	3
<i>Russula ilicis</i> Romagn., Chevassut & Privat	2
<i>Russula integra</i> (L.) Fr.	5
<i>Russula laricina</i> Velen.	2
<i>Russula luteotacta</i> Rea	1
<i>Russula maculata</i> Quél. & Roze	2
<i>Russula monspeliensis</i> Sarnari	2
<i>Russula nymphaeum</i> F. Hampe & Marxm.	2
<i>Russula odorata</i> Romagn.	1
<i>Russula pelargonica</i> Niole	1
<i>Russula persicina</i> Krombh.	2
<i>Russula praetervisa</i> Sarnari	1, 2, 4
<i>Russula pseudoaeruginea</i> (Romagn.) Kuyper & Vuure	2
<i>Russula purpurascens</i> Bres.	2
<i>Russula sanguinea</i> (Bull.) Fr.	1, 2, 4
<i>Russula subfoetens</i> W.G. Sm.	2

<i>Russula torulosa</i> Bres.	4
<i>Russula vesca</i> Fr.	1, 2
<i>Russula xerampelina</i> (Schaeff.) Fr.	2
<i>Saproamanita vittadinii</i> (Moretti) Redhead, Vizzini, Drehmel & Contu	1
<i>Sarcodon</i> sp.	4
<i>Schizophyllum commune</i> Fr.	3, 4, 6
<i>Scleroderma meridionale</i> Demoulin & Malençon	2, 4
<i>Scleroderma polyrhizum</i> (J.F. Gmel.) Pers.	4
<i>Scleroderma verrucosum</i> (Bull.) Pers.	1, 2, 3, 5, 6
<i>Singerocybe phaeophthalma</i> (Pers.) Harmaja	1, 3
<i>Spodocybe fontqueri</i> (R. Heim) Vizzini, P. Alvarado & Dima	2
<i>Stereum hirsutum</i> (Willd.) Pers.	2, 3, 4, 5
<i>Suillellus comptus</i> (Simonini) Vizzini, Simonini & Gelardi	2
<i>Suillellus luridus</i> (Schaeff.) Murrill	1, 2
<i>Suillellus queletii</i> (Schulzer) Vizzini, Simonini & Gelardi	4
<i>Suillus bellinii</i> (Inzenga) Kuntze	1, 4
<i>Suillus collinitus</i> (Fr.) Kuntze	1, 3, 4, 6
<i>Suillus mediterraneensis</i> (Jacquet. & J. Blum) Redeuilh	4
<i>Tarzetta</i> sp.	1
<i>Thelephora terrestris</i> Ehrh. ex Pers.	4
<i>Trametes hirsuta</i> (Fr.) Lloyd	2
<i>Tremella mesenterica</i> Retz.	2, 6
<i>Tricholoma album</i> (Schaeff.) P. Kumm.	1, 3, 4
<i>Tricholoma argyraceum</i> (Bull.) Gillet	3
<i>Tricholoma atosquamosum</i> Sacc.	1, 2, 3
<i>Tricholoma basirubens</i> (Bon) A. Riva & Bon	3
<i>Tricholoma batschii</i> Gulden ex Mort. Chr. & Noordel.	4, 5
<i>Tricholoma bresadolae</i> Schulzer	2, 3
<i>Tricholoma caligatum</i> (Viv.) Ricken	2, 4
<i>Tricholoma orirubens</i> Quél.	3
<i>Tricholoma populinum</i> J.E. Lange	6
<i>Tricholoma saponaceum</i> (Fr.) P. Kumm.	3, 5
<i>Tricholoma scalpturatum</i> (Fr.) Quél.	1, 2, 3, 4, 5
<i>Tricholoma squarrulosum</i> Bres.	2, 3
<i>Tricholoma stiparophyllum</i> (N. Lund) P. Karst.	5
<i>Tricholoma sulphureum</i> (Bull.) P. Kumm.	1, 3, 5
<i>Tricholoma terreum</i> (Schaeff.) P. Kumm.	1
<i>Tricholoma ustale</i> (Fr.) P. Kumm.	2
<i>Tricholoma ustaloides</i> Romagn.	2
<i>Tubaria furfuracea</i> (Pers.) Gillet	1
<i>Tulostoma fimbriatum</i> Fr.	3
<i>Utraria excipuliformis</i> (Scop.) Quél.	2
<i>Utraria mollis</i> (Pers.) R.L. Zhao & J. Xin Li	1, 3, 5
<i>Vitreoporus dichrous</i> (Fr.) Zmitr.	1
<i>Volvariella gloiocephala</i> (DC.) Boekhout & Enderle	4, 6
<i>Xerocomellus cisalpinus</i> (Simonini, H. Ladurner & Peintner) Klofac	5
<i>Xerocomellus porosporus</i> (Imler ex Watling) Šutara	1, 3
<i>Xerocomellus redeuilhii</i> A.F.S. Taylor, U. Eberh., Simonini, Gelardi & Vizzini	1, 2, 4

