A Catalogue of Fossil Fungi in Southern South America

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Summary. As a consequence of the revival of paleomycological studies, an anotated catalogue synthesis of the South American findings of fossil fungi and fungal spores is presented. 24 megafungi taxa belonging to at least 5 families, and the literature of 186 spore species and types is listed. They range from Permian to Recent.

Key words: Fungi. Fungal spores. Catalogue. South America.

Resumen. Como consecuencia del resurgimiento de los estudios paleomicológicos, y a partir de la literatura disponible, se brinda un catálogo anotado de los hallazgos de hongos y esporas fúngicas de Sud América. Se da la lista de 24 taxones de megafungi que pertenecen al menos a 5 familias. Se menciona asimismo la bibliografía correpondiente al hallazgo de 186 especies y tipos de esporas.

Palabras clave: Hongos. Esporas fúngicas. Catálogo. Sud América.

Introduction

During the last two decades there has been a revival in the interest for the knowledge of fossil fungi in general. As it is well known these organisms are not too common in the fossil record mainly because many of them lack hard parts suitable for fossilization and many more are microscopic. Another hindrance to the description of fossils was that most of the times it was rather difficult to clasify them at generic or even family level, this precision being a sort of «must» in older times. These problems were shortly commented among others by Stubblefield & Taylor (1988) and Lutz & Herbst (1992).

This general ignorance has been reflected in most paleobotanical text-books where only a short chapter (if any) was devoted to them. Nonetheless since the upsurge of pre-Quaternary palynology more and more, and increasingly older, fungal spores were found and described as such. This led to the (now) natural understanding that fungi are really a rather ancient group of organisms probably fulfilling important ecological and physiological roles as they do today. Evidence in this direction is more and more conclusive. The general result was that many researchers took interest in them and literature begun to «grow» slowly.

South American paleobotany was no exception and during the last years several papers appeared showing part of the wealth of forms and functions to be discovered. The present authors think that it might be time to present a short synthesis of the actual state of knowledge as shown in the various papers (many of them in Spanish and Portuguese), which were published in the last years.

Although the first paper with a short description of a fungus in our region dates back to 1876 (Geinitz, 1876) no other publication appeared until 1958 (Singer & Archangelsky, 1958). From there on, only a few other findings were reported.

A very important contribution to this «Synthesis» was provided by Drs. Mary E. Bernardes-de-Oliveira and Maria Judite

Garcia, who to our request delivered a list of papers, some published and others as unpublished doctoral thesis and «dissertaçao do maestrado»in which important assemblages of fossil spores are described. All of these, including the unpublished ones are quoted under the «Fungal spores» heading.

What follows is surely not a complete revision of the literature as, in spite of our efforts, some papers might have escaped our attention. In the same way only those papers exclusively devoted to fungal spores are recorded, but in many other palynological described assemblages a few fungal spores might be found; these are not cited here. Even so we hope that the present catalogue might be useful.

Although most of the papers reviewed are from southern South America, we included several of northern Brazil and the only two known from Colombia.

The list of fungi is arranged in a «loose» systematic order.

Class: ASCOMYCETES
Order: MICROTHYRIALES
Family: MICROTHYRIACEAE

Callimothallus corralense Doubinger, J. & Pons, D., 1975: 146, 148; Pl. II figs. 1-6; text - fig. 1: description of juvenile and mature sterile stroma.

Age: Maastrichtian; Horizon: Guaduas Formation.

Locality: Mina Corrales, Boyacá basin, Colombia.

Callimothallus cf. *pertusus* Dilcher, 1965, in: Durango de Cabrera, J. & Rodríguez de Sarmiento, M., (1995): Lam.1, figs. 2-3: description of sterile ascostroma on leaves of *Laurelia guiñazui* Berry (Monimiaceae).

Age: Lower-Middle Eocene; Horizon: Laguna del Hunco Formation

Locality: Laguna del Hunco, Province Chubut, Argentina.

Microthyriacites baqueroensis Martinez, A. 1968: 261, Lam. I, figs. 1-3: description of sterile ascostroma on leaves of *Dictyozamites* sp. (Bennetitales ?)

