

Checklist of Bolivian *Agaricales*. 1: Species with dark and pink spore prints

E. MELGAREJO-ESTRADA^{1,2,3,4}, M.E. SUÁREZ^{2,3},
D. ROCABADO⁴, O. MAILLARD^{4,5} & B.E. LECHNER^{1,3}

¹Universidad de Buenos Aires, Facultad de Ciencias Exactas y Naturales, Departamento de Biodiversidad y Biología Experimental, Laboratorio de Hongos Agaricales, Buenos Aires, Argentina.

²Universidad de Buenos Aires, Facultad de Ciencias Exactas y Naturales, Departamento de Biodiversidad y Biología Experimental, Grupo de Etnobiología, Buenos Aires, Argentina.

³CONICET-Universidad de Buenos Aires, Instituto de Micología y Botánica (INMIBO) - CONICET, Buenos Aires, Argentina.

⁴Museo de Historia Natural Noel Kempff Mercado, Herbario del Oriente Boliviano (USZ).
Av. Irala 565. Casilla 2489 Correo Central, Santa Cruz, Bolivia.

⁵Fundación para la Conservación del Bosque Chiquitano (FCBC).

Av. Ibérica calle 6 Oeste 95, Puerto Busch, Barrio Las Palmas. Santa Cruz, Bolivia.

CORRESPONDENCE TO: blechner@bg.fcen.uba.ar

ABSTRACT — We provide a literature-based checklist of *Agaricales* reported from Bolivia. In this first contribution, 101 species belonging to 28 genera and 9 families are listed. *Pluteaceae*, *Agaricaceae* and *Hymenogastraceae* are the most species-abundant families.

KEY WORDS — *Basidiomycota*, distribution, diversity, *Gasteromycetes*, Neotropics, macromycetes, South America.

Introduction

Bolivia is one of the most diverse countries of the tropical Andes and conserves 30% of the endemisms of vascular flora of South America (Jørgensen et al. 2011). Its territory comprises four biogeographic regions (Amazonian, Brazilian-Paranense, Chaqueña and Tropical Andean) that are divided into eleven biogeographic provinces (Navarro 2015). Due to the large size of the country, it has a vast variety of climates and ecoregions: humid tropical (subtropical forests like the Yungas and the Amazonian Rainforest), dry forests (Chaco, Chiquitano, Dry Valleys), deserts (Puna, Salar), and cold and humid habitats (Cloud Andes forest) (Navarro & Maldonado 2011, Navarro 2015). Each ecoregion has particular climatic conditions and different soil types, as well as specific types of vegetation which are adapted to the former, and some of them are biodiversity *hotspots* and endemism centers of flora and fauna, like the Yungas and/or Amazonian Rainforest (Navarro & Maldonado 2011, Young 2007). According to the estimates by Hawksworth (1991) and Hawksworth & Lücking (2017) and based on the richness of the vascular flora in Bolivia (15,345 species) documented up to 2014 (Jørgensen et al. 2014, Meneses et al. 2015), we calculate that there are about 46,000 species of fungi in the country, following the hypothesis that for each species of vascular plant there are approximately three species of fungi.

The mycological history of Bolivia is recent and probably started in 1832 with the first fungal collections made by Alcides d’Orbigny, all this information was compiled in “The preliminary list of Fungi of Bolivia” by Stevenson & Cárdenas (1949) and Farr & Stevenson (1963). Other important contributions on *Basidiomycota* were made by Fries (1909), Rocabado et al. (2007) on *Gasteromycetes*, Jackson (1926, 1927, 1931a, 1931b, 1931c, 1932) on *Pucciniomycetes*, Piepenbring (2002, 2003a, 2003b), Vánky (2009) and Vánky et al. (2009) on *Ustilaginomycetes*, Dennis (1958) on *Ascomycota* and recently Pasaca et al. (2018) on *Eurotiomycetes*. Most of the literature on fungi

of Bolivia was published by foreign researchers (botanist and a few mycologist) who collected specimens in Bolivia and deposited them in different fungal reference collections (mostly LIL and BAFC). At the same time, there is a minimum participation of Bolivian researchers in the study of fungi until today.

The order *Agaricales* as it is currently known is characterized by presenting lamellae (Wright & Albertó 2002), including some gasteroid fungi (Hibbett et al. 2007). The Bolivian *Agaricales* were studied by Fries (1909), who was the first mycologist that studied gasteroid taxa in the Chaco region. Some decades later, in 1956, Rolf Singer studied Bolivian *Agaricales* in the Amazonas and the Yungas regions, becoming one of the most important contributions (Singer 1958, 1960, 1962a).

Singer lived and worked in Tucumán, Argentina, from 1948 to 1960, and during this time he contributed to the knowledge of Bolivian *Agaricales* with the description of 200 agaric species in 22 publications (Mueller et al. 1997, Singer 1958, 1960, 1962a, 1962b, 1973, 1989, Singer & Smith 1958, Smith & Singer 1964).

However, knowledge on fungi, including *Agaricales*, is still quite limited (Piepenbring 2003a, Rocabado et al. 2007, Melgarejo 2015) on a national scale and even null even in regions known for their high biodiversity. Therefore, the purpose of this study is to provide a check list of the *Agaricales* species in Bolivia. In this first part we have selected the following families: *Agaricaceae*, *Bolbitiaceae*, *Entolomataceae*, *Hymenogastraceae*, *Inocybaceae*, *Pluteaceae*, *Psathyrellaceae*, *Strophariaceae*. The remaining families will be presented in a forthcoming checklist.

Materials and methods

We consulted all existing bibliography (including articles, books and monographs) reporting dark and pink spore print *Agaricales* from Bolivia since 1909 until 2019. Thesis and other academic texts were not considered in this survey. In the case of gasteroid and secotioid fungi, the color of the spore print was considered in mature specimens.

Full data for each species collected in Bolivia, distribution (Dist.) per department (Figure 1, Table 1), the collectors and the collection number are mentioned, followed by the acronym of the fungal reference collection where the specimen is preserved and, if applicable, its typification is also included. (Coll. & Num. & Herbaria). The references (Ref.) correspond to the cited literature.

Remarks are added (as Notes) only for those taxa that showed a nomenclatural conflict, e.g. a species when the collector was not indicated (CNI), the herbaria was not indicated (HNI), the holotype is missing (MH), number of collection was not indicated (NNI) or it was non validly published (NVP).

Species names were updated and organized by families according to the *Index Fungorum* website (<http://www.indexfungorum.org>), which was also consulted for synonym included in the checklist. The synonyms considered in this checklist correspond to those reported in the Bolivian literature.

Journal abbreviations follow the Botanico-Periodicum-Huntianum (Lawrence & Hunt Botanical Library 2019). Authors names abbreviations are according The International Plant Names Index (<https://www.ipni.org>) and Authors of Fungal Names (<http://www.indexfungorum.org/names/Names.asp>).

The following herbaria and their respective acronyms are mentioned according to the *Index Herbariorum* (<http://sweetgum.nybg.org/science/ih/>) (Thiers 2019): Field Museum of Natural History U.S.A, Chicago (F), Fundación Miguel Lillo (LIL), Herbario de la Facultad de Ciencias Exactas y Naturales, Universidad de Buenos Aires (BAFC), Herbario del Oriente Boliviano, Museo de Historia Natural Noel Kempff Mercado (USZ), Herbario Real Jardín Botánico of Madrid (MA), Swedish Museum of Natural History, Stockholm (S-F), The New York Botanical Garden (NY), U.S. National Fungus Collections USDA-ARS (BPI) and University of Michigan (MICH).

