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Approach to the mycological catalogue of the Dehesa of Somosierra and new records for the Community of Madrid (Spain)

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Abstract. An approach to the mycological catalogue of the Dehesa of Somosierra, in the northeast corner of the Community of Madrid, has been carried out. The expeditions were accomplished from April 2013 to October 2015. A total of 96 species were identified belonging to 45 families and 18 orders. To the best of our knowledge, it is the first time that the species as *Hyalorbilia inflatula*, *Panellus serotinus* and *Vibrissea filisporia f. boudieri* have been cited in the Community of Madrid.
Keywords: Mycology; diversity; *Hyalorbilia inflatula*; *Panellus serotinus; Vibrissea filisporia* f. *boudieri*.

[es] Aproximación al catálogo micológico de la Dehesa de Somosierra y nuevas citas para la Comunidad de Madrid (España)

Resumen. Con este trabajo presentamos la aproximación al catálogo micológico de la Dehesa de Somosierra, ubicada en la parte noreste de la Comunidad de Madrid. Se realizaron muestreos periódicos a lo largo del año desde abril de 2013 a octubre de 2015. Como resultado de los mismos se han identificado un total de 96 especies, correspondientes a 45 familias integradas en 18 órdenes. Hasta donde sabemos, es la primera vez que se citan para la Comunidad de Madrid las especies *Hyalorbilia inflatula*, *Panellus serotinus* y *Vibrissea filisporia* f. *boudieri*.
Palabras clave: Micología; diversidad; *Hyalorbilia inflatula*; *Panellus serotinus; Vibrissea filisporia* f. *boudieri*.

Introduction

The Fungal Kingdom is one of the most diverse group of organisms in the world. Last estimations suggest a number from 0.8 to 5.1 million species, although only 100.000 are named. The importance of this group in the world is extremely big: They are the basis of the trophic chains participating in soil carbon cycling, they are source of food and source of the most important antibiotics. Therefore, the mycological knowledge is of global interest (Tedersoo *et al*. 2014; Royal Botanic Gardens Kew: https://stateoftheworldsfungi.org/).

As part of our research of the Dehesa of Somosierra (Lázaro-Lobo *et al*. 2017), an approach to the mycological biodiversity of the Dehesa of Somosierra have been carried out. This zone is located in the northern area of the Community of Madrid (Spain), inside the Sistema Central mountain range with an extension of 98 ha. The geology of this region is characterized by the presence of gneisses, marbles and schists, which confers acid properties to the substrate and determines the presence of a characteristic mycobiota (Díaz Martínez *et al.* 2012). Due to the orographic situation, it is located in a valley with abundant rainfall and an average height of 1450 m. It has a characteristic climate of the Atlantic area of Central Europe with an average annual temperature and precipitation of 8.6 °C and 588 mm, respectively (Climate-Data.org: Climate data for cities worldwide 2019). It should be noted the presence of trees of these climatic areas such as: *Betula pendula* subsp. *fontqueri*, *Corylus*

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avellana or *Quercus petraea*. This type of climate, and therefore vegetation, makes the mycological richness different from other places of the Community of Madrid.

The aim of this research is to contribute to the mycological knowledge of the Community of Madrid. In a previous study, Ruiz *et al.* (2013) found, in this area, the first locations of *Coprinopsis xenobia* for the Iberian Peninsula. Therefore, because of this work and the absence of an intensive study of the mycological diversity of the Dehesa of Somosierra, we decided to choose this place for a deep study following the same strategy as in other Spanish regions (Moreno & López-González 1978, Campos *et al*. 2014, Ribes *et al*. 2016, Pancorbo *et al*. 2017).

Materials and Methods

Sample collections have been carried out within different expeditions during more than two years, from April 2013 to October 2015, along the different seasons of the year. All the specimens have been lodged at the Herbarium of the Faculty of Biology (MACB), Complutense University, Madrid (Spain) following the same strategy described in Lázaro-Lobo *et al*. (2017). Only species that have been clearly determined are presented in the study. Doubtfully determinations have been excluded in the final catalogue (Table 1). All the identified species have been cited according to the Index Fungorum website (www.indexfungorum.org/).

Table 1. Family, species name and herbarium number of the catalogue.