<i>Xerocomellus sarnarii</i> Simonini, Vizzini & U. Eberh.	1
<i>Xerocomus armeniacus</i> (Quél.) Quél.	1
<i>Xerocomus moravicus</i> (Václ. Vacek) Herink	1, 5
<i>Xerocomus subtomentosus</i> (L.) Quél.	1, 2, 4, 5
<i>Xerula pudens</i> (Pers.) Singer	1, 2
<i>Xylaria hypoxylon</i> (L.) Grev.	1



Summary of the Presentation

Seem Mediterranean but are Neotropical: Diversity, taxonomy, and cultural history of fungi in Guatemala

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Guatemala belongs to the group of megadiverse countries of the world and local fungi are an extraordinary example of that diversity. Many Holarctic fungal genera are present there, especially in the subtropical areas, and more than 100 species are eaten by local people, placing the country as the second with the highest traditional consumption of mushrooms in the American continent, after Mexico. Before the year 2000, many European names were applied to local Funga, but now we know that most are endemic to the continent, to Mesoamerica and to the country. Despite there are very few local mycologists, significant advances have been made in the taxonomy of ectomycorrhizal fungi, particularly in Boletales, Russulales and Cantharellales, and some saprotrophs as *Marasmius*, confirming high endemism. Recent molecular and phylogenetic analyses also provided information about related/disjunct species in southeast Asia and Guatemala, that require more attention about dispersal and distribution of certain genera/species in both continents. Other interesting results are related to similar species in Europe (*Imperator*, *Imleria*, *Neoboletus*, *Rubroboletus*) and distribution of some species from North America. But Guatemala is not only interesting for the striking diversity of its fungi, but also because of the ancient use of them. The pre-Columbian Mushroom-Stones, made by Mayan people in the south and highland of Guatemala for more than 2000 years, are superb examples of this. Advances in the research on the origin, cultural meaning, styles, and locations of these magnificent artefacts will be presented.



Figure 11 Presentation by Roberto Flores titled “Seem Mediterranean but are Neotropical: Diversity, taxonomy, and cultural history of fungi in Guatemala”. Image of Andrea Rinaldi.

Red-listed, rare and other interesting Mediterranean macrofungi recently recorded in Greece

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Greece is characterized by unique geomorphological and climatological conditions that contribute to the existence of a large variety of habitats ranging from arid Mediterranean to alpine. This, in conjunction with the high plant diversity and endemism, results in a rich mycobiota. Since the beginning of the 21st century the inventory of Greek macrofungi was considerably intensified, while during the last 10 years the joint initiative of the mycological team of the Laboratory of General and Agricultural Microbiology (Agricultural University of Athens, LGAM-AUA) and of prominent citizen scientists of the Greek Mushroom Society (GMS) has resulted in a plethora of first national taxa records as well as in the descriptions of several species new to science. However, it was only two years ago that the compilation of the first phase (Phase A) of the Red Data List of Greek Macrofungi was completed, and 382 mushroom species were assessed following the criteria of the International Union for the Conservation of Nature (IUCN). Interesting taxa that have been either red-listed by LGAM-AUA's assessors, or constitute new and noteworthy records for the Greek mycobiota (due to their rarity, vulnerability and/or ecological importance in the Mediterranean basin), are presented, namely: *Genea cephalonicae* (assessed, CR), *Tuber magnatum* (assessed, VU), *Chlorophyllum lusitanicum* (assessed, EN), *Pleurotus nebrodensis* (assessed, EN), *Pyrophomes demidoffii* (assessed, EN), *Neolentiporus squamosellus* (Not Evaluated), *Peniophora malenconii* (Not Evaluated), *Boletopsis mediterraneensis* (Not Evaluated), *Sarcodon cyrneus* (Not Evaluated). In addition, the extremely rare *Dictyocephalos xinjiangensis* is reported for the first time in Europe (based on material collected in northern Greece), a few years after the description of this species from China.



Figure 12 Presentation by Elias Polemis titled “Red-listed, rare and other interesting Mediterranean macrofungi recently recorded in Greece”. Image of Andrea Rinaldi.