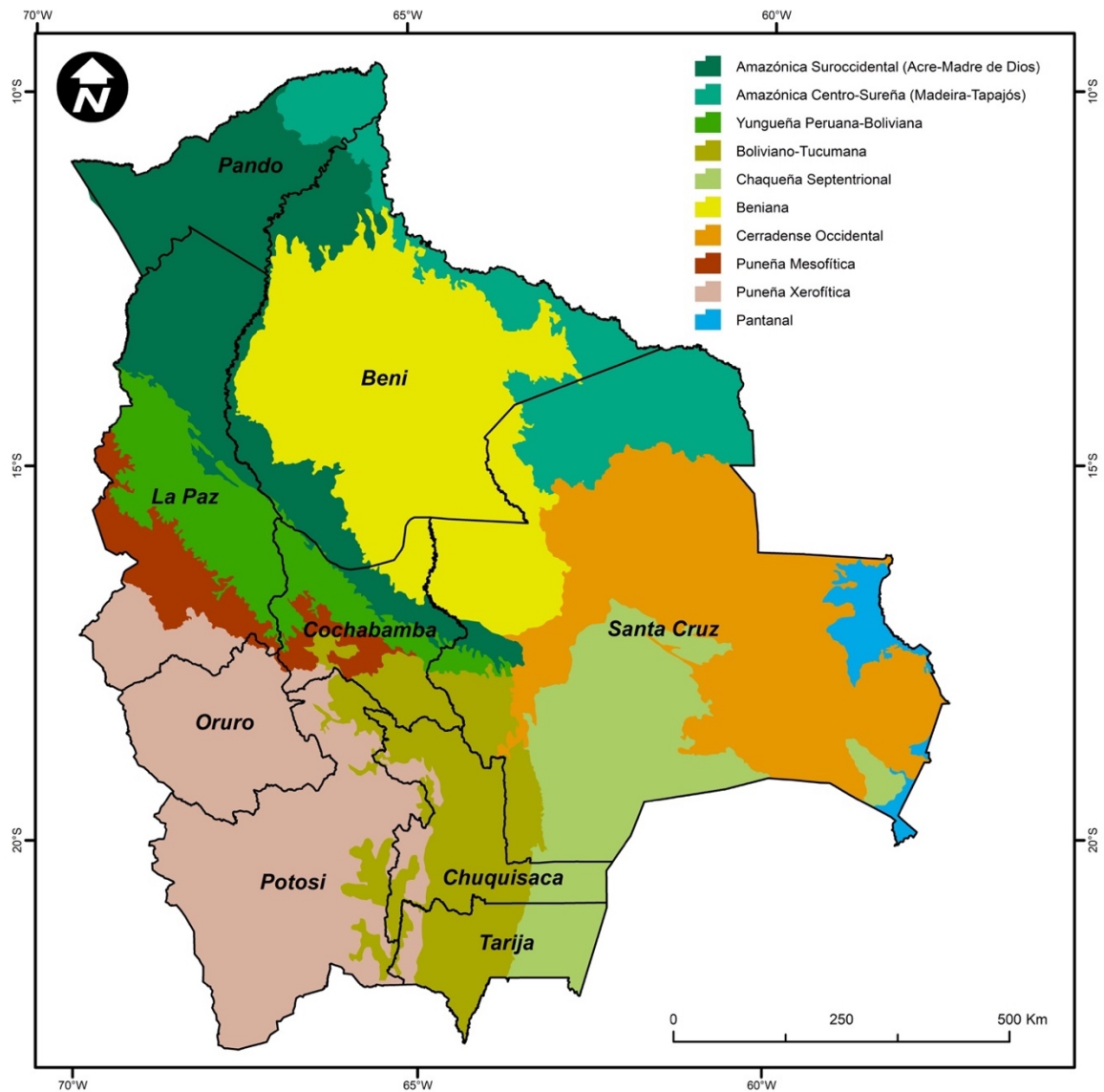


Figure 1: Map of Bolivia with biogeographical and political division following the classification system by Navarro & Maldonado (2011). Prepared and modified by O. Maillard.

TABLE 1– Abbreviations used for the departments of Bolivia.

| DEPARTMENT | ABBREV. |
|---------------|---------|
| Beni | BE |
| Chuquisaca | CH |
| Cochabamba | CO |
| La Paz | LP |
| Not indicated | NI |
| Oruro | OR |
| Pando | PA |
| Potosí | PO |
| Santa Cruz | SC |
| Tarija | TA |

Results

A total of 152 publications were consulted for records of fungi for Bolivia. Twenty-one of these publications contained information and citations on Bolivian dark- and pink-spored *Agaricales*, which were used for the present checklist.

TABLE 2: Species number by genera and family of *Agaricales* with dark or pink spore prints reported for Bolivia

| SPORE PRINT COLOR | FAMILIES/GENERA REPRESENTED | NO. OF SPECIES |
|-------------------------------|--------------------------------|----------------|
| DARK | <i>Agaricaceae</i> | 24 |
| | <i>Agaricus</i> | 9 |
| | <i>Apioperdon</i> | 1 |
| | <i>Arachnion</i> | 1 |
| | <i>Bovista</i> | 2 |
| | <i>Calvatia</i> | 3 |
| | <i>Lycoperdon</i> | 4 |
| | <i>Podaxis</i> | 1 |
| | <i>Tulostoma</i> | 1 |
| | <i>Vascellum</i> | 2 |
| | <i>Incertae sedis</i> | 1 |
| | <i>Panaeolus</i> | 1 |
| | <i>Bolbitiaceae</i> | 1 |
| | <i>Conocybe</i> | 1 |
| | <i>Cortinariaceae</i> | 2 |
| | <i>Pyrrhoglossum</i> | 2 |
| | <i>Hymenogastraceae</i> | 21 |
| | <i>Galerina</i> | 12 |
| | <i>Gymnopilus</i> | 1 |
| | <i>Phaeocollybia</i> | 2 |
| | <i>Psilocybe</i> | 6 |
| | <i>Inocybaceae</i> | 12 |
| | <i>Crepidotus</i> | 6 |
| <i>Inocybe</i> | 1 | |
| <i>Phaeomarasmius</i> | 2 | |
| <i>Simocybe</i> | 3 | |
| <i>Psathyrellaceae</i> | 1 | |
| <i>Psathyrella</i> | 1 | |
| <i>Strophariaceae</i> | 2 | |
| | <i>Melanotus</i> | 2 |
| PINK | <i>Entolomataceae</i> | 7 |
| | <i>Clitopilus</i> | 4 |
| | <i>Entoloma</i> | 2 |
| | <i>Rhodocybe</i> | 1 |
| | <i>Pluteaceae</i> | 28 |
| | <i>Pluteus</i> | 28 |

We found 132 records referring to 101 species belonging to 28 genera and 9 families of *Agaricales* in the phylum *Basidiomycota*. These records are listed in the present checklist presented here, which is organized in two parts: dark spore print (a) and pink spore print (b).

Overall, *Pluteaceae* is the most species rich family studied in this checklist with 28 species, followed by *Agaricaceae* with 24 species, and *Hymenogastraceae* with 21 species (Table 2).

In relation with the distribution of the species by department (Table 3), most of the records are documented for the Yungueña Peruano-Boliviano Province - Cuenca Alta del Beni Sector (41 records), Amazónica Suroccidental Province - Acre y Madre de Dios Sector (25 records) and the Chaqueña Septentrional Province - Chaco Noroccidental Sector (21 records) (Navarro & Maldonado 2011).

According to Perera et al. (2017), 39 agaric type specimens from the mycological collection of Singer from Bolivia that were deposited in the Miguel Lillo Fundación (LIL), are currently missing or have been destroyed; of them, 13 type specimens are reported in this manuscript.

TABLE 3: Numbers of known species of *Agaricales* with dark or pink spore print and principal collectors from departments of Bolivia

| DEPARTMENTS | RECORDED SPECIES | PRINCIPAL COLLECTORS |
|-------------------------|------------------|--------------------------------------|
| Beni | 25 | R. Singer |
| Cochabamba | 1 | M. Farr & J. Stevenson |
| La Paz | 41 | R. Singer, M. Cárdenas |
| Not indicated | 5 | J. Gomez y Moreno-Arroyo, R.E. Fries |
| Pando | 15 | R. Singer |
| Santa Cruz de la Sierra | 9 | B. Moreno, D. Rocabado. |
| Tarija | 21 | R.E. Fries |

Most of the mycological records were made in the departments of La Paz (41), Beni (25) and Tarija (21). There are no records of *Agaricales* for the departments of Chuquisaca, Oruro and Potosí.

BASIDIOMYCOTA**[a] Dark spored taxa*****Agaricaceae******Agaricus* L.**

Agaricus bicortinatellus Heinem. *Bull. Jard. Bot. État Brux.* 32: 18 (1962b).

Dist.: BE. Coll. & Num. & Herbaria: Singer B 2575 (LIL). Heinemann (1962b).

Agaricus* cf. *johnstonii Murrill. *Mycologia* 10(2): 75 (1918).

Dist.: PA. Coll. & Num. & Herbaria: Singer B 2231. Ref.: Heinemann (1962b). Notes: HNI.

Agaricus cinnamomellus Heinem. *Bull. Jard. Bot. État Brux.* 32: 15 (1962b).

Dist.: BE. Coll. & Num. & Herbaria: Singer B 2544 (LIL). Ref.: Heinemann (1962b).

Agaricus dulcidulus Schulzer. *Icon. Sel. Hymenomyc. Hung. (Budapest)*: 29 (1874).

= *Agaricus purpurellus* F.H. Møller (1952), *Agaricus rubelloides* Bon (1985), *Agaricus rubellus* (Gillet) Sacc. (1887), *Fungus dulcidulus* (Schulzer) Kuntze (1898), *Pratella rubella* Gillet (1878), *Pratella sylvatica* var. *rubella* (Gillet) L. Corb. (1929), *Psalliota purpurella* F.H. Møller (1952).

Dist.: BE, PA, LP. Coll & number: Singer B 2545, 2326, 2171, 2250, 907. Ref.: Heinemann (1962b). Notes: HNI.