Age: Lower Cretaceous; Horizon: Baqueró Formation

Locality: Anfiteatro Ticó, Province Santa Cruz, Argentina.

cf. *Paramicrothallites* Jain & Gupta, in: Durango de Cabrera,J. & Rodríguez de Sarmiento, M. (1995): Lam I, fig.1: description of sterile ascostroma on leaves of *Laurelia guiñazui* Berry (Monimiaceae).

Age: Lower-Middle Eocene; Horizon: Laguna del Hunco Formation

Locality: Laguna del Hunco, Province Chubut, Argentina.

Plochmopeltinites massoni (Cookson) Selkirk, in: Romero, E. & Castro, M., 1986: 104, Lam. I, figs. 1-2: description of sterile fungal body.

Age: Eocene; Horizon: Rio Turbio Formation

Locality: Rio Turbio, Province Santa Cruz, Argentina.

Plochmopeltinites sp., in: Sepúlveda,E. & Norris, G., 1982: 329, Pl.4, figs. 24 A -B: description of fertile stroma.

Age: Oligocene; Horizon: Ñorquinco Formation

Locality: Ea. Leleque, Province Chubut, Argentina.

«Germlings» of Microthyriaceae, in: Romero, E. & Castro, M., 1986: 104, Lam. 1, figs. 3-6: sterile fungal bodies.

Age: Eocene; Horizon: Rio Turbio Formation

Locality: Rio Turbio, Province Santa Cruz, Argentina.

Family: MICROTHYRIACEAE (?); doubfully included in Family.

Phragmothyrites sp., in: Sepúlveda,E. & Norris, G., 1982: 329, Pl. 3, fig. 23 B; Pl.4, fig. 23 A: description of fertile stroma.

Age: Oligocene; Horizon: Cabo Curioso Formation.

Locality: Cabo Curioso, Province Santa Cruz, Argentina.

Hyphae type 1, 2 and Hyphae ?: in: Sepúlveda, E., 1980: 268, Lam. II, figs. 12, 11, 13: description of 3 types of hyphae.
Age: Upper Paleocene; Horizon: «Serie Andesitica Andina»
Locality: A° El Encanto, Cordón Oriental de Futalaufquén, Province Chubut, Argentina.

Hyphae, in: Sepúlveda, E. & Norris, G., 1982: 328, PL. 3, figs. 22 A- 22 B: description of hyphae with spores (basidiospores ?).
Age: Oligocene; Horizon: Cabo Curioso Formation
Locality: Cabo Curioso, Province Santa Cruz, Argentina.

Family: TRICHOPELTACEAE

Brefeldiellites sp., in: Martinez, A., 1968: 262, Lam. II, figs. 5-6: description of sterile membranaceous stroma on leaves of *Podocarpus dubius* Archangelsky (Podocarpaceae).
Age: Lower Cretaceous; Horizon: Baqueró Formation
Locality: Bajo Grande, Province Santa Cruz, Argentina.

Trichopeltinites pulcher Martinez,A., 1968:261, Lam I, fig. 4: description of sterile membranaceous stroma on leaves of *Podocarpus dubius* Archangelsky (Podocarpaceae).
Age: Lower Cretaceous; Horizon: Baqueró Formation
Locality: Bajo Grande, Province Santa Cruz, Argentina.

Order: PYRENOMYCETES

(not named) in: Lutz, A., Herbst, R. & Goth, K., 1992: 78, Lam. I, figs. 1-6: description of sterile ascostroma.
Age: Upper Permian; Horizon: Yaguarí Formation.
Locality: A° del Blanquillo, Dept. Rivera, Uruguay.

(not named) in: Herbst, R. & Lutz, A., 1993: 92, Figs. A, B, C: description of sterile ascostroma.
Age: Upper Triassic; Horizon: Carrizal Formation
Locality: Rio Marayes, Province San Juan, Argentina.

Observation: this is probably the same type of fungus described by Geinitz (1876) as cf. *Hylozamites zamitae* Goeppert. The assignation to genus and species is unwarranted in the light of our present knowledge.