PHYLLUM *ASCOMYCOTA*	
ORDEN *CONOPHORALES*	
Bertiaceae	
Bertia moriformis (Tode) De Not.	MACB 109940
ORDEN *HELOTIALES*	
Hemiphacidiaceae	
Mitrula paludosa Fr.	MACB 109977
Hyaloscyphaceae	
Brunnipila calyculiformis (Schumach.) Baral	MACB 109943
Perrotia flammea (Alb. & Schwein.) Boud.	MACB 109987
Rhytismataceae	
Propolis farinosa (Pers.) Fr.	MACB 109997
Vibrisseaceae	
Vibrissea filisporia f. boudieri A. Sánchez & Korf	MACB 110021
Vibrissea truncorum (Alb. & Schwein.) Fr.	MACB 110022
ORDEN *HYPOCREALES*	
Hypocreaceae	
Hypomyces chrysospermus Tul. & C. Tul.	MACB 109960
ORDEN *ORBILIALES*	
Orbiliaceae	
Hyalorbilia inflatula (P. Karst.) Baral & G. Marson	MACB 109958
ORDEN *PEZIZALES*	
Ascobolaceae	
Ascobolus furfuraceus Pers.	MACB 109938
Pezizaceae	
Adelphella babingtonii (Sacc.) Pfister, Matočec & I. Kušan	MACB 109929
Peziza michelii (Boud.) Dennis	MACB 109988

Pyronemataceae	
Cheilymenia stercorea (Pers.) Boud.	MACB 109946
Trichophaea woolhopeia (Cooke & W. Phillips) Boud.	MACB 110017
ORDEN *XYLARIALES*	
Diatrypaceae	
Diatrypella quercina (Pers.) Cooke	MACB 109953
Hypoxylaceae	
Annulohypoxylon multiforme (Fr.) Y.M. Ju, J.D. Rogers & H.M. Hsieh	MACB 109935
Hypoxylon fuscum (Pers.) Fr.	MACB 109961
Xylariaceae	
Xylaria hypoxylon (L.) Grev.	MACB 110024
PHYLLUM *BASIDIOMYCOTA*	
ORDEN *AGARICALES*	
Agaricaceae	
Agaricus litoralis (Wakef. & A. Pearson) Pilát	MACB 109930
Bovista nigrescens Pers.	MACB 109942
Lycoperdon pyriforme Schaeff.	MACB 109974
Vascellum pratense (Pers.) Kreisel	MACB 110019
Amanitaceae	
Amanita muscaria (L.) Lam.	MACB 109933
Amanita rubescens Pers.	MACB 109934
Cortinariaceae	
Cortinarius hemitrichus (Pers.) Fr.	MACB 109950
Hydnangiaceae	
Laccaria amethystina Cooke	MACB 109963
Laccaria laccata (Scop.) Cooke	MACB 109964
Laccaria pumila Fayod	MACB 109965
Laccaria tortilis (Bolton) Cooke	MACB 109966
Hymenogastraceae	
Psilocybe montana (Pers.) P. Kumm	MACB 110001
Psilocybe subcoprophila (Britzelm.) Sacc.	MACB 110002
Incertae sedis	
Panaeolus papilionaceus (Bull.) Quél.	MACB 109980
Panaeolus semiovatus (Sowerby) S. Lundell & Nannf.	MACB 109981
Inocybaceae	
Inocybe geophylla (Bull.) P. Kumm.	MACB 109962
Simocybe haustellaris (Fr.) Walting	MACB 110009
Marasmiaceae	
Crinipellis scabella (Alb. & Schwein.) Murrill	MACB 109951
Marasmius epiphyllus (Pers.) Fr.	MACB 109975
Marasmius oreades (Bolton) Fr.	MACB 109976
Mycenaceae	
Mycena galericulata (Scop.) Gray	MACB 109978
Mycena pura (Pers.) P. Kumm.	MACB 109979
Panellus serotinus (Pers.) Kühner	MACB 109982
Panellus stipticus (Bull.) P. Karst.	MACB 109983