Agaricus nigrescentulus Heinem. *Bull. Jard. Bot. État Brux.* 32: 18 (1962b).

Dist.: PA. Coll. & Num. & Herbaria: Singer B 2251 (LIL). Ref.: Heinemann (1962b).

Agaricus riberalensis Heinem. *Bull. Jard. Bot. État Brux.* 32: 9 (1962b).

Dist.: BE. Coll. & Num. & Herbaria: Singer B 2333 (LIL). Ref.: Heinemann (1962b).

Agaricus rufoaurantiacus Heinem. *Kew Bull.* 15(2): 242 (1961).

Dist.: BE, LP. Coll. & Num. & Herbaria: Singer B 1105, 2078, 2432. Ref.: Heinemann (1962b).
Notes: HNI.

Agaricus singeri Heinem. *Bull. Jard. Bot. État Brux.* 32: 2 (1962b).

Dist.: BE. Coll. & Num. & Herbaria: Singer B 2126 (LIL). Ref.: Heinemann (1962b).

Agaricus subochraceosquamulosus Heinem. *Bull. Jard. Bot. État Brux.* 32: 12 (1962b).

Dist.: LP, PA. Coll. & Num. & Herbaria: Singer B 663, 2524 (LIL). Ref.: Heinemann (1962b).

***Apioperdon* (Kreisel & D. Krüger) Vizzini.**

Apioperdon pyriforme (Schaeff.) Vizzini. *Phytotaxa* 299(1): 81 (2017).

Bas: *Lycoperdon pyriforme* Schaeff. (1774).

= *Lycoperdon pyriforme* subsp. *globosum* Sosin (1952), *Lycoperdon pyriforme* var. *echinosporum* Naveau (1923), *Lycoperdon pyriforme* var. *flavum* Lloyd (1915), *Lycoperdon pyriforme* var. *globosum* (Sosin) F. Šmarda (1958), *Lycoperdon serotinum* Bonord. (1857), *Morganella pyriformis* (Schaeff.) Kreisel & D. Krüger (2003).

Dist.: SC. Coll. & Num. & Herbaria: D. Rocabado et al. 321 (USZ 35). Ref.: Rocabado et al. (2007). Notes: The position in *Agaricaceae* or *Lycoperdaceae* is not clear.

Arachnion Schwein.

Arachnion album Schwein. *Schr. naturf. Ges. Leipzig*: no. 14, tab. 1, fig. 2 (1822).

Dist.: SC. Coll. & Num. & Herbaria: B. Moreno & J. Gómez (MA-Fungi 47179). Ref.: Calonge et al. (2000). Notes: NNI.

Bovista Pers.

Bovista pusilla (Batsch) Pers. *Syn. Meth. Fung.* (Göttingen) 1: 138 (1801).

Bas: *Lycoperdon pusillum* Batsch (1789)

= *Globaria pusilla* (Batsch) Quél. (1873), *Lycoperdon polymorphum* var. *pusillum* (Batsch) F. Šmarda (1958), *Pseudolycooperdon pusillum* (Batsch) Velen. (1947).

Dist.: TA. Coll. & Num. & Herbaria: R. E. Fries 255 (S-F 20418), 256 (S-F 20417). Ref.: Fries (1909), Stevenson & Cárdenas (1949), Rocabado et al. (2007).

Bovista singeri V.L. Suárez & J.E. Wright. *Mycotaxon* 50: 282 (1994).

Dist.: LP. Coll. & Num. & Herbaria: R. Singer 1129 (BAFC 31411). Ref.: Suárez & Wright (1994).

Calvatia Fr.

Calvatia candida (Rostk.) Hollós. *Term. Füz.* 25: 112 (1902).

Bas: *Langermannia candida* Rostk. (1839).

= *Calvatia candida* var. *rubroflava* (Cragin) G. Cunn. (1926), *Calvatia rubroflava* (Cragin) Lloyd (1899), *Lycoperdon candidum* (Rostk.) Bonord. ex Sacc. (1888), *Lycoperdon rubroflavum* Cragin (1885).

Dist.: TA. Coll. & Num. & Herbaria: R. E. Fries 252 (S-F 30778). Ref.: Fries (1909).

Calvatia cyathiformis (Bosc) Morgan. *J. Cincinnati Soc. Nat. Hist.* 12(4): 168 (1890).

Bas: *Lycoperdon cyathiforme* Bosc (1811).

= *Calvatia cyathiformis* f. *fragilis* (Quél.) A.H. Sm. (1964), *Calvatia cyathiformis* subsp. *fragilis* (Quél.) Dring (1964), *Calvatia fragilis* (Quél.) Morgan (1890), *Lycoperdon cyathiforme* Bosc (1811), *Lycoperdon fragile* Vittad. (1842), *Utraria fragilis* Quél. (1886).

Dist.: TA. Coll. & Num. & Herbaria: R. E. Fries 240 (S-F 23091), 436 (S-F 23295), 279 (S-F 23092), 280 (S-F 23093). Ref.: Fries (1909), Rocabado et al. (2007), Stevenson & Cárdenas (1949).

Calvatia pygmaea (R.E. Fr.) Kreisel, G. Moreno, C. Ochoa & Altés. *Cryptog. Mycol.* 19(12): 132 (1998).

Bas: *Lanopila pygmaea* R.E. Fr. (1908).

Dist.: TA. Coll. & Num. & Herbaria: R. E. Fries 277a. (S-F 16197). Ref.: Fries (1909), Stevenson & Cárdenas (1949).

Lycoperdon Pers.

Lycoperdon costaricense (M.I. Morales) Baseia, Alfredo & M.P. Martín. *Mycol. Progr.* 16(10): 980 (2017).

Bas: *Morganella costaricensis* M.I. Morales (1974).
Dist.: BE. Coll. & Num. & Herbaria: R. Singer B 2937 (BAFC 31452, neotype). Ref.: Suárez & Wright (1996).

Lycoperdon fuligineum Berk. & M.A. Curtis. *Linn. Soc. Bot.* 10(46): 345 (1868).
= *Morganella fuliginea* (Berk. & M.A. Curtis) Kreisel & Dring (1967).
Dist.: LP, PA. Coll. & Num. & Herbaria: R. Singer B 1379 (BAFC 31453), 2204 (BAFC 32204).
Ref.: Suárez & Wright (1996).

Lycoperdon perlatum Pers. *Observ. Mycol.* (Lipsiae) 1: 4 (1796).
= *Lycoperdon bonordenii* Masee (1887), *Lycoperdon gemmatum* Batsch (1783), *Lycoperdon gemmatum* var. *perlatum* (Pers.) Fr. (1829), *Lycoperdon lacunosum* Bull. (1782).
Dist.: NI. Coll. & Num. & Herbaria: (BPI 733980). Ref.: Rocabado et al. (2007). Notes: CNI, NNI.

Lycoperdon wrightii Berk. & M.A. Curtis. *Grevillea* 2(16): 50 (1873).
Dist.: TA. Coll. & Num. & Herbaria: R. E. Fries 257 (S-F 264497, F), 280 (S-F 264496, NY).
Ref.: Fries (1909), Stevenson & Cárdenas (1949).

Podaxis Desv.

Podaxis pistillaris (L.) Fr. *Syst. mycol.* (Lundae) 3(1): 63 (1829).
Bas: *Lycoperdon pistillare* L. (1771).
= *Podaxis pistillaris* f. *macrosporus* G. Cunn. (1932), *Podaxis pistillaris* var. *paurospora* Dearn. & Morse (1941), *Scleroderma pistillare* (L.) Pers. (1801).
Dist.: SC. Coll. & Num. & Herbaria: O. Maillard et al. (USZ 82). Ref.: Rocabado et al. (2007).
Notes: NNI.

Tulostoma Pers.

Tulostoma berteroanum Lév. *Syll. Fung.* (Abellini) 6: 63 (1888).
Dist.: TA. Coll. & Num. & Herbaria: R. E. Fries 241. Ref.: Fries (1909), Stevenson & Cárdenas (1949). Notes: HNI.

Vascellum F. Šmarda.

Vascellum abscissum (R.E. Fr.) Kreisel. *Reprim Nov. Spec. Regni veg.* 64: 159 (1962b).
Bas: *Lycoperdon abscissum* R.E. Fr. (1908).
Dist.: TA. Coll. & Num. & Herbaria: R. E. Fries 243 (S-F 47271), 253 (S-F 47270, syntype), 258 (S-F 47272), 259 (S-F 47268, NY), 278 (S-F 16163), 415 (S-F 16161). Ref.: Rocabado et al. (2007), Stevenson & Cárdenas (1949).

Vascellum pampeanum (Speg.) Homrich. *Can. J. Bot.* 66(7): 1286 (1988).
= *Lycoperdon pampeanum* Speg. (1896).
Dist.: CO, SC. Coll. & Num. & Herbaria: E. Calzadilla et al. 231 (USZ 40, 73). Ref.: Rocabado et al. (2007).