Class: ASCOMYCETES
(no Order nor Family indicated)

Asterinites colombiensis Doubinger,J. & Pons, D., 1973: 240, PL. II, figs. 1-6, text-fig. 1: description of dense sterile colonies.
Age: Paleocene; Horizon: boundary between Hato Nuevo/Cerrejón Formations.
Locality: Cerrejón basin, Dept. Guajira, Colombia.

Asterinites tellezii Doubinger, J. & Pons, D., 1973: 235, PL. I, figs. 1-4: description of sterile ramified epiphyt colonies.
Age: Paleocene; Horizon: boundary between Hato Nuevo/ Cerrejón Formations
Locality: Cerrejón basin, Dept. Guajira, Colombia.

Molinea asterinoides Doubinger, J. & Pons, D., 1975: 150-155, Pl. II, figs. 1-2, PL. III, figs. 1-6; text - fig. 2-4: epiphyll colonies and ascospores.
Age: Maastrichtian; Horizon: Guaduas Formation
Locality: Mina Corrales, Boyacá basin, Colombia.

Class: BASIDIOMYCETES
Family: POLYPORACEAE

cf. *Anthrodia* sp. in: Lutz,A., 1993: 421, Lam. I, figs. A-D: description of sterile ba-

sidiocarp.

Age: Upper Pliocene; Horizon: Ituzaingó Formation

Locality: A° Quebracho, Province Entre Rios, Argentina.

cf. *Trametes* sp., in: Lutz, A., 1993: 421, Lam. I, fig. E: description of sterile basidiocarp.

Age: Upper Pliocene; Horizon: Ituzaingó Formation

Locality: A° Quebracho, Province Entre Rios, Argentina.

Family: POLYPORACEAE (?)

Phellinites degiustoi Singer, R. & Archangelsky, S., 1958: 196, Text fig. 2-3: description of sterile carpophore of «aphyllophoraceous basidiomycete».

Age: Middle Jurassic; Horizon: La Matilde Formation

Locality: Ea. Bella Vista, Province Santa Cruz, Argentina.

Observation: In a paper by Hibbett *et. al* (1997) the authors cast doubts upon *Phellinites* being a fungus; the authors instead claim that these specimens are parts of the bark of the trunks of *Araucaria*-like trees. For the time being, until more proofs are available, *Phellinites* will be considered a fungus.

Fungi Incertae Sedis

Endomicorrhyzae, in: Lutz, A., (in press): Lam. I, figs. 1-7: description of VAM hyphae, invading roots of *Palmoxylon concordiense* Lutz.

Age: Upper Pliocene; Horizon: Ituzaingó Formation

Locality: National Park «El Palmar», Province Entre Rios, Argentina.

Hyphae of probable micorrhyza, in: Romero, E., 1968: 421, Lam. I, fig. 4: brief description of hyphae invading roots of *Palmoxylon patagonicum* Romero.

Age: Paleocene; Horizon: Rio Chico Formation

Locality: C° Abigarrado, Colonia Sarmiento, Province Chubut, Argentina.

Mycelium, in: Lutz, A. & Herbst, R., 1992: 169, Lam. I, figs. 1-5: description of hyphae in roots of *Guairea carnieri* (Schuster) Herbst, an osmundalean fern.

Age: Upper Permian; Horizon: Independencia Formation.

Locality: A° Vista Alegre, Colonia Independencia, Dept. Guairá, Paraguay.

Filament mycelium, in: Doubinger, J. & Pons, D., 1973: 242, 249-250, Pl. III, figs. 2-3; Pl. IV, fig. 5: description of epiphillous hiphae mycelium.

Age: Paleocene-Eocene; Horizon: ?

Locality: Cerrejón bassin; Dept. Guajira, Colombia.

Fungal Spores

A list is given of the published papers exclusively devoted to fungal spore descriptions:

Doubinger, J. & Pons, D., 1973: 244; 245; 247; Pl. III, figs. 1,4-8; IV, figs. 1-4, 6-7; V, figs. 1-6: descriptions of 5 genera and 12 species of spores.

Age: Paleocene-Eocene; Horizon: ?