Omphalotaceae	
Gymnopus aquosus (Bull.) Antonín & Noordel.	MACB 109955
Salacriaceae	
Armillaria mellea (Vahl) P. Kumm.	MACB 109936
Flammulina velutipes (Curtis) Singer	MACB 109954
Pluteaceae	
Pluteus phlebophorus (Ditmar) P. Kumm.	MACB 109993
Psathyrellaceae	
Coprinellus brevisetulosus (Arnolds) Redhead, Vilgalys & Moncalvo	MACB 109948
Coprinellus domesticus (Bolton) Vilgalys, Hopple & Jacq. Johnson	MACB 109949
Parasola plicatilis (Curtis) Redheah, Vilgalys & Hopple	MACB 109984
Psathyrella spadiceogrisea (Schaeff.) Maire	MACB 109999
Strophariaceae	
Agrocybe praecox (Pers.) Fayod	MACB 109931
Agrocybe vervacti (Fr.) Singer	MACB 109932
Cyclocybe aegerita (V. Brig.) Vizzini	MACB 109952
Pholiota squarrosa (Vahl) P. Kumm.	MACB 109989
Protostropharia semiglobata (Batsch) Redhead, Moncalvo & Vilgalys	MACB 109998
Tricholomataceae	
Arrhenia griseopallida (Desm.) Watling	MACB 109937
Clitocybe odora (Bull.) P. Kumm.	MACB 109947
Tricholoma sejunctum (Sowerby) Quél.	MACB 110015
Tricholoma sulphureum (Bull.) P. Kumm.	MACB 110016
ORDEN *AURICULARIALES*	
Auriculariaceae	
Auricularia mesenterica (Dicks.) Pers.	MACB 109939
ORDEN *BOLETALES*	
Boletaceae	
Boletus edulis Bull.	MACB 109941
Chalciporus piperatus (Bull.) Bataille	MACB 109945
Leccinum variicolor Watling	MACB 109972
Porphyrellus porphyrosporus (Fr. & Hök) E.-J. Gilbert	MACB 109995
Paxillaceae	
Paxillus involutus (Batsch) Fr.	MACB 109985
ORDEN *CANTHARELLALES*	
Botryobasidiaceae	
Haplotrichum conspersum (Link) Hol.-Jech.	MACB 109957
Cantharellaceae	
Cantharellus cibarius Fr.	MACB 109944
Pseudocraterellus undulatus (Pers.) Rauschert	MACB 110000
ORDEN *CORTICIALES*	
Corticiaceae	
Vuilleminia comedens (Ness) Maire	MACB 110020
ORDEN *GEASTRALES*	
Geastraceae	
Sphaerobolus stellatus Tode	MACB 110010

ORDEN *HYMENOCHAETALES*	
Hymenochaetaceae	
Hymenochaete rubiginosa (Dicks.) Lev.	MACB 109959
Phellinus igniarius (L.) Quél.	MACB 109991
Repetobasidiaceae	
Rickenella fibula (Bull.) Raithelh.	MACB 110004
Rickenella swartzii (Fr.) Kuyper	MACB 110005
ORDEN *POLYPORALES*	
Fomitopsidaceae	
Piptoporus betulinus (Bull.) P. Karst.	MACB 109992
Postia subcaesia (A. David) Jülich	MACB 109996
Polyporaceae	
Lopharia spadicea (Pers.) Boidin	MACB 109973
Polyporus arcularius (Batsch) Fr.	MACB 109994
Trametes ochracea (Pers.) Gilb. & Ryvarden	MACB 110013
Xenasmataceae	
Xenasmatella vaga (Fr.) Stalpers	MACB 110023
ORDEN *PUCCINIALES*	
Pucciniaceae	
Gymnosporangium clavariiforme (Wulfen) DC.	MACB 109956
Puccinia asphodeli Moug.	MACB 110003
Uromyces ficariae (Schumach.) Lev.	MACB 110018
Phragmidiaceae	
Phragmidium mucronatum (Pers.) Schltdl.	MACB 109990
ORDEN *RUSSULALES*	
Peniophoraceae	
Peniophora quercina (Pers.) Cooke	MACB 109986
Russulaceae	
Lactarius aurantiacus (Pers.) Gray	MACB 109967
Lactarius glyciosmus (Fr.) Fr.	MACB 109968
Lactarius lacunarum Romagn. ex Hora	MACB 109969
Lactarius pyrogalus (Bull.) Fr.	MACB 109970
Lactarius turpis (Weinm.) Fr.	MACB 109971
Russula gracillima Jul. Schäff.	MACB 110006
Russula risigallina (Batsch) Sacc.	MACB 110007
Stereaceae	
Stereum hirsutum (Willd.) Pers.	MACB 110011
Stereum rugosum Pers.	MACB 110012
ORDEN *SEBACINALES*	
Sebacinaceae	
Sebacina grisea Bres.	MACB 110008
ORDEN *TREMELLALES*	
Tremellaceae	
Tremella mesenterica Retz.	MACB 110014

Macroscopic studies have been performed with descriptions of the specimens regarding size, colour, taste or smell. Tests with different chemical compounds such as Fe_2SO_4, Guaiac or KOH 5% (m/v) have been done when the correct identification of the species required them. For the microscopic study, an optical microscope OPTIKA B-353 PL has been used. In most cases fresh material has been examined. In the case of dehydrated material, the samples have been rehydrated previously in KOH 5% (m/v). Different dyes have been applied in the microscopic preparations: Congo Red, IKI reagement, cresyl blue or fenicade fuchsine. Microscopic measurements were performed with the software Piximètre (Henriot & Cheype 2016).