Bolbitiaceae

Conocybe Fayod.***Conocybe myosura*** Singer. *Fieldiana, Bot.* 21: 104 (1989).

Dist.: BE. Coll. & Num. & Herbaria: R. Singer B 2403 (LIL, type). Ref.: Singer (1989).

Cortinariaceae***Pyrrhoglossum*** Singer.***Pyrrhoglossum lilaceipes*** Singer. *Sydowia* 15(1-6): 77 (1962).

Dist.: LP. Coll. & Num. & Herbaria: R. Singer B 1225 (LIL, type). Ref.: Mueller & Wu. (1997), Singer (1961a).

Pyrrhoglossum macrosporum Singer. *Beih. Sydowia* 7: 92 (1973).= *Gymnopilus macrosporus* (Singer) Singer (1986).

Dist.: LP. Coll. & Num. & Herbaria: R. Singer B 1229 (BAFC, type). Ref.: Mueller & Wu. (1997), Singer (1973).

Hymenogastraceae***Galerina*** Earle.***Galerina aimara*** Singer. *Beitr. Naturk. Forsch. Südwestdeutschl.*: 112 (1964).

Dist.: LP. Coll. & Num. & Herbaria: R. Singer B 502 (MICH, type). Ref.: Smith & Singer (1964).

Galerina andina Singer. *Beitr. Naturk. Forsch. Südwestdeutschl.*: 112 (1964).

Dist.: LP. Coll. & Num. & Herbaria: R. Singer B 509 (MICH, type). Ref.: Smith & Singer (1964).

Galerina boliviana Singer. *Beitr. Naturk. Forsch. Südwestdeutschl.*: 58 (1964).

Dist.: LP. Coll. & Num. & Herbaria: R. Singer B 628a. (MICH, type). Ref.: Smith & Singer (1964).

Galerina cerina A.H. Sm. & Singer. *Mycologia* 47(4): 563 (1955).= *Galerina cerina* f. *bispora* A.H. Sm. & Singer (1955), *Galerina cerina* f. *longicystis* (A.H. Sm. & Singer) A. de Haan & Walley (2002), *Galerina cerina* var. *nebularum* A.H. Sm. & Singer (1964), *Galerina cerina* var. *yungensis* A.H. Sm. & Singer (1964).

Dist.: LP. Coll. & Num. & Herbaria: R. Singer B 624, 1471 (MICH, type). Ref.: Smith & Singer (1964).

Galerina cingulata Singer. *Beitr. Naturk. Forsch. Südwestdeutschl.*: 218 (1964).

Dist.: LP. Coll. & Num. & Herbaria: R. Singer B 1536 (MICH, type). Ref.: Smith & Singer (1964).

Galerina laeta Singer. *Beitr. Naturk. Forsch. Südwestdeutschl.*: 185 (1964).

Dist.: LP. Coll. & Num. & Herbaria: R. Singer B 626 (MICH, type). Ref.: Smith & Singer (1964).

Galerina nubigena A.H. Sm. & Singer. *A Monograph of the genus Galerina*: 60 (1964).

Dist.: LP. Coll. & Num. & Herbaria: R. Singer B 1469 (MICH, type). Ref.: Smith & Singer (1964).

- Galerina polytrichorum*** Singer. *Beitr. Naturk. Forsch. Südwestdeutschl.*: 194 (1964).
Dist.: LP. Coll. & Num. & Herbaria: R. Singer B 619 (MICH, type). Ref.: Smith & Singer (1964).
- Galerina subpapillata*** Singer. *A Monograph of the genus Galerina*: 221 (1964).
Dist.: LP. Coll. & Num. & Herbaria: R. Singer B 1240 (LIL, type). Ref.: Smith & Singer (1964).
Notes: MH.
- Galerina uchumachiensis*** Singer. *Beitr. Naturk. Forsch. Südwestdeutschl.*: 150 (1964).
Dist.: LP. Coll. & Num. & Herbaria: R. Singer B 1470. Herbaria: MICH (type). Ref.: Smith & Singer (1964).
- Galerina viatica*** Singer. *Beitr. Naturk. Forsch. Südwestdeutschl.*: 231 (1964).
Dist.: LP. Coll. & Num. & Herbaria: R. Singer B 1247 (MICH, type). Ref.: Smith & Singer (1964).
- Galerina yungicola*** Singer. *Beitr. Naturk. Forsch. Südwestdeutschl.*: 114 (1964).
= *Galerina yungicola* var. *bispora* Natarajan & Raman (1983).
Dist.: LP. Coll. & Num. & Herbaria: R. Singer B 932 (MICH, type). Ref.: Smith & Singer (1964).
- Gymnopilus*** P. Karst.
- Gymnopilus chrysopellus*** (Berk. & M.A. Curtis) Murrill. *Mycologia* 5(1): 23 (1913).
Bas: *Agaricus chrysopellus* Berk. & M.A. Curtis (1868).
= *Flammula chrysopella* (Berk. & M.A. Curtis) Pat. (1903).
Dist.: Coll. & Num. & Herbaria: J. Gomez & Moreno-Arroyo (AMSS 02). Ref.: Moreno-Arroyo et al. (2001). Notes: NNI.
- Phaeocollybia*** R. Heim
- Phaeocollybia amazonica*** Singer. *Sydowia* 15(1-6): 77 (1962b).
Dist.: BE. Coll. & Num. & Herbaria: R. Singer B 2372 (LIL, type). Ref.: Singer (1961).
- Phaeocollybia subattenuata*** Singer. *Sydowia* 15(1-6): 78 (1962b).
Dist.: PA. Coll. & Num. & Herbaria: R. Singer B 2510 (LIL, type). Ref.: Singer (1961).
- Psilocybe*** (Fr.) P. Kumm.
- Psilocybe alpestris*** Singer. *Fieldiana, Bot.* 21: 108 (1989).
Dist.: LP. Coll. & Num. & Herbaria: R. Singer B 976 (LIL). Ref.: Singer (1989). Notes: Some species of *Psilocybe* was translated on *Deconica* and are located in *Strophariaceae*. Any of the presented species here are in *Deconica*.
- Psilocybe chrysocystidiata*** Singer. *Beih. Sydowia* 7: 82 (1973).
Dist.: BE. Coll. & Num. & Herbaria: R. Singer B 1747 (BAFC, type). Ref.: Coimbra (2015), Singer (1973).
- Psilocybe februaryia*** Singer. *Fieldiana, Bot.* 21: 108 (1989).

Dist.: LP. Coll. & Num. & Herbaria: R. Singer B 976 (LIL, type). Ref.: Coimbra (2015), Singer (1989). Notes: MH.

Psilocybe mammillata (Murrill) A.H. Sm. *Mycologia* 40(6): 700 (1948).

Bas: *Psathyra mammillata* Murrill (1918).

Dist.: NI. Coll. & Num. & Herbaria. Ref.: Coimbra (2015), Guzmán (1983), Guzmán et al. (1998).

Notes: CNI, HNI, NNI.

Psilocybe subcubensis Guzmán. *Mycotaxon* 7(2): 248 (1978).

Dist.: NI. Coll. & Num. & Herbaria. Ref.: Coimbra (2015), Guzmán et al. (1998). Notes: CNI, HNI, NNI.

Psilocybe yungensis Singer & A.H. Sm. *Mycologia* 50(1): 142 (1958).

= *Psilocybe acutissima* R. Heim (1959), *Psilocybe chiapanensis* Guzmán (1995), *Psilocybe isauroi* Singer (1959), *Psilocybe subyungensis* Guzmán (1978), *Psilocybe yungensis* var. *diconica* Singer & A.H. Sm. (1958).

Dist.: LP. Coll. & Num. & Herbaria: R. Singer B 648, 651 (MICH, type). Ref.: Coimbra (2015), Singer & Smith (1958).

Inocybaceae

Crepidotus (Fr.) Staude.

Crepidotus albidus var. ***boliviae*** Singer. *Beih. Nova Hedwigia* 44: 478 (1973).

Dist: LP. Coll. & Num. & Herbaria: R. Singer B 1335 (BAFC, type), B 1404 (BAFC), B 1022(BAFC). Ref: Bandala & Montoya (2000), Singer (1973b).

Crepidotus fulvifibrillosus Murrill. *N. Amer. Fl. (New York)* 10(3): 153 (1917).

= *Crepidotus applanatus* var. *fulvifibrillosus* (Murrill) Pilát (1948), *Crepidotus fulvifibrillosus* var. *meristocystis* (Singer) E. Horak. (1980), *Crepidotus nephrodes* var. *meristocystis* Singer (1954).

Dist: LP. Coll. & Num. & Herbaria: R. Singer B 1186 (BAFC). Ref: Singer (1973b).

Crepidotus martinii Singer. *Mycologia* 47(5): 775 (1955).

