

AGARICALES (BASIDIOMYCOTA) FUNGI IN THE SOUTH SHETLAND ISLANDS, ANTARCTICA

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Abstract: Fungi are the most important nutrient cycling organisms in any ecosystem, which is also the case in Antarctica. Among the species, the Agaricales (Basidiomycota), popularly known as mushroom has a reported presence in this continent, but with no monographic account done up to now. In field trips to Antarctica and especially to the South Shetland Archipelago, we collected specimens during a period of 25 years of study of this order and reviewed specimens from other collections to present a systematic account of the order. The collecting and studying of samples was done according to the usual methods in Agaricales modern taxonomy and the material was deposited in the HCB herbarium. The study of collections permits the recognition of 9 species of Agaricales from the area. *Leptoglossum lobatum*, *L. omnivorum* and *Simocybe antarctica* were collected for the first time in Elephant Island, Antarctica. Species are illustrated and a dichotomous key is proposed for the easy identification.

Keywords: Antarctica, fungi, taxonomy

Introduction

The South Shetland Archipelago is a group of 11 greater islands located at the Northern area of the Antarctic Peninsula, at ca. 800 km South of South America in an area called the Maritime Antarctic.

The Maritime Antarctic vegetation is basically composed of cryptogams (Bryophyta, Marchantiophyta, Lichens and Algae) and two species of flowering plants (Longton, 1985). Fungi are also very well represented, but only recently the group has been monographed (Onofre *et al.*, 2007), but with no mention of the macroscopic mushrooms of the Agaricales order.

The first revision on Antarctic fungi that included Agaricales was that of Pegler *et al.* (1980) who reported only two species in the South Shetland but with references to 13 species in Sub-Antarctic areas.

Gumińska *et al.* (1994) refers to the occurrence of 4 species (*Galerina pseudomycenopsis*, *Arrhenia salina*, *Omphalina antarctica* and *Omphalina pyxidata*) collected in the South Shetland but only sampled in Livingstone and King George Island.

This work deals with the species of Agaricales collected over 25 years of research activities in the South Shetland Islands and aims to monograph the order in the area.

Materials and Methods

The work was done on the South Shetland Archipelago, mainly in Elephant, Penguin, King George, Nelson and Deception Islands, Antarctica. The moss carpets were studied for the occurrence of ring forming fungi. The carpets chosen were entirely photographed, the photos mounted to create a map, drawing all the ring fungi found in its exact point of occurrence. The map was used to understand the fungi distribution.

Collections of mosses were taken to laboratory for identification and or maintenance in culture (humid chamber) for evaluation.

Results

Nine species of Agaricales were found in the South Shetland Islands (plus one introduced), keyed out and listed below

(Figure 1). There were found two species with smooth hymenophore and one with vein like gills, probably indicating an adaptation to cold environments. There were found more white spored agarics (6) than brown spored ones (4). *Galerina perrara* Sing. appears to be specific to *Chorisodontium acyphyllum*, being all the other non-substrate specific. *Sanionia uncinata* is the substrate most used among the moss species.

Key to South Shetland Agaricales:

- 1.1 Stipe absent or lateral; hymenophore completely smooth or with vein like gills or with intervenose lamellae.....2
- 1.2 Stipe central or somewhat eccentric; hymenophore characteristically lamellate4
- 2.1 Spores brown under the microscope*Simocybe antarctica*
- 2.2 Spores hyaline3
- 3.1 Pileus with up to 1,5 cm in diameter, with completely smooth hymenophore..... *Leptoglossum omnivorum*
- 3.2 Pileus with 2-10 mm in diameter; hymenophore with gill-like veins *Leptoglossum lobatum*
- 4.1 Spore print brown and spores brownish under the microscope5
- 4.2 Spore print with and spores hyaline under the microscope6
- 5.1 Pileus up to 8 mm in diameter, campanulate to convex; pleurocystidia absent*Galerina perrara*
- 5.2 Pileus up to 25 mm in diameter, campanulate to almost appanate; pleurocystidia present*Galerina moelleri*
- 6.1 Pileus translucent striate; hymenophore almost lamellate, with gill-like longitudinal elevations which are forked and anastomosed.....*Arrhenia salina*
- 6.2 Pileus translucent striate or not; hymenophore with well-developed lamellae.....7
- 7.1 Pileus fuliginous to black; lamellae concolorous but with darker border; spores ovoid*Omphalina antarctica*
- 7.2 Pileus yellowish-brown to pallid ochraceous; spores ovoid or not8
- 8.1 Pileus yellowish—brown, not sulcate when dry; lamellae concolorous*Omphalina pyxidata*
- 8.2 Pileus pallid ochraceous, translucent striate, strongly sulcate when dry; lamellae white to pallid yellowish.....
Lichenomphalia umbellifera