A voucher of each identified species has been lodged at MACB Herbarium as it has above mentioned.

Results and Discussion

Along different expeditions, 96 species belonging to 45 families and 18 orders have been collected and identified (Table 1). All the species belong to the two big phyla of higher fungi Basidiomycota and Ascomycota (figure 1). The absence of representatives of other phyla such as Zygomycota, Glomeromycota, or Chrytridiomycota is due mainly to the fact that most of the fungi that have epigeous and visible fruiting bodies belong to these two phyla (Blackwell *et al*. 2012). According to our results, the phyllum Basidiomycota is the most represented, perhaps for the same reason. Even though within Ascomycota and Basidiomycota the distribution of taxonomic groups is similar, based on the data collected in this study (Figure 1). It should be noted that all genera within the phyla Ascomycota are represented just by one species, except *Vibrissea,* a genus linked to very humid areas. On the other hand, within Basidiomycota, we found two very well represented genera, *Laccaria* and *Lactarius*. The species of both genera are mycorrhizal and tend to have a predilection for humid places, as quagmires. However, genera that were abundant in similar works, for example, *Boletus*, *Amanita* or *Cortinarius*, are not well represented in the studied area (Campos *et al.* 2014, Pancorbo *et al*. 2017).

This richness of species from different taxonomic groups could be explained by the presence of a varied vegetation as well as by the climatology. There are several plants that reflect the presence of certain associated mycorrhizal fungi. It should be noted, the existence of *Betula pendula* subsp. *fontqueri*, as it is the largest concentration of birches in the Community of Madrid. We found exclusive species linked to these trees, such as *Lactarius glyciosmus*, *Lactarius turpis*, *Leccinum variicolor* or *Piptoporus betulinus* (birch parasitic). Furthermore, the presence of birch trees is highly related to the existence of almost constant water flows, specifically, in the Dehesa of Somosierra. Those trees can be found in areas of quagmires that have water even in the driest months of the year. These microhabitats harbor species as *Adelphella babingtonii*, *Mitrula paludosa* or *Rickenella fibula*. However, most of the species identified in this work, have not been mentioned in a previous work focused on birches of other areas of Madrid (Moreno & López-González, 1978). Only 9 of the 29 species cited appear in our study area (*Amanita muscaria*, *Amanita rubescens*, *Armillaria mellea*, *Inocybe geophylla*, *Lactarius glyciosmus*, *Paxillus involutus*, *Pholiota squarrosa* and *Piptoporus betulinus*).

During our herborizations and for the best of our knowledge three species had been gathered for the first time in the Community of Madrid (Figure 2). These species are *Hyalorbilia inflatula*, a very small species (2-3 mm diameter) characterized by its cylindrical spores narrower than 1.2 µm. It is widespread in Europe and present in Jaen, Barcelona, Canary Islands and Basque Country (Quijada *et al*. 2015). Another species is *Vibrissea filisporia* f. *boudieri*, a rare form characterized by its long spores, measuring between 200 and 300 µm, and by the presence of more than 15 septa in each spore (Sanchez 1967). In this collection, the spores were 230 × 2.5 µm long on average and had more than 20 septa. Finally, *Panellus serotinus*, a species well characterized macroscopically, is an uncommon species cited widely in the northern area of Spain with a preference for beeches, although in this case it has been found growing on *Betula pendula* subsp. *fontqueri* (Moreno & García Manjón 2010, Moreno *et al.* 1986, Esteve-Raventós *et al*. 2007). Maybe, this is the reason why it has not been cited previously in the Community of Madrid. The closest report for

this species corresponds to the province of Segovia on *Fagus sylvatica* (García Blanco, Sanz Carazo & Del Val, 31-oct-1994, MA-Fungi 54233). The presence of these species in this area is due to its special climatic and geomorphology characteristics. Although it corresponds to the Mediterranean biogeographic region, the high rain and humidity allow the presence of Eurosiberian elements (Worldwide Bioclimatic Classification System 1996-2019). That could explain the existence of their associated fungal species.