Dist: LP. Coll. & Num. & Herbaria: R. Singer B 1120 (BAFC), B 1427(BAFC). Ref: Singer (1973b).

Crepidotus sublevisporus Singer in Singer & Digilio. *Lilloa* 25: 410 (1952).

Dist: LP. Coll. & Num. & Herbaria: R. Singer B 989 (BAFC), B 1404 (LIL). Ref: Singer (1973b).

Crepidotus uber (Berk. & M.A. Curtis) Sacc. *Syll. fung.* (Abellini) 5: 878 (1887).

Bas: *Agaricus uber* Berk. & M.A. Curtis (1860).

Dist: LP. Coll. & Num. & Herbaria: R. Singer B 682 (BAFC). Ref: Singer (1973b).

Crepidotus yungicola Singer. *Beih. Nova Hedwigia* 44: 480 (1973).

Dist: LP. Coll. & Num. & Herbaria: R. Singer B 1335 (BAFC, type), B 1422 (BAFC). Ref: Singer (1973b).

***Inocybe* (Fr.) Fr.**

Inocybe matrisdei Singer. *Sydowia* 15(1-6): 112 (1962b).

= *Astrosporina matrisdei* (Singer) Raithelh. (1995).

Dist.: PA. Coll. & Num. & Herbaria: R. Singer B 2285 (LIL, type). Ref.: Singer (1962ba).

***Phaeomarasmius* Scherff.**

Phaeomarasmius nebularium Singer. *Sydowia* 15(1-6): 75 (1962b).

Dist.: LP. Coll. & Num. & Herbaria: R. Singer B 637 (LIL, type). Ref.: Singer (1961).

Phaeomarasmius spadiceospinulosus Singer. *Beih. Sydowia* 7: 88 (1973).

Dist.: LP. Coll. & Num. & Herbaria: R. Singer B 1047 (BAFC, type). Ref.: Singer (1973).

***Simocybe* P. Karst.**

Simocybe amazonica Singer. *Beih. Nova Hedwigia* 44: 516 (1973).

Dist.: BE. Coll. & Num. & Herbaria: R. Singer B 2319 (LIL, type). Ref.: Singer (1973).

Simocybe coroicensis Singer. *Beih. Nova Hedwigia* 44: 516 (1973).

Dist.: LP. Coll. & Num. & Herbaria: R. Singer B 999 (F, type). Ref.: Singer (1973 b).

Simocybe praeandina (Singer) Singer. *Sydowia* 15(1-6): 74 (1962).

= *Naucoria praeandina* Singer (1950).

Dist.: LP. Coll. & Num. & Herbaria: R. Singer B 1094 (F). Ref: Singer (1973b).

Psathyrellaceae***Psathyrella* (Fr.) Quél.**

Psathyrella palmigena (Berk. & M.A. Curtis) Guzmán. *Mycotaxon* 6(3): 473 (1978).

Bas: *Agaricus palmigena* Berk. & M.A. Curtis (1868).

= *Deconica palmigena* (Berk. & M.A. Curtis) Singer (1951), *Psilocybe palmigena* (Berk. & M.A. Curtis) Sacc. (1887).

Dist.: NI. Coll. & Num. & Herbaria: J. Gomez & Moreno-Arroyo (AMSS 03). Ref.: Moreno-Arroyo et al. (2001). Notes: NNI.

Strophariaceae***Melanotus* Pat.**

Melanotus heteroloma Singer. *Fieldiana, Bot.* 21: 110 (1989).

Dist.: LP. Coll. & Num. & Herbaria: R. Singer B 867 (BAFC, type). Ref.: Singer (1989). Notes: Species of *Melanotus* were transferred to *Deconica* (Noordeloos, 2011), however we cannot determine if this species belong to this genus.

Melanotus matrisdei Singer. *Fieldiana, Bot.* 21: 111 (1989).

Dist: PA. Coll. & Num. & Herbaria: R. Singer B 2313 (BAFC, type) and (LIL, isotype). Ref.: Coimbra (2015), Singer (1989). Notes: It is not clear if this species also belong to genus *Deconica*.

Incertae sedis

Panaeolus (Fr.) Quél.

Panaeolus cyanescens Sacc. *Syll. fung.* (Abellini) 5: 1123 (1887).

= *Agaricus cyanescens* Berk. & Broome (1871), *Copelandia cyanescens* (Sacc.) Singer (1951).

Dist.: BE. Coll. & Num. & Herbaria: Farr 20. Ref.: Farr & Stevenson (1963). Notes: HNI.

[b] Pink spored taxa

Entolomataceae

Clitopilus (Fr. ex Rabenh.) P. Kumm.

Clitopilus galerinoides (Singer) Noordel. & Co-David. *Persoonia* 23: 161 (2009).

Bas: *Rhodocybe galerinoides* Singer (1962b).

Dist: BE. Coll. & Num. & Herbaria: R. Singer B 1973 (LIL, type). Ref.: Singer (1962b).

Clitopilus lactariiformis (Singer) Noordel. & Co-David. *Persoonia* 23: 162 (2009).

Bas: *Rhodocybe lactariiformis* Singer (1962b).

Dist: BE. Coll. & Num. & Herbaria: Singer B 2070 (LIL, type). Ref.: Singer (1962b).

Clitopilus laetus (Singer) Noordel. & Co-David. *Persoonia* 23: 162 (2009).

Bas: *Rhodocybe laeta* Singer (1962b).

Dist: BE. Coll. & Num. & Herbaria: R. Singer B 1951 (LIL, type). Ref.: Singer (1962b).

Clitopilus russularia (Singer) Noordel. & Co-David. *Persoonia* 23: 164 (2009).

Bas: *Rhodocybe russularia* Singer (1962b).

Dist: BE. Coll. & Num. & Herbaria: R. Singer B 1709 (LIL, type). Ref.: Singer (1962b).

Entoloma P. Kumm.

Entoloma dragonosporum (Singer) E. Horak. *Sydowia* 29(1-6): 292 (1977).

Bas: *Rhodophyllus dragonosporus* Singer (1965).

= *Inocephalus dragonosporus* (Singer) T.J. Baroni & Largent (2008).

Dist.: BE. Coll. & Num. & Herbaria: R. Singer B 2106 (BAFC) and (LIL, type). Ref.: Mueller et al. (1997), Singer (1958). Notes: MH.

Entoloma schistaceum (Mont.) Sacc. *Syll. fung.* (Abellini) 5: 687 (1887).

Bas: *Agaricus schistaceus* Mont. (1856).

Dist.: LP. Coll. & Num. & Herbaria: Weddell. Ref.: Stevenson & Cárdenas (1949). Notes: NNI, HNI.

Rhodocybe Maire.

Rhodocybe lignicola Singer. *Sydowia* 15(1-6): 80 (1962b).

Dist.: LP. Coll. & Num. & Herbaria: R. Singer B 1495 (LIL, type). Ref.: Mueller et al. (1997), Singer (1958). Notes: MH.

Pluteaceae

Pluteus Fr.

Pluteus allostipitatus (Dennis) Singer. *Lloydia* 21: 240 (1959).

Bas: *Pluteus spilopus* var. *allostipitatus* Dennis (1953).

= *Pluteus allostipitatus* var. *poliobasis* Singer (1973).

Dist.: BE. Coll. & Num. & Herbaria: R. Singer B 2065, 2123 (LIL). Ref.: Singer (1962ba).

Pluteus amazonicus Singer. *Fieldiana, Bot.* 21: 93 (1989).

Dist.: BE. Coll. & Num. & Herbaria: R. Singer B 1587 (LIL). Ref.: Mueller et al. (1997), Singer (1962ba).

Pluteus ampicystis Singer. *Lloydia* 21: 213 (1959).

Dist.: PA. Coll. & Num. & Herbaria: R. Singer B 2249 (LIL, type). Ref.: Farr & Stevenson (1963), Singer (1959).

Pluteus angustisporus Singer. *Lloydia* 21(4): 206 (1959).

Dist.: PA. Coll. & Num. & Herbaria: R. Singer B 2497 (LIL, type). Ref.: Farr & Stevenson (1963), Mueller et al. (1997).

Pluteus beniensis Singer. *Lloydia* 21: 285 (1959).

Dist.: BE. Coll. & Num. & Herbaria: R. Singer B 2346 (LIL, type). Ref.: Farr & Stevenson (1963).

Pluteus burserae Singer. *Lloydia* 21: 268 (1959).

Dist.: LP. Coll. & Num. & Herbaria: R. Singer B 1061 (LIL, type). Ref.: Farr & Stevenson (1963), Singer (1958). Notes: MH.

Pluteus circumscissus Singer. *Lloydia* 21: 226 (1959).

Dist.: LP. Coll. & Num. & Herbaria: R. Singer B 12185 (LIL, type). Ref.: Farr & Stevenson (1963), Mueller et al. (1997), Singer (1958).

Pluteus compressipes Murrill. *N. Amer. Fl.* (New York) 10 (2): 137 (1917).

