CATALOGUE OF MACROMYCETES
of the La Garrotxa Volcanic Zone Nature Park

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In 2000, 2001 and 2002 we were awarded a grant to perform a task that we had already begun in an irregular, sporadic fashion: studying the wild mushrooms in one of the most interesting areas within the Gerona counties, namely the La Garrotxa Volcanic Zone Nature Park. The town hall of Olot gave us this grant as one of its Research Grant in the Natural Sciences, and thus our more or less occasional, individual visits, especially to La Fageda d'en Jordà, turned into a more systematic, intensive study. With this study, the number of fungus taxa catalogued in the park rose to 504, of which 487 different species, 15 varieties and 11 forms from the fungus kingdom were identified.

Until 2000, when this study officially got underway, there was a dearth of mycological studies that provided data on the wild mushrooms found within the La Garrotxa Volcanic Zone Nature Park (GVZNP), and even less information on the ones found in La Fageda d'en Jordà and its environs over the volcanic substrate. We are only aware of the 1924 BOLÓS study on Olot county, which contains several citations of wild mushrooms found inside the park. Very few species had been cited within the park grounds prior to our study. All told, we compiled 40 citations corresponding to 36 taxa (Appendix 1), most of them from recent prospections gathered in sporadic outings and published in an isolated fashion in different studies (ROCABRUNA & PASCUAL, 1986, 1987; SANCLEMENTE & LLIMONA, 1987; SIERRA *et al*., 1987; MARTÍN, 1988; VILA & PASCUAL, 1992; ROCABRUNA *et al.*, 1994; VILA, 1995; VILA *et al.*, 1997; PÉREZ-DE-GREGORIO, 1997, 1999, 2002; CARBÓ & PÉREZ-DE-GREGORIO, 2002; PALAZÓN, 2002).

In order to catalogue the wild mushrooms in the volcanic areas of the GVZNP we made excursions in different seasons of the year for three consecutive years, from 2000 to 2002, mainly in the peak periods of mushroom fructification, and primarily in the summer and autumn. The places first chosen as most representative of the soils with a volcanic substrate were: a) **the zone of La Fageda d'en Jordà**; b) **the zone of El Croscat**, and c) **the zone near the Santa Margarida volcano**.

Based on the data obtained in all the outings, the abundance and frequency of each of the species found was estimated following the criterion developed by GILBERT (1928):

- VERY COMMON (VC): abundant, numerous sporophores found in the zone examined.
- COMMON (C): frequent, some sporophores found in virtually all the prospections.
- RARE (R): occasional, sporophores found few times.
- VERY RARE (VR): sporadic, some sporophores found only once.

During the entire period of the study, 22 outings were made to inventory the fungus diversity in the park. In addition to these prospection outings, we also took into account the prospections either we or other mycologists had done during the years prior to this study,

many of them from bibliographic sources and isolated or sporadic outings. Given the fact that during the three years that the study lasted there was no spring season with plentiful rainfall, the typically springtime species (mainly ascomycetes) could not be properly catalogued. It should also be noted that in 2000 and 2001, there were few fungus fructifications due to the poor climatic conditions, and only 2002 was a good year, mycologically speaking, with a rainy summer that allowed a wide variety of species to fructify.