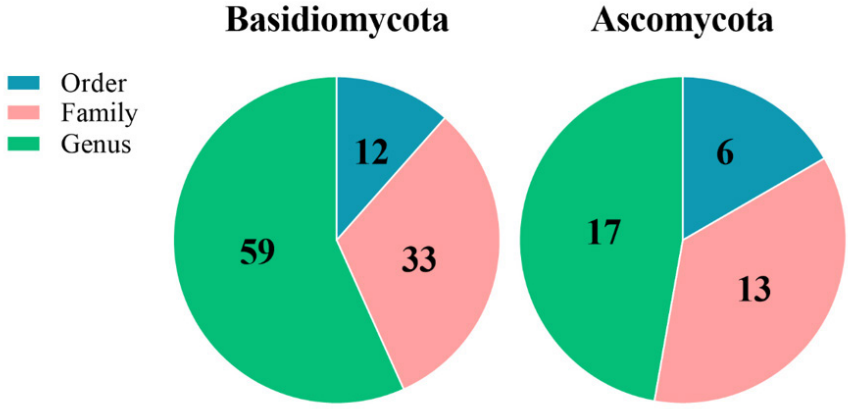

Figure 1. Mycological richness of Dehesa de Somosierra by taxonomic groups.

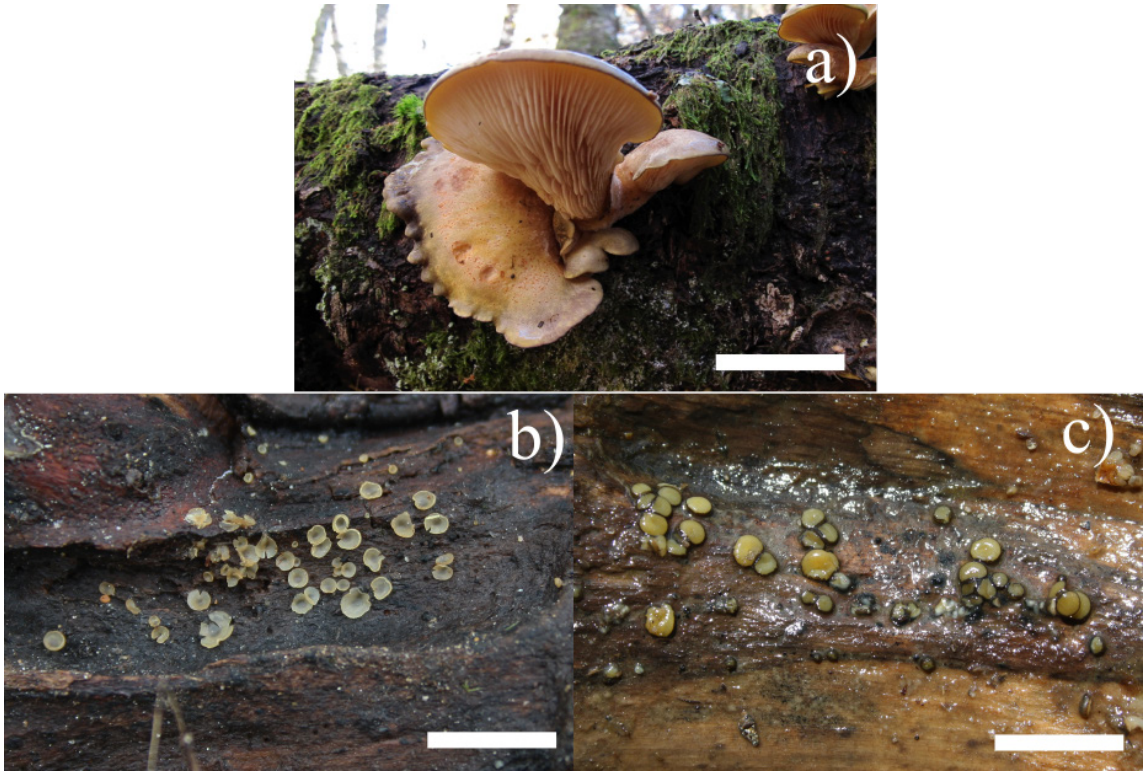

Figure 2. a) *Panellus serotinus* (MACB 109982), b) *Hyalorbilia inflatula* (MACB 109958) and c) *Vibrissea filisporia* f. *boudieri* (MACB 110021). The scale bars correspond to 4 cm in image a and to 5 mm in b and c.

The study shows a rich abundance of species but there are quite a few genera not well represented. To increase the number of records, it is essential to continue exploring this area since, given its climatological and floristic characteristics, very interesting fungal species could be found. It is also worth noting that *Hyalorbilia inflatula*, *Panellus serotinus* and *Vibrissea filisporia* f. *boudieri* have been reported for the first time in the Community of Madrid province.

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