Dist.: BE. Coll. & Num. & Herbaria: R. Singer B 2337 (LIL), 2338 (LIL). Ref.: Mueller et al. (1997), Singer (1958).

Pluteus eliae Singer. *Lloydia* 21: 290 (1959).

Dist.: PA. Coll. & Num. & Herbaria: R. Singer & E. R. de la Sota B 2193 (LIL, type). Ref.: Farr & Stevenson (1963), Mueller et al. (1997). Notes: MH.

Pluteus eugraptus (Berk. & Br.) Sacc. *Syll. fung.* (Abellini) 5: 678 (1887).

Bas: *Agaricus eugraptus* Berk. & Broome (1871).

Dist.: BE, LP. Coll. & Num. & Herbaria: R. Singer B 2132 (LIL), 1196 (LIL). Ref.: Mueller et al. (1997).

Pluteus eupigmentatus Singer. *Lloydia* 21: 223 (1959).

Dist.: LP. Coll. & Num. & Herbaria: R. Singer B 850 (LIL). Ref.: Singer (1962ba). Notes: NVP.

Pluteus globiger Singer. *Lilloa* 25: 266 (1952).

Dist.: LP. Coll. & Num. & Herbaria: R. Singer B 12185 (LIL). Ref.: Mueller et al. (1997), Singer (1958).

Pluteus jamaicensis Murrill. *Mycologia* 3(6): 278 (1911).

= *Pluteus aethalus* var. *jamaicensis* (Murrill) Dennis (1953), *Pluteus fluminensis* Singer (1959).

Dist.: LP. Coll. & Num. & Herbaria: R. Singer B 1215 (LIL). Ref.: Mueller et al. (1997), Singer (1958).

Pluteus laetifrons (Berk. & M.A. Curtis) Sacc. *Syll. fung.* (Abellini) 5: 677 (1887).

Bas: *Agaricus laetifrons* Berk. & M.A. Curtis (1868).

Dist.: LP. Coll. & Num. & Herbaria: R. Singer B 889 (LIL, type). Ref.: Farr & Stevenson (1963), Mueller et al. (1997), Singer (1958).

Pluteus laetus Singer. *Lloydia* 21: 274 (1959).

= *Pluteus laetus* var. *mixtus* Singer (1962b).

Dist.: BE. Coll. & Num. & Herbaria: R. Singer B 2483 (LIL, type). Ref.: Farr & Stevenson (1963), Mueller et al. (1997), Singer (1962ba).

Pluteus neophlebophorus Singer. *Lloydia* 21: 262 (1959).

= *Pluteus neophlebophorus* f. *olivaceogriseus* Singer (1959), *Pluteus neophlebophorus* f. *sublongistriatus* Singer (1959).

Dist.: BE, PA. Coll. & Num. & Herbaria: R. Singer B 2128 (LIL, type). Ref.: Farr & Stevenson (1963), Mueller et al. (1997).

Pluteus oligocystis Singer. *Lloydia* 21: 266 (1959).

= *Pluteus oligocystis* var. *dennisii* Singer (1959), *Pluteus psychiophorus* var. *dennisii* Singer (1956) Dist.: LP. Coll. & Num. & Herbaria: R. Singer B 1420 (LIL, type). Ref.: Farr & Stevenson (1963), Mueller et al. (1997), Singer (1962ba). Notes: MH.

Pluteus pluvialis Singer. *Lloydia* 21: 234 (1959).

Dist.: PA. Coll. & Num. & Herbaria: R. Singer B 2194 (LIL, type). Ref.: Farr & Stevenson (1963), Mueller et al. (1997), Singer (1958). Notes: MH.

Pluteus riberaltensis Singer. *Lloydia* 21: 255 (1959).

= *Pluteus riberaltensis* var. *conquistensis* Singer (1959), *Pluteus riberaltensis* var. *missionensis* Singer (1962b).

Dist.: BE, PA. Coll. & Num. & Herbaria: R. Singer B 2336 (LIL), R. Singer B 2177 (LIL, type). Ref.: Farr & Stevenson (1963), Mueller et al. (1997).

Pluteus rubrotomentosus Singer. *Lloydia* 21: 228 (1959).

Dist.: LP. Coll. & Num. & Herbaria: R. Singer B 1412 (LIL, type). Ref.: Farr & Stevenson (1963), Mueller et al. (1997).

Pluteus rugososulcatus Singer. *Lloydia* 21: 250 (1959).

Dist.: LP. Coll. & Num. & Herbaria: R. Singer B 609 (LIL, type). Ref.: Farr & Stevenson (1963), Mueller et al. (1997), Singer (1958). Notes: MH.

Pluteus sergii Singer. *Lloydia* 21: 253 (1959).

Dist.: PA. Coll. & Num. & Herbaria: R. Singer B 2513 (LIL, type). Ref.: Farr & Stevenson (1963), Mueller et al. (1997). Notes: MH.

Pluteus sublaevigatus (Singer) Menolli & Capelari. *Mycology* 1(2): 148 (2010).

= *Pluteus chrysophlebius* subsp. *sublaevigatus* Singer (1959).

Dist.: LP. Coll. & Num. & Herbaria: R. Singer B 1147 (LIL, type). Ref.: Farr & Stevenson (1963), Mueller et al. (1997).

Pluteus subminutus Singer. *Lloydia* 21: 269 (1959).

Dist.: LP. Coll. & Num. & Herbaria: R. Singer B 1419 (LIL, type). Ref.: Farr & Stevenson (1963), Mueller et al. (1997).

Pluteus substigmaticus Singer. *Lloydia* 21: 273 (1959).

Dist.: PA. Coll. & Num. & Herbaria: R. Singer B 2183 (LIL, type). Ref.: Farr & Stevenson (1963), Mueller et al. (1997), Singer (1958). Notes: MH.

Pluteus variipes var. *variipes* Singer. *Trans. Br. Mycol. Soc.* 39(2): 218 (1956).

Dist.: LP. Coll. & Num. & Herbaria: R. Singer B 1425 (LIL). Ref.: Mueller et al. (1997), Singer (1958).

Pluteus xylophilus var. *xylophilus* (Speg.) Sing. *Lilloa* 22: 405 (1951).

Bas: *Entoloma xylophilum* Speg. (1926).

Dist.: BE. Coll. & Num. & Herbaria: R. Singer B 2335 (LIL). Ref.: Mueller et al. (1997), Singer (1958).

Pluteus yungensis Singer. *Lloydia* 21: 232 (1959).

Dist.: LP. Coll. & Num. & Herbaria: R. Singer B 777 (LIL, type). Ref.: Farr & Stevenson (1963), Mueller et al. (1997). Notes: MH.

Discussion

The order *Agaricales* is composed of approximately 26 families, 347 genera and 9387 species worldwide (Kirk et al. 2008), being one of the most diverse groups within *Basidiomycota*. The checklist of *Agaricales* from Bolivia is the beginning of research for revealing the fungal richness and the biodiversity of the country, which is practically unknown. In Argentina, for example, the order *Agaricales* is one of the best studied groups with updated and vast bibliography regarding the taxonomy of this group (Albertó et al. 2000, Wright & Albertó 2002, Lechner & Albertó 2000, Lechner et al. 2006, Lechner et al. 2004, 2005, Niveiro et al. 2010, Niveiro & Alberto 2012a, 2012b, 2012c, 2012d, 2013a, 2013b, 2014). Besides, many countries of the Neotropics have documented the richness of *Agaricales* as a baseline of research, for example: for Argentina approximately 221 species of *Agaricales* (Niveiro & Alberto 2012, 2013a) were documented, for Brazil, 926 species of *Agaricales* (Capelari et al. 2015), for Colombia, 537 species of *Agaricales* (Vasco-Palacios & Franco-Molano 2013), for Chile approximately 150 species of *Agaricales* (Lazo 2012), for Panamá approximately 75 species of *Agaricales* (Piepenbring 2007), and for Paraguay, 125 species of agaricoid mushrooms are documented (Flecha-Rivas & Niveiro 2018).

Most collecting trips have been carried out in the Andean region of Bolivia, probably due to the easy access to the forests from the cities; hence, nearly 95% of all species of *Agaricales* known for Bolivia are reported for this region. Collecting trips have also been carried out in Yungas-Sector of the Cuenca Alta del Beni, in the context of projects of R. Singer. Bolivia has nine departments, but collections of *Agaricales* have only been reported from six departments (Table 2), and there are no records in

isolated areas of the Amazon, Altiplano areas and Salar regions. For three species of *Agaricales* (Table 2), there is only one report showing the need of more fieldwork for species of *Agaricales*.

A large number of collections made by undergraduate students probably correspond to new or unreported species for Bolivia, but these results have not been published and are therefore not considered in this work (Sucasaca-Torrez 2009, Arce 2011, Tarqui-Aruquipa 2016). Many collections deposited in Bolivian fungal reference collections (USZ and LPB) are still waiting to be studied, e.g., there are 241 specimens of unidentified fungi deposited in the LPB collection (Meneses et al. 2012).