Locality: Cerrejón bassin; Depto. Guajira, Colombia.

Durango de Cabrera,J. & Rodriguez de Sarmiento, M., 1995: Lam. I, figs. 4-16: description of 8 genera and 12 species of spores.

Age: Lower-Middle Eocene; Horizon: Laguna del Hunco Formation

Locality: Laguna del Hunco, Province Chubut, Argentina.

Garralla, S., 1987: 32-33; Lam I, figs. 1-19: description of 10 genera and 18 species of spores, and 21 forms described as «types».

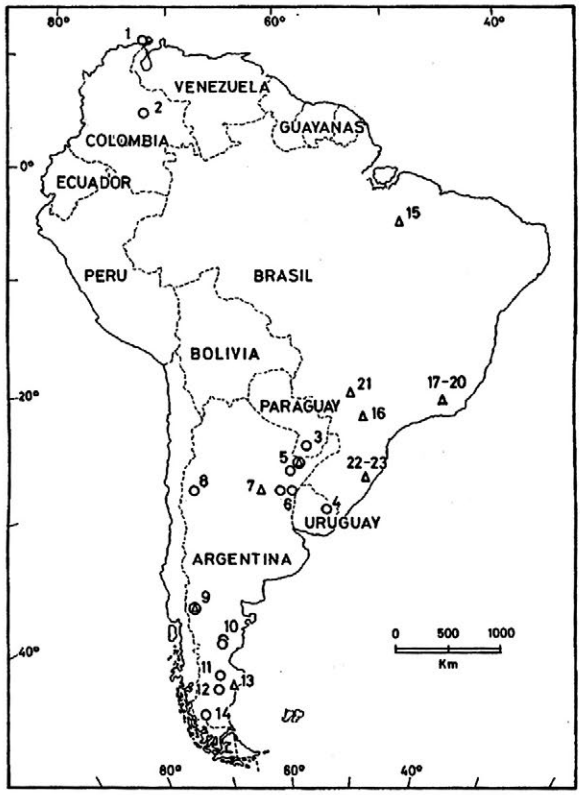

Fig. 1. Map of South America, showing general location of localities quoted in the papers. Triangles represent spore asssociations and circles megafungi.
(Numbers refer to localities on the map)
1. Dept. Guajira, COLOMBIA; see Doubinger, J. & Pons, D., 1973.
2. Dept. Boyacá, COLOMBIA; see Doubinger, J. & Pons, D., 1975.
3. Dept. Guairá, PARAGUAY; see Lutz, A. & Herbst, R., 1992.
4. Dept. Rivera, URUGUAY; see Lutz, A. *et al.*, 1992.
5. Province Corrientes; see Garralla, S., 1987.
6. Province Entre Rios; see Lutz, A., 1993 and Lutz, A. (in press).
7. Josefina, Province Santa Fe; see Garralla, S., 1989.
8. Marayes, Province San Juan; see Herbst, R. & Lutz, A., 1993.
9. Province Chubut; see Sepúlveda, E., 1980 and Sepúlveda, E. & Norris G., 1982.
10. Colonia Sarmiento, Province Chubut; see Romero, E., 1968.
11. Ea. Bella Vista, Province Santa Cruz; see Singer,R., & Archangelsky, S., 1958.
12. Baqueró-Ticó, Province Santa Cruz; see Martínez, A., 1968.
13. Cabo Curioso, Province Santa Cruz; see Sepúlveda, E. & Norris,G., 1982.
14. Rio Turbio, Province Santa Cruz; see Romero, E. & Castro, M. 198
(Localities from 5 to 14 are all in ARGENTINA)
15. State of Maranhao; see Lima, M. R.,1988.
16. State of Sao Paulo; see Lima,M. R, *et al.*, 1986.
17. State of Rio de Janeiro; see Lima, M. R. & Amador, R. J., 1985.
18. State of Rio de Janeiro; see Lima, M.R., *et al.*, 1986.
19. State of Rio de Janeiro; see Lima, M.R., *et al.*, 1994.
20. State of Rio de Janeiro; see Lima, M.R., *et al.*, 1996.
21. State of Paraná; see Lima, M. R., & Angulo, R. J., 1990.
22. State of Rio Grande do Sul; see Lorscheiter, M. L., 1989.
23. State of Rio Grande do Sul; see Neves, P. C. P. & Lorscheiter, M. L., 1992.
(Localities 15 to 23 are all in BRAZIL)

Age: Upper Pliocene; Horizon: Ituzaingó Formation
Locality: (several localities), Province Corrientes, Argentina.