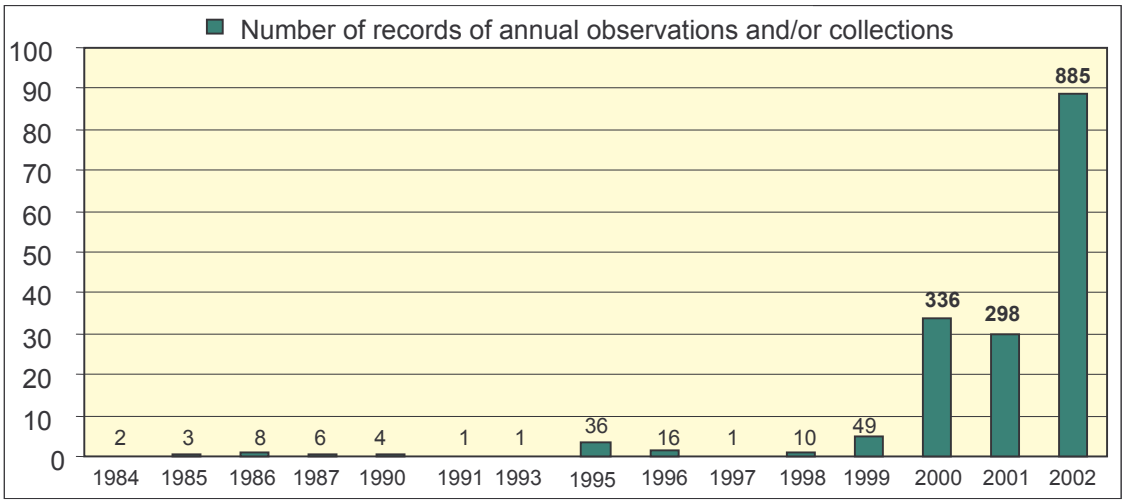

Figure 1.- Distribution of the number of observations and/or collections made during the sporadic outings in the GVZNP between 1984 and 1999, and in the systematic outings made during 2000, 2001 and 2002.

The results of the prospections are outlined in detail in three appendixes. Appendix 1 compiles the citations found in the literature surveyed prior to the beginning of the study; Appendix 2 lists the species gathered in the GVZNP while the study was underway (2000-2002); and Appendix 3 lists the species gathered after the study, between 2003 and 2007, the result of more infrequent, irregular outings.

NATURE RESERVE OF LA FAGEDA D'EN JORDÀ

This zone, unquestionably the most emblematic one in the park, boasts vast mycological wealth. Communities of *beech forest with boxwood* (*Buxo-Fagetum*), *beech forest with green hellebore* (*Helleboro-Fagetum*) and *beech forest with wavy hairgrass (deschampsia flexuosa)* (*Luzulo niveae-Fagetum*) predominate. There are also areas in which remains of *oak-hornbeam forest of pubescent oak with boxwood* (*Buxo-Quercetum pubescentis*) can be seen, especially in the Puig Jordà and the Puig de la Roureda. Other zones with chestnuts, aspens, hazelnuts, honey locust and other vegetation that lived in the beech forests were also explored.

A total of 414 taxa were observed in this zone, which accounts for 82% of all the taxa inventoried in the entire park grounds.

The five species with the highest number of specimens recorded in this area are: *Collybia butyracea* f. *asema, Coprinus picaceus, Oudemansiella radicata, Russula solaris* and *Collybia peronata.*

One of the most noteworthy species found in La Fageda d'en Jordà is a new variety of

puffball mushroom that was unknown until now (*Lycoperdon lambinonii* var. *griseo-violaceum*).

NATURE RESERVE OF THE CROSCAT VOLCANO

In the El Croscat area, the place most intensely prospected was near La Pomereda. The main communities visited in this zone were: *beech forest with boxwood* (*Buxo-Fagetum*), *beech forest with green hellebore* (*Helleboro-Fagetum*), *beech forest with wavy hairgrass (deschampsia flexuosa)* (*Luzulo niveae-Fagetum*), *oak-hornbeam forest of pubescent oak with boxwood* (*Buxo-Quercetum pubescentis*), *sweet chestnut forest (Castanea sativa) and hazelnut forest with ferns* (*Polysticho-Coryletum*). Certain open areas near El Croscat which were dominated by wasteland and uncultivated land over volcanic lapilli were also explored.

A total of 163 taxa were observed in this zone, which accounts for 32% of all the species inventoried in the entire park grounds.

The five species with the highest number of specimens recorded in this area are: *Daedaleopsis tricolor, Artomyces pyxidatus, Amanita pantherina, Chlorociboria aeruginascens* and *Clitopilus prunulus.*

NATURE RESERVE OF THE SANTA MARGARIDA VOLCANO

The main community studied in this zone is the *mountain holm oak forest* (*Quercetum mediterraneo-montanum*). Species associated with the chestnuts (*Castanea sativa*) and pines that are scattered amidst the holm oaks were also found.

This is the zone within the GVZNP that has been studied the least; as a result, the data are very sketchy. Furthermore, it is easy to reach and quite popular among visitors to the park, which makes it more difficult to prospect.

A total of 61 taxa were observed in this zone, which accounts for 12% of all the taxa inventoried in the different zones of the park.

This more modest percentage is due to the fact that this is a much drier and more thermophilic zone than the rest of the GVZNP, and that the weather conditions in the years studied were not highly favourable to the growth of fungus species in this zone. Despite this, the species recorded within these areas are highly interesting and characteristic of a Mediterranean environment.