We suppose that the diversity of fungi will be specific to the ecosystems of altitude in the case of the Altiplano region of Bolivia (Oruro and Potosi departments) with wetlands, which is interesting because this type of ecosystem has been little studied in South America (Table 2), and Bolivia report high endemism levels of vascular flora for this region (PNUMA 2011, Ministerio de medio ambiente y agua 2014). In Chuquisaca, on the other hand, we believe that a high richness of fungi exists, as this department, as well as the Cochabamba department, are located at the bottom of the Bolivian mesothermal valleys and has notable altitudinal gradients, where there is significant biodiversity in general terms.

Considering the number of species that have been reported for neighboring countries is superior to the currently reported for Bolivia, and considering the high diverse of ecosystems unexplored for Bolivian fungi and the few collection trips made currently, results suggest the mycological studies in the country are still in an incipient state such as Piepenbring (2003a), Rocabado et al. (2007) and Melgarejo (2015) suggested in previous works. It is necessary to increase efforts to explore the mycological diversity in Bolivia, mainly in the unexplored regions.

This work constitutes a first approach to a general overview of the richness and distribution of *Agaricales* of Bolivia and a baseline for future studies in the region.

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Literature cited

Albertó E. Sannazzaro A. & Moreno G. 2000. *Agaricus heinemanii* a new species from Argentina. *Micologia e Vegetazione Mediterranea* 15(1): 71-78.

Arce W. 2011. *Macrohongos: riqueza, usos y sustrato en La Asunta (Sud Yungas, La Paz)*. Tesis de licenciatura. Universidad Mayor de San Andrés. La Paz, Bolivia. 65 pp.

Bandala VM. & Montoya L. 2000. A taxonomic revision of some American *Crepidotus*. *Mycologia* 92(2):341-353. <https://doi.org/10.1080/00275514.2000.12061165>

CABI Bioscience. CBS. Landcare Research. 2019. Index fungorum. Available in: <http://www.indexfungorum.org/> (Accessed on July 2019).

Calonge FD. Moreno-Arroyo B. & Gómez J. 2000. Aportación al conocimiento de los *Gasteromycetes*, *Basidiomycotina* de Bolivia (América del Sur). *Geastrum ovalisporum* sp. nov. Boletín de la Sociedad Micológica de Madrid 25: 271-276.

Capelari M. Cortez VG. Neves MA. Baseia IG. Wartchow F. Menolli Júnior N. Karstedt F. Oliveira JJS. & Urrea-Valencia S. 2015. *Agaricales* in Lista de Espécies da Flora do Brasil. Jardim Botânico do Rio de Janeiro. Available in <http://floradobrasil.jbrj.gov.br/jabot/FichaPublicaTaxonUC/FichaPublicaTaxonUC.do?id=FB12> (Accessed on July 2019).

Coimbra VRM. 2015. Checklist of Central and South American *Agaricales* (*Basidiomycota*) II: *Strophariaceae*. Mycosphere 6(4): 441-458. DOI 10.5943/mycosphere/6/4/6.

Dennis RWG. 1958. *Ascomycetes* collected by Dr. R. Singer in Bolivia and North Argentina. Kew Bulletin 13(1): 151-154.

Farr ML. & Stevenson JA. 1963. Eine Ergänzungsliste bolivianischer Pilze. Sydowia 17: 37-69.

Flecha-Rivas A. & Niveiro N. 2018. Checklist of the agaricoid fungi from Paraguay. Mycotaxon 133: 729.

Fries R.E. 1909. Ueber einige Gasteromyceten aus Bolivien und Argentinien. Arkiv für Botanik 8: 1-34.

Guzmán G. 1983. The genus *Psilocybe*. A systematic revision of the known species including the history, distribution and chemistry of the hallucinogenic species. Beihefte zur Nova Hedwigia 74.

Guzmán G. Allen JW & Gartz J. 1998. A worldwide geographical distribution of the neurotrophic fungi, an analysis and discussion. Annali dei Musei Civico di Rovereto 14: 189-280.

Hawksworth D. & Lücking R. 2017. Fungal diversity revisited 2.2 to 3.8 million species. Microbiology Spectrum 5: FUNK-0052-2016. DOI:10.1128/microbiolspec.FUNK-0052-2016

Hawksworth D. 1991. The fungal dimension of biodiversity: magnitude, significance, and conservation. Mycological Research 95: 641-655.

Heinemann P. 1962b. Agarici Austro Americani: II *Agaricus* de Bolivie. Bulletin du Jardin botanique de l'État a Bruxelles 32(1): 1-21.

Hibbett DS. Binder M. Bischoff JF. Blackwell M. Cannon PF. Eriksson OE. & Zhang N. 2007. A higher-level phylogenetic classification of the Fungi. Mycological Research 111(5): 509-547. DOI: <https://doi.org/10.1016/j.mycres.2007.03.004>

International Plant Names Index. 2019. Real Jardín Botánico de Kew, Herbario de la Universidad de Harvard y Herbario nacional Australiano (eds.). Available in <https://www.ipni.org/> (Accessed on May 2019)

Jackson HS. 1926. The rusts of South America based on the Holway collections: I. Mycologia 18(4): 139-162.

Jackson HS. 1927. The rusts of South America based on the Holway collections: II. Mycologia 9(2): 51-65.

Jackson HS. 1931a. The rusts of South America based on the Holway collections: III. Mycologia 23(2): 96-116.

Jackson HS. 1931b. The rusts of South America based on the Holway collections: IV. *Mycologia* 23(5): 332-364.

Jackson HS. 1931c. The rusts of South America based on the Holway collections: V. *Mycologia* 23(6): 463-503.

Jackson HS. 1932. The rusts of South America based on the Holway collections: VI. *Mycologia* 24(1): 62-186.

Jørgensen PM, Nee MH, & Beck ST. 2014. Missouri Botanical Garden. Herbario Nacional de Bolivia. Herbario Nacional Forestal Martín Cárdenas. Herbario del Oriente Boliviano. New York Botanical Garden. Catálogo de plantas vasculares de Bolivia. Volumen I y II. Missouri Botanical Gardens Press. St. Louis. 1741 pp.

Jørgensen PM, Ulloa-Ulloa C, León B, León-Yáñez S, Beck S, Nee M, Zarucchi JL, Celis M, Bernal R, & Gradstein R. 2011. Patrones regionales de diversidad y endemismo en plantas vasculares. In: Herzog S, Martinez R, Jorgensen P & Tiessen H (Eds). *Climate Change and biodiversity in the Tropical Andes*. Inter-American Institute of Global Change Research (IAI) and Scientific Committee on Problems of the Environment (SCOPE), pp 221-234. Paris, France. 426 pp.

Kirk P, Cannon M, David PF & Stalpers JA. 2001. *Ainsworth & Bisby's Dictionary of the Fungi*. CAB International, Surrey UK. 771 pp.

Lawrence G. & Hunt Botanical Library. 2019. Carnegie Mellon University. Available in <http://www.huntbotanical.org/databases/show.php?1> (Accessed on December 2018).

Lazo W. 2012. *Hongos de Chile Atlas Micológico*. Facultad de Ciencias de la Universidad de Chile. Editorial Universitaria. Santiago de Chile, Chile. 315 pp.

Lechner BE, & Albertó E. 2000. *Pleurotus lindquistii* is a *Lentinus*. *Mycotaxon* 76: 97-104.

Lechner BE, Wright JE & Albertó E. 2004. The genus *Pleurotus* in Argentina. *Mycologia* 96(4): 844-857.

Lechner BE, Wright JE & Albertó E. 2005. The genus *Pleurotus* in Argentina: mating tests. *Sydowia* 57(2): 233-245.

Lechner BE, Wright JE & Popoff O. 2006. New taxa and new records for Argentina of fungi from Iguazú National Park, Misiones. *Fungal Diversity* 21: 131-139.

Melgarejo E. 2015. Algunos usos de los hongos silvestres de Bolivia en el contexto sudamericano. *Kempffiana* 11(1): 48-65.

Meneses RI, Beck S, García E, Mercado M, Araujo A, & Serrano P. 2015. Flora of Bolivia – where do we stand? *Rodriguésia* 66(4): 1025-1031. DOI: <http://dx.doi.org/10.1590/2175-7860201566406>.

Meneses RI, Gonzales J, Aldana C, Churchill S, & Rodriguez P. 2012. Las pteridofitas y las plantas no vasculares de Madidi. In: Servicio Nacional de Áreas Protegidas. *Conocimientos científicos y prioridades de investigación en el Parque Nacional y Área Natural de Manejo Integrado Madidi*, pp 14-29. Eds. Salinas E. & Wallace R. B. La Paz, Bolivia. 176 pp.