***Boletus erythropus*, *B. luridiformis*, and *B. praestigiator*: nomenclatural and taxonomic issues**

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The small group of species revolving around *Boletus erythropus* sensu Fries 1860 is unfortunately affected by nomenclatural and taxonomic problems. The illegitimate and misapplied name *B. erythropus* sensu Fries 1860 is a widely used name, assigned to a well-known entity. Article 57.1 of the Code (ICN) protects names that are in broad and persistent use, with rules and procedures explained in the Examples of the Code. In this study, we show how these Examples have changed over time, from the Tokyo Code (1994) to the Madrid Code (2025), without yet reaching clarity regarding the case in question. From a nomenclatural standpoint, the situation is no better: molecular biology studies show that there are two entities, which we currently refer to as *Boletus erythropus* sensu Fries 1860 (= *Boletus praestigiator* R. Schulz 1924) and *Boletus xanthopus* Klofac & A. Urban 2014, but the diagnosis of the latter does not appear to correctly circumscribe the morphological and edaphic characters of the species. This results in a certain overlap in morphological–chromatic traits and in the geographic and ecological distribution of the two entities. Ongoing studies, not yet concluded, aim to connect the morphological and environmental characters with the results of molecular analyses, and to establish the correct delimitation of the two species, both of which admit xanthoids.



Figure 13 Presentation by Giampaolo Simonini titled “*Boletus erythropus*, *B. luridiformis*, and *B. praestigiator*: nomenclatural and taxonomic issues”. Image of Andrea Rinaldi.

Let's be clear: how can lignicolous fungi help tackle the environmental problem of dyes?

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Used in hair products, food, fabrics, and much more, dyes are a large group of substances that in recent years have been added to the list of pollutants that can have a negative impact on the environment. The issue becomes particularly important in the textile industry, where large quantities of dyes are used, with retention rates during the dyeing process ranging from 2 to 50%: dyes that do not bind to the textile fibers are washed away and accumulate in wastewaters (Staiano, 2022). Wood decay fungi are a well-studied group, especially for technologies related to their enzymatic production, which makes these fungi, along with bacteria and algae, for example, good bioremediation agents. Many studies demonstrated their potential to degrade and eliminate environmental organic pollutants. The aim of this study is to test the degradation and decolorization potential of seven strains of wood decay fungi belonging to the research culture collection of the University of Pavia (MicUNIPV) on wastewater and process water from a textile company in Piedmont (north Italy). The mycelium of the selected strains was applied to the wastewater for different incubation times in order to identify the most optimal mycelium-wastewater contact time. The strain with the highest activity was then further tested on two different types of process water (water loaded with dyes used for the fixing process on textile fibers), testing a different type of inoculum, mycelium immobilized on *Cucumis melo* L., as a preliminary test for a possible future application in a pilot plant. The results obtained show that among the strains tested, *Perenniporia meridionalis* Decock & Stalpers was the one that achieved the fastest wastewater decolorization, 48% in 24 hours, while on the process water, a decolorization rate up to 98% was achieved in 24 hours. In conclusion, wood decay fungi are once again confirmed as a green solution for fighting contaminants, capable of complementing traditional remediation techniques. For the application presented here, wood decay fungi are not only useful for their ability to decolorize wastewater, but in doing so they are also a means of reducing the economic impact that chemical decolorants have on the companies themselves. Research in this area will continue in order to facilitate and promote a possible and effective application on a pilot scale.

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Genomic variability of *Tuber borchii* between Sardinian and continental populations

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Tuber borchii plays a key ecological role in Mediterranean ecosystems as an ectomycorrhizal fungus. Its distribution extends from the Iberian Peninsula to Iran and from Mediterranean islands to Finland. Sardinia represents a biodiversity hotspot and provides a unique setting to explore the genetic variability of *T. borchii*. The species occurs throughout the island, from coastal to inland mountain areas, spanning a wide ecological and geographical gradient. In this study, we investigated the genomic diversity of *T. borchii* by jointly analyzing samples from Sardinia and mainland Italy. A total of 24 Sardinian and 5 continental ascocarps were sequenced. Preliminary molecular barcoding analyses confirmed that all samples belonged exclusively to haplotype 1 (Bonuso et al., 2010), the most widespread in Italy. Whole-genome sequencing was performed on the Illumina MiSeq platform with an average coverage of 30× ($\approx$ 4 Gb per sample). Reads were mapped to the reference genome of strain Tbo3840 (Murat et al., 2018; 98 Mb) available in the MycoCosm (JGI) database. Phylogenetic relationships and population structure were reconstructed through comparative and clustering analyses. Clustering revealed two major groups: one comprising all Sardinian samples together with the continental sample Tbo19 (Pineto, Abruzzo), and another including the continental genotypes from Calabria and central Italy (Tbo29, Tbo35, Tbo37, Tbo39). This pattern indicates a clear geographical separation between insular and continental genomes, with Tbo19 showing genetic affinities closer to the Sardinian group. A PCA based on 1303 SNPs confirmed this structure: PC1 (12.99 %) distinctly separated the Sardinian cluster (compact, with slight intra-island dispersion) from the continental group, which was divided into two subgroups consistent with the dendrogram. PC3 (6.26 %) further revealed secondary genetic gradients among continental samples, suggesting possible geographic differentiation. Analyses of coding regions showed a variant profile dominated by missense and synonymous mutations, with an average of one variant every 16 bases in Sardinian samples and one every 29 bases in continental ones. Although preliminary, these differences may reflect genetic divergence linked to geographic isolation and ecological adaptation. This study contributes to the international JGI project "Investigating the *Tuber borchii* pan-genome for insights into local-scale adaptive evolution," which aims to sequence over 20 European genomes of *T. borchii*. Integrating these data will provide a comprehensive view of the species' phylogeographic structure at national and European scales, laying the groundwork for identifying molecular markers capable of distinguishing populations and their local ecological adaptations.