Garralla, S., 1989: 108-109; Lam. I, figs. 1-25; II, figs. 26-39: description of 10 genera and 17 species of spores and 2 forms as «types».
Age: Upper Miocene; Horizon: Paraná Formation
Locality: Josefina, Province Santa Fe, Argentina.

Lima, M.R.,1988,: description of 4 genera and 5 species of fungal spores.
Age: Pliocene; Horizon: Nova Iorque Beds
Locality: State of Maranhao, Brazil

Lima, M. R., & Amador, R. J., 1985: description of 2 genera and 2 species of fungal spores.
Age: Eocene; Horizon: Resende Formation.
Locality: State of Rio de Janeiro, Brazil

Lima, M. R., & Angulo, R. J., 1990: description of 2 genera and 2 species of fungal spores.
Age: Early Miocene; Horizon: Alexandra Formation
Locality: State of Paraná, Brazil

Lima, M. R., Cabral Jr. M. & Stefani, F. L., 1996: Description of 1 genus and 1 species of fungal spore
Age: Eocene-Oligocene; Horizon: Macacu Formation
Locality: Guanabara Rift, State of Rio de Janeiro, Brazil

Lima, M. R., Riccomini, C. & Souza, P.A., 1994: description of 5 genera and 5 species of fungal spores and some undetermined hyphae
Age: Eocene; Horizon « Casa de Pedra Graben «
Locality: «Volta Redonda Basin», State of Rio de Janeiro, Brazil.

Lima, M.R., & Souza Cunha, F.L., 1986: description of 1 genus and 1 species of fungal spore.
Age: Paleocene; Horizon: ?
Locality: Sao José de Itaboraí, State of Rio de Janeiro, Brazil.

Lima, M.R.,Vespucci, J.B. & Suguio, K, 1985: description of 1 genus and 1 species of fungal spore
Age: Late Oligocene; Horizon: Caçapava Formation
Locality: Taubaté Basin, State of Sao Paulo, Brazil.

Lorscheiter, M. L., 1989: description of 2 genera and 2 species of fungal spores, fragments of *Tilletia, Ustilago,* undetermined hyphae and several types of Zygomyectes rests.
Age: Quaternary (Pleistocene); Horizon: ?
Locality: Cone de Rio Grande, State of Rio Grande do Sul, Brazil.

Neves, P. C. P. & Lorscheiter, M. L., 1992: description of 2 genera and 2 species of fungal spores, fragments of *Mycrothyrium, Rhizophagites*, undetermined hyphae and 7 undefined fungal spores.
Age: Quaternary (Pleisto-Holocene); Horizon: ?
Locality: Terra de Sareia region, Northern Coastal Plain, State of Rio Grande do Sul, Brazil.

Romero, E. & Castro, M., 1986: 117, Lam, I, figs. 7-15: description of 3 genera and 3 species.
Age: Eocene; Horizon: Rio Turbio Formation
Locality: Rio Turbio, Province Santa Cruz, Argentina.

Sepúlveda, E. 1980: 271-272; Lam. I, figs. 1-19; Lam. II, figs. 1-10: description of 12 genera and 39 species.
Age: Upper Paleocene; Horizon:»Serie Andesitica Andina»
Locality: A° El Encanto, Cordón Oriental del Futalaufquén, Province Chubut, Argentina.

Sepúlveda, E. & Norris, G. 1982: 324, 326, 328; Pl., I, figs. 1-12; Pl., II, figs. 13-18; Pl. III, fig. 19 A-B: description of 15 genera and 24 species.

Age: Lower Tertiary; Horizon: ?

Locality: several localities in Provinces Chubut and Santa Cruz, Argentina.

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