The five species with the highest number of specimens recorded in this area are: *Amanita citrina, Amanita phalloides, Armillaria mellea, Phellinus torulosus* and *Entoloma hebes.*

Most noteworthy species

According to the literature examined before presenting the results of the study (autumn 2002), we can regard certain taxa as new or novel for both Spanish and Catalan mycoflora.

Species not cited in Spain:

- *Cantharellus subpruinosus* Eyssartier et Buyck
- *Clavulinopsis subtilis* (Fr.) Corner

- *Cortinarius cookeianus* Rob. Henry
- *Lactarius blennius* f. *virescens* J. E. Lange (although it may be surprising because it is a highly common species, there are no explicit citations of this species).
- *Mycena polygramma* f. *candida* (Gillet) Buchs
- *Mycena pura* f. *ianthina* (Gillet) Maas Geest.
- *Mycena pura* f. *multicolor* (Bres.) Kühner
- *Mycena pura* f. *purpurea* (Gillet) Maas Geest.
- *Mycena pura* f. *violacea* (Gillet) Maas Geest.
- *Mycena romagnesiana* Robich
- *Pluteus boudieri* P.D. Orton
- *Pluteus mammifer* Romagn.
- *Psathyrella albidula* (Romagn.) M.M. Moser
- *Psathyrella orbitarum* (Romagn.) M.M. Moser
- *Psathyrella phegophylla* Romagn.
- *Psathyrella romagnesiana* Bon
- *Ramaria fennica* var. *griseolilacina* Schild
- *Ramaria flaccida* var. *crispula* (Fr.) Schild
- *Russula pelargonia* var. *citrinovirens* Sarnari
- *Sarcodon lepidus* Maas Geest.

Species not cited in Catalonia:

- *Collybia aquosa* (Bull.: Fr.) P. Kumm. (cited just once in Spain).
- *Collybia butyracea* f. *asema* (Fr.: Fr.) Singer (cited several times in Spain).
- *Collybia fagiphila* Velen. (cited twice in Spain, although one citation was as *C. konradiana* Singer, which is synonymous).
- *Cortinarius largus* var. *rubrozonatus* Bidaud, Moënne-Locc. et Reumaux (cited just once in Huesca)
- *Mycena algeriensis* Maire (cited six times in Spain)
- *Mycena diosma* L. G. Krieglst. and Schwöbel (cited just once in Spain in 2000).
- *Mycena pura* f. *lutea* (Gillet) Kühner (cited four times in Spain)
- *Russula fragrantissima* Romagn. (cited twice in Spain)

Rarely cited species:

- *Cortinarius anomalus* (Fr.: Fr.) Fr. (cited just once in Catalonia and twice in Valencia).
- *Cortinarius caerulescentium* Rob. Henry (cited four times in Spain).
- *Cortinarius citrinus* Rob. Henry ex P. D. Orton (cited three times in Spain).
- *Cortinarius olivaceofuscus* Kühner (cited twice in Catalonia and just once in Spain).
- *Cortinarius ophiopus* Peck (cited just once in Catalonia and once in the Basque Country).
- *Cortinarius rheubarbarinus* Rob. Henry (cited twice in Catalonia).
- *Delicatula integrella* (Pers.: Fr.) Fayod (cited twice in Catalonia and just once in Spain).
- *Hydropus subalpinus* (Höhn.) Singer (cited just once in Catalonia and just once in Spain).
- *Lactarius rubrocinctus* Fr. (cited just once in Spain and twice in Catalonia)

- *Marasmiellus vaillantii* (Pers.: Fr.) Singer (cited just once in Catalonia – by Maire – and once in Spain in 2000 and without exsiccatum).
- *Marasmius undatus* (Berk.) Fr. (never cited outside Catalonia, where it has been cited four times, twice by Maire and Heim and another time at the CEMM workshops in Calella).
- *Mycena flavescens* Velen. (cited twice in Catalonia, the second time in 2002 in La Fageda d'en Jordà).
- *Mycena pura* f. *alba* (Gillet) Kühner (cited twice in Catalonia and three times in Spain; never before cited in Gerona).
- *Ramariopsis kunzei* (Fr.) Corner (cited just once, in 2001 in Catalonia).