Preliminary insights on fungal diversity associated to *Pinus mugo* Turra in a relict Apennine population

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Pinus mugo Turra is an European orophyte with several disjunctions from the main Alpic corpus and only three native populations in the Apennines. Although *P. mugo* is a powerful pioneer adapted to remarkable temperature variation, it is facing the threats of the climate change especially due to the alteration in snow cover. To now, few data are available for mycorrhizae or macrofungi and a rational analysis of the fungal component referred to specific habitat has never been carried out, although an increasing interest has been received in Europe by proposals to introduce fungi as featuring elements in habitat description. Based on the fragmented distribution of *P. mugo*, relict populations preserve the diversity of fungal disjunctions too. The Emilian population examined here lives on ultramafic bedrock and points out a spot of Habitat 9430* - *Subalpine and montane Pinus uncinata* forests on gypsum or limestone within SIC IT4020008 - *Monte Ragola, Lago Moo', Lago Bino* and IT4010003 - *Monte Nero, Monte Maggiorasca, La Ciapa Liscia*. Monte Nero and Monte Ragola morphology moreover allows to survey different sides properly representative of N, S, W and E aspects. In this work, the results from the first year of field survey on macrofungi across 50x50 m macroplots are presented and the main diversity parameters are discussed in the light of use (unmanaged vs grazed), vegetation structure and side aspect, revealing that Monte Nero and Monte Ragola have similar diversity patterns and dominant species but different phenology throughout the season. First insights on featuring mycofloristic entities such as *Mycena rosella* (Fr.) P. Kumm. and *Meruliopsis taxicola* (Pers.) Bondartsev are also discussed in the light of niche specialization and shift in host range in disjuncted populations. As it concerns *M. rosella*, differences in morphometrics are presented versus the available literature references.

The FunDive Project: mapping European fungal biodiversity

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FunDive is a pan-European initiative, funded by Biodiversa+, that unites 33 partners from 22 countries to enhance fungal monitoring across the continent. Its main objectives are to address knowledge gaps in fungal distribution and taxonomy, thereby strengthening fungal conservation efforts and improving correct species classification. Within the project, the Work Package 3 (WP3) focuses on fungal species distribution and the promotion of citizen science, which has always played a key role in mycological research. For centuries, many of the leading taxonomic experts in mycology did not hold academic positions. Today, fungal ecologists and conservationists also rely on citizen science data to complement professional monitoring, which is often constrained by taxon-specific phenology. At the same time, molecular techniques such as DNA barcoding have become standard in fungal research, although they typically remain inaccessible to amateur mycologists. This creates an increasing gap in the comparability of data produced by professional and non-academic researchers. To bridge this divide, the FunDive project is building a pan-European collaboration network that will provide access to DNA barcoding, standardized protocols, and training opportunities, thereby improving both the quantity and quality of fungal biodiversity data available for research and monitoring. WP3 uses the PlutoFGO app to monitor fungal distributions and has selected several groups of fungi to focus on, either because of their threatened conservation status or their well-known taxonomic challenges. For example, these include genera such as *Chroogomphus*, *Geastrum*, *Paxillus*, and *Tulostoma*; broader groups such as other gasteromycetes; as well as habitat-specific fungi, like ectomycorrhizal species associated with *Pinus* spp. or *Hygrophorus* species linked to *Abies* spp.

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Figure 14 Presentation by Simone Graziosi titled “The FunDive Project: mapping European fungal biodiversity”. Image of Andrea Rinaldi.