List of Agaricales Found in the South Shetland Islands:

- *Arrhenia salina* (Høiland) Bon & Courtecuisse, *Documents Mycol.*18(no. 69): 37. 1987. Fam.: Tricholomataceae. 42110 (HCB).
 - The specimens were found growing on *Sanionia uncinata* and *Hennediella heimii*. Found in King George (Gumińska *et al.*, 1994) and Elephant Islands.
- *Lichenomphalia umbellifera* (L. ex Fr.) Redhead, Lutzoni, Moncalvo & Vilgalys, *Mycotaxon* 83: 38 (2002). Fam.: Hygrophoraceae.
 - It was found in *Sanionia uncinata* carpets. It was reported in South Georgia by Øvstedal & Lewis Smith (2011). Registered as 30700 (HCB).
- *Omphalina antarctica* Sing.
 - Originally published by Singer (1957, 1969), the black basidiome color and the smaller pileus diameter are characteristic. It grows frequently on *Sanionia uncinata*. The species was cited by Putzke & Pereira (1996) to King George and Elephant Islands. Registered as 30701(HCB).
- *Omphalina pyxidata* (Bull. Ex Fr.) Quél. *Enchir. fung.* (Paris): 43. 1886.
 - On various moss species. It was reported on King George (Gumińska *et al.*, 1994) and on Elephant Islands. Registered as 30702 (HCB).
- *Galerina moelleri* Bas., *Persoonia* 1 (3): 310. 1960. Fam.: Strophariaceae. = *Pholiota pumila*(Fr.) Karst. ss. Molier.
 - Gumińska *et al.* (1994) consider this species synonymy of *Galerina pseudomycenopsis* Piłat apud Piłat et Nannfeldt. Registered as 15209 (HCB).
- *Galerina perrara* Sing., *Contr. Inst. Ant. Arg.* 71: 15. 1962. Fam.: Strophariaceae.
 - Found only on *Chorisodontium acyphyllum* and referred by Putzke & Pereira (1996). Registered as 15702 and 30703 (HCB).
- *Leptoglossum omnivorum* Agerer - *Trans. Br. mycol. Soc.*82(1): 184. 1984.Fam.:Tricholomataceae.
 - This species has up to 1,5 mm in diameter and a white cup shaped to appanate and sessile pileus, with