Menolli Junior N, Meijer AAR, & Capelari M. 2015. The genus *Pluteus* (*Pluteaceae*, *Agaricales*) from the state of Paraná, Brazil. *Nova Hedwigia* 100: 101-157. DOI: [10.1127/nova_hedwigia/2014/0224](https://doi.org/10.1127/nova_hedwigia/2014/0224).

Ministerio de Medio Ambiente y Agua. 2014. IV Informe nacional convenio de las naciones unidas

sobre la diversidad biológica. Viceministerio de Medio Ambiente, Biodiversidad, Cambios Climáticos y de Gestión y Desarrollo Forestal. La Paz, Bolivia. 151 pp.

Moreno-Arroyo B. Ortega-Díaz A. Esteve-Raventós F. & Gómez J. 2001. Brevi note tassonomiche su alcuni macromiceti della Bolivia. Bolletino del Gruppo Micologico G. Bresadola-Nouva serie BGMB 44(3): 45-62.

Mueller G. Wu QX Ginns JH. & Redhead. SA. 1997. The publications of Rolf Singer. Fieldiana, Botany 38: 101-112.

Navarro G. & Maldonado M. 2011. Geografía de Bolivia. Ed. Centro de Ecología Simón I. Patiño. Santa Cruz, Bolivia. 589 pp.

Navarro G. 2015. La vegetación de Bolivia. Ed. Centro de Ecología Simón I. Patiño. Santa Cruz, Bolivia. 779 pp.

Niveiro N. & Albertó E. 2012a. Checklist of the argentine *Agaricales* 1. *Amanitaceae*, *Pluteaceae* and *Hygrophoraceae*. Mycotaxon 119: 493-494. DOI: <https://doi.org/10.5248/119.493>.

Niveiro N. & Albertó E. 2012b. Checklist of the argentine *Agaricales* 2. *Coprinaceae* & *Strophariaceae*. Mycotaxon 120: 505. DOI: <http://dx.doi.org/10.5248/119.493>.

Niveiro N. & Albertó E. 2012c. Checklist of the argentine *Agaricales* 3. *Bolbitiaceae* and *Crepidotaceae*. Mycotaxon 120: 505. DOI: <http://dx.doi.org/10.5248/119.505>.

Niveiro N. & Albertó E. 2012d. Checklist of the argentine *Agaricales* 4. *Tricholomataceae* & *Polyporaceae*. Mycotaxon 121: 499-500. DOI: <http://dx.doi.org/10.5248/121.499>.

Niveiro N. & Albertó E. 2013a. Checklist of the argentine *Agaricales* 5. *Agaricaceae*. Mycotaxon 122: 491. DOI: <http://dx.doi.org/10.5248/122.491>.

Niveiro N. & Albertó E. 2013b. Checklist of the argentine *Agaricales* 6. *Paxillaceae*, *Gomphidiaceae*, *Boletaceae* and *Russulaceae*. Mycotaxon 123: 491. DOI: <http://dx.doi.org/10.5248/123.491>.

Niveiro N. & Albertó E. 2014. Checklist of the argentine *Agaricales* 7. *Cortinariaceae* and *Entolomataceae*. Checklist 10(1): 72-96. DOI: <http://dx.doi.org/10.15560/10.1.72>

Niveiro N. Popoff O. & Albertó E. 2010. Contribución al conocimiento de los *Agaricales s.l.* de la Selva Paranaense Argentina. Boletín de la Sociedad Argentina de Botánica 45 (1-2): 17-27.

Pasaca F. Gonzales E. & Paco V. 2018. Hongos del suelo de la región central del altiplano Boliviano. Cooperación Suiza en Bolivia. Oruro, Bolivia. 223 pp.

Perera TC. Izarduy CC. Languasco MP. & Hladki AI. 2017. Especímenes Tipo faltantes de la colección histórica de Rolf Singer. Miscelanea 138: 3-12.

Piepenbring M. 2002 Diversity, taxonomy, and ecology of plant parasitic smut fungi in Bolivia. Ecología en Bolivia 37: 49-58.

Piepenbring M. 2003a. Fungi. In: Ibisch P. Biodiversidad: La riqueza de Bolivia. Estado de conocimiento y conservación, 90-96 pp. Eds. Merida G. FAN. Santa Cruz de la Sierra, Bolivia. 638 pp.

Piepenbring M. 2003b. Smut fungi (*Ustilaginomycetes* p.p. and *Microbotryales*, *Basidiomycota*). Flora Neotropica Vol. 86. Eds. The Organization for Flora Neotropica. New York Botanical Garden Press. New York, USA. 291 pp.

- Piepenbring M. 2007. Inventorying the fungi of Panama. *Biodiversity and Conservation* 16: 73-84. DOI: 10.1007/s10531-006-9051-8.
- PNUMA. 2011. *Perspectivas del Medio Ambiente en el Sistema Hídrico Titicaca-Desaguadero-Salar de Coipasa (TDPS) – Geo Titicaca*. 187 pp.
- Rocabado D. Wright JE. Maillard O. & Munchenik NF. 2007. Catálogo de los *Gasteromycetes* (Fungi: *Basidiomycotina*) de Bolivia. *Kempffiana* 3(1): 3-13.
- Singer R. & Smith AH. 1958. New species of *Psilocybe*. *Mycologia* 50: 141-142.
- Singer R. 1958. Monographs of South American Basidiomycetes, especially those of the east slope of the Andes and Brazil. I. The genus *Pluteus* in South America. *Lloydia* 21: 195-299.
- Singer R. 1960. Monographs of South American *Basidiomycetes*, especially those of the East Slope of the Andes and Brazil. III: Reduced marasmioid genera in South America. *Sydowia* 14(1-6): 258-282.
- Singer R. 1962a. Monographs of South American *Basidiomycetes*, especially those of the East Slope of the Andes and Brazil. IV *Inocybe* in the Amazon region, with a supplement to part 1 (*Pluteus* in South America). *Sydowia* 15(1-6): 112-132.
- Singer R. 1962b. Diagnoses fungorum novorum Agaricalium II. *Sydowia*. 15(1-6): 45-83.
- Singer R. 1973. Diagnoses fungorum novorum Agaricalium III. *Beihefte zur Sydowia* 7: 1-106.
- Singer R. 1973b. The genera *Marasmiellus*, *Crepidotus* and *Simocybe* in the Neotropics. *Beihefte zur Nova Hedwigia* 44: 1-517.
- Singer R. 1989. New taxa and new combinations of *Agaricales* (Diagnoses fungorum Novorum Agaricalium IV). *Fieldiana, Botany* 21: 1-133.
- Smith AH. & Singer R. 1964. A monograph of the genus *Galerina* Earle. Hafner Publishing Company. New York, USA. 384 pp.
- Stevenson JA. & Cárdenas M. 1949. Lista preliminar de los hongos de Bolivia. *Lilloa* 21: 77-134.
- Suárez VL. & Wright JE. 1996. South American *Gasteromycetes* V: The genus *Morganella*. *Mycologia* 88(4): 655-662.
- Sucasaca-Torrez J. 2009. Identificación y caracterización de especies nativas de hongos comestibles en humedales y bosques en la provincia Camacho, Departamento de La Paz. Tesis de Licenciatura. Facultad de Ingeniería Agronomía. Universidad Mayor de San Andrés. La Paz, Bolivia. 96 pp.
- Tarqui-Aruquipa N. 2016. Caracterización de los hongos en parcelas en descanso y su relación con la temperatura en tres comunidades de Patacamaya-La Paz. Tesis de Licenciatura. Facultad de Agronomía. Universidad Mayor de San Andrés. La Paz, Bolivia. 119 pp.
- Thiers B. (continuously updated). 2019. Index Herbariorum: a global directory of public herbaria and associated staff. New York Garden's Virtual Herbarium. Available in <http://sweetgum.nybg.org/science/ih/> (Accessed on May 2019).
- Vánky K. 2009. Taxonomic studies on *Ustilaginomycetes*. *Mycotaxon* 110: 289-324. DOI: <https://doi.org/10.5248/110.289>.

Vánky K. Shivas RG. McTaggart AR. Vánky C. & Arce W. 2009. Additions to the smut fungi (*Ustilaginomycetes*) of Bolivia. *Mycologia Balcanica* 6: 99-105.

Vasco-Palacios A. & Franco-Molano AE. 2013. Diversity of Colombian macrofungi (*Ascomycota-Basidiomycota*). *Mycotaxon* 121: 4. DOI: <http://dx.doi.org/10.2307/3756459>.

Wright JE. & Albertó E. 2002. Guía de los hongos de la Región Pampeana: I: Hongos con laminillas. *Literature of Latin America*. Buenos Aires, Argentina. 279 pp.

Young BE. 2007. Distribución de las especies endémicas en la vertiente oriental de los Andes en Perú y Bolivia. *NatureServe*. Virginia, USA. 92 pp.