***Tuber* spp.: a food source for an unexpected number of arthropods**

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Truffle ascomata represent a food source for several groups of animals such as mammals, mollusks and arthropods. To date, only a few arthropods have been reported feeding on truffles and their role in the ecology and biology of *Tuber* spp. is largely unknown. The most studied truffle feeders among arthropods are *Leiodes* spp. and, to a lesser extent, *Suillia* spp. A recent work (Marino et al., 2024) conducted in two different Italian provinces identified seven different taxa of Dipteran larvae inhabiting *T. aestivum* ascomata: *Cheilosia soror* (Syrphidae), *Phaonia* cf. *trimaculata* (Muscidae), *Drosophila subobscura* (Drosophilidae), *Suillia gigantea* (Helomizidae) and four other taxa attributable to the Helomizidae family. Further research carried out by our research group on other *Tuber* species (*T. magnatum*, *T. borchii*, *T. mesentericum*, *T. brumale*, *T. melanosporum*, *T. excavatum* and *T. rufum*) has revealed an unexpected range of diversity of arthropods feeding on truffles. The sequencing of COI gene from additional 49 ascomata allowed the identification of 15 other taxa of arthropods. Almost all the collected larvae belonged to the order Diptera with the following genera: *Megaselia* and *Triphleba* (Phoridae) with four taxa, *Stigmatomeria* (Mycetophilidae) with two taxa, *Suillia* with six other taxa in addition to *S. gigantea*, and one member of the Sciaridae family. A larva of the “fungus moth family” Tineidae (genus *Nemapogon*, Lepidoptera) was found in a new *T. aestivum* ascoma while a member of the genus *Dinotrema* (Hymenoptera) was found in *T. mesentericum*. The latter genus is known to include parasitoids of Diptera larvae which are abundant in truffle ascomata. No Coleoptera were found in any examined truffle. Our data do not seem to reveal host specificity toward truffle species but this cannot be excluded with the analysis of other truffle specimens throughout Europe. Future investigations should further explore the diversity of insects feeding on truffles at a continental or global scale and understand if they have a role in the life cycle of truffles like other animals.

Photo Album



Figure 15 Mycological exhibition open to the public, organized at the Istituto Minerario “Giorgio Asproni” in Iglesias (CI). Image of Andrea Rinaldi.



Figure 16 Mushroom identification room set up after each mycological excursion, with fungal specimens arranged according to their collection locality. Image of Simone Graziosi.



Figure 17 Collected fungal sporomata arranged on plates according to species. Image of Simone Graziosi.



Figure 18 *Hygrophorus russula* (Schaeff. ex Fr.) Bataille, a common fungal species found in Gutturu Mannu Regional Park. Image of Simone Graziosi.



Figure 19 The purple coloration at the base of the stipe, a characteristic feature of *Tricholoma basirubens* (Bon) A. Riva & Bon. Image of Simone Graziosi.



Figure 20 *Geastrum fimbriatum* Fr. collected collected from a forest floor covered with pine needles. Image of Simone Graziosi.



Figure 21 Goldcrest, *Regulus regulus* L., one of the smallest bird species in Europe, photographed among the Mediterranean vegetation of Sardinia. Image of Simone Graziosi.



Figure 22 Mature basidiomata of *Omphalotus olearius*, a saprotrophic and occasionally parasitic species associated with the wood and roots of broadleaf trees, characterized by its conspicuous orange to reddish-orange fruiting bodies. Image of Carolina Elena Girometta.



Figure 23 Imbricate basidiomata of *Pallidohirschioporus biformis*, a saprotrophic wood-decay fungus commonly occurring on dead broadleaf wood and causing white rot. Image of Carolina Elena Girometta.



Figure 24 Participants conducting mycological field sampling in a *Quercus ilex*-dominated forest visited during the congress. Image of Carolina Elena Girometta.

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UMI - Unione Micologica Italiana-APS
<https://www.unionemicologicaitaliana-aps.it/>



FAMM - Fédération des Associations Mycologiques Méditerranéennes
<https://mycofamm.fr/associations-et-societes-mycologique-membres-de-la-famm/>



SCM - Societat Catalana de Micologia
<https://micocat.org/>



A: Pandorra - Associação Micológica “A PANTORRA”
<https://mycologyconfederation.com/associations/pantorra/>



GMG - Grupo Mixológico Galego “Luis Freire”
<https://www.mykes.es/>



SOMIVAL - Societat Micològica Valenciana
<https://somival.org/>



NSNF -Norges Sopp- og Nyttevekstforbund
<https://soppognyttevekster.no/>



Associació Micològica de Tarragona
<https://www.micotarraco.com/>



Sociedad Micológica Cantabra
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