Even though none of the years used in this study can be regarded as mycologically exceptional, the highest number of different wild mushrooms was spotted in the summer and autumn of 2002, making these seasons highly valuable for estimating the frequency and abundance of the species found. Clearly many other species did not fructify or did so scarcely, given the fact that unlike plants, every fungus follows set periods of fructification and requires different degrees of moisture and temperature. Many years, many more exploration sessions and many more mycologists would be needed to fully study the fungus communities in the GVZNP. In contrast, the first two years of the study, 2000 and 2001, were very dry and yielded few mycological observations, as can be gleaned from the data gathered (around 200 species in 2000 and 2001 compared to 353 in 2002).

As mentioned above, the summer and autumn of 2002 were the most interesting seasons in the entire prospection period, as there was a great deal of rainfall which led to a vast explosion of macromycetes in La Fageda d'en Jordà. More than 855 different observations or collections were recorded, which account for 51.6% of the total number in the entire GVZNP. Due to the high degree of moisture in the soil and the atmosphere, some species (*Scleroderma areolatum*, *Helvella macropus*, *Coltricia cinnamomea*) even fructified over the volcanic rocks covered with moss. We could also witness an explosion of certain species that were theretofore unknown in the GVZNP, such as *Boletus spretus, Coltricia cinnamomea* and *Mycena flavescens*.

After conducting this study, the impressive mycodiversity in the park grounds can clearly be seen, especially in La Fageda d'en Jordà. This area harbours species that are characteristic of both Central European beech forests (*Lactarius rubrocinctus, L. subdulcis, L. volemus, Cantharellus cibarius, Hebeloma radicosum, Collybia fagiphila, Hygrophorus fagi, Helvella lacunosa, Russula solaris*) and Mediterranean holm oak forests (*Amanita caesarea*, *Lactarius luteolus, L. rugatus, Cantharellus subpruinosus*, *Cortinarius cedretorum*, *Hebeloma malençonii*, *Mycena algeriensis*, *Russula fragrantissima*). This is due to the privileged location of this beech forest, at a low altitude – around 600 m. – and protected and located halfway between the Pyrenees and the coast. There is also a wide variety of both silicolous species (*Lactarius rugatus, Amanita caesarea*) and calcicolous species (*Cortinarius salor, Cortinarius sodagnitus*) thanks to the type of pH neutral volcanic substrate (andosoil). All of these factors, along with their excellent state of conservation and the age, make the forests within the GVZNP located over volcanic substrates generally host a wide variety of species with a highly balanced distribution pattern of both mycorrhizogenic and saprotrophic species, all of them typical of well-formed, balanced forests, although the majority of pioneering species found in young

forests are lacking, such as hypogeous species. Also worth noting is the low number of parasitical species detected, which is an indicator of the good health of the forests within the park.

From the data on abundance and frequency, by comparing them with the data we have on other beech and oak forests in Catalonia, a few species can be extracted that we could regard as the most emblematic of La Fageda d'en Jordà.

A partial list of the species we consider the most emblematic of La Fageda d'en Jordà would include:

Cantharellus friesii Quél.
Coltricia cinnamomea (Jacq. ex Gray) Murrill
Cortinarius humicola (Quél.) Maire
Cortinarius elegantissimus Rob. Henry
Cystoderma superbum Huijsman
Hydnellum compactum Pers.: Fr.) P. Karst.
Lyophyllum ionides (Bull.: Fr.) Kühner et Romagn.
Pluteus mammifer Romagn.
Psathyrella phegophila Romagn.
Tricholoma filamentosum (Alessio) Alessio

A few very rare species could also be regarded as worth protecting, given the fact that La Fageda d'en Jordà is one of the few sites where they have been found.

The species worth protecting due to their mycological interest include:

Hebeloma radicosum (Bull.: Fr.) Ricken
Hydnellum spongiosipes (Peck) Pouzar
Mycena romagnesiana Robich Romagn.
Sistotrema confluens Pers.: Fr.
Sowerbyella rhenana (Fuckel) J. Moravec

ACKNOWLEDGEMENTS

Our gratitude to the Olot town hall for awarding us the grant to perform this study; to the La Garrotxa Volcanic Zone Nature Park for the facilities obtained and the authorizations granted; to M. Campos for economic assistance and help in processing the computer data and the vegetation from the park; and to M. Jeppson, R. Mahiques, R. Fernández Sasia, J. Fernández, F. Palazón and G. Redeuilh for having furnished bibliographic data and helping to confirm certain taxa.

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