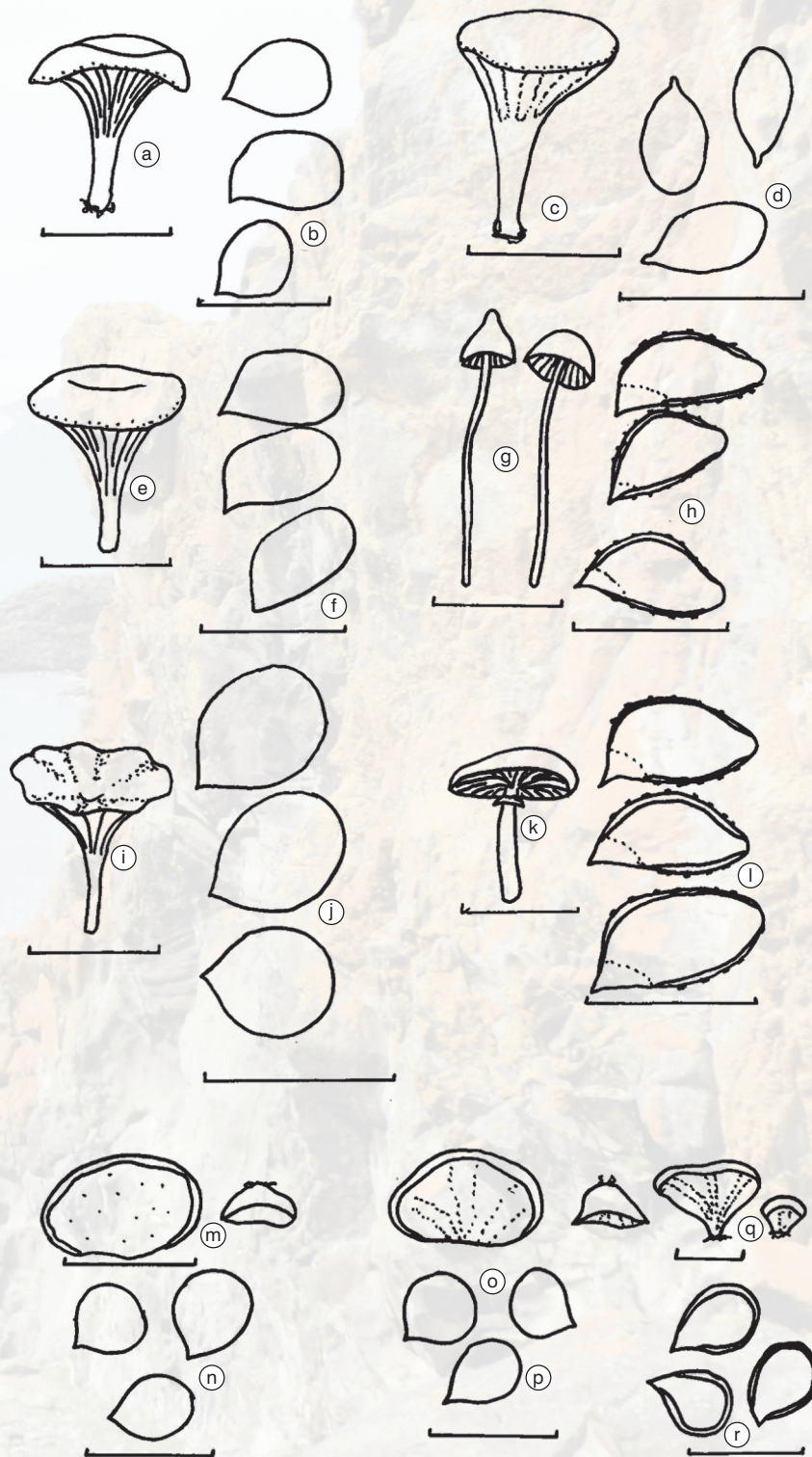


Figure 1. Agaricales found in the South Shetland Islands: a-b) *Omphalina antarctica* (a - basidiomes; b - spores); c-d) *Arrhenia salina* (c - basidiomes; d - spores); e-f) *Omphalina pyxidata* (e - basidiomes; f - spores); g-h) *Galerina perrara* (g - basidiomes; h - spores); i-j) *Lichenomphalia umbellifera* (i - basidiomes; j - spores); k-l) *Gerronema moelleri* (k - basidiomes; l - spores); m-n) *Leptoglossum omnivorum* (m - basidiomes; n - spores); o-p) *Leptoglossum lobatum* (o - basidiomes; p - spores); q-r) *Simocybe antarctica* (q - basidiomes; r - spores). Scale: 10 mm (a; c; e; g; i; k); 1 mm (m; o; q); 10 mm for all spores.

- completely smooth hymenophore (Agerer, 1984).
Registered as 42111 (HCB)
- *Leptoglossum lobatum* (Pers. ex Fr.) Ricken var. *antarcticum* Horak, *Contribucion del Instituto Antártico Argentino*, no. 104: 6. 1966. Fam.: Tricholomataceae
 - The species has larger pileus than the above cited, 2-10 mm in diameter, with hymenophore showing gills-like veins. It was found in Deception and Half Moon Islands by Horak (1966). We noticed it in Elephant Island for the first time. Registered as 42112 (HCB)
 - *Simocybe antarctica* Pegler, in Pegler, Spooner & Smith, *Kew Bull.* 35 (3): 552. 1980.
 - The species was originally found as mycelium and cultivated in laboratory up to basidiome formation (Pegler *et al.*, 1980). We have collected it fresh in Antarctica for the first time. Registered as 42113 (HCB).
 - *Pholiota spumosa* Fr. var. *crassitunicata* Singer. *Mycofl. Australis* p. 272. 1969. Fam. Strophariaceae.
 - Found only on Deception Island by Singer (1969) but not collected by us. The specimen was found on wood on an abandoned a whaler's boat near fumaroles, so it was probably introduced.

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Discussion and Conclusion

Ten species of mushrooms are found in the South Shetland Islands - Antarctica, only one not collected (*Pholiota spumosa*), since it was originally found on introduced wood. *Simocybe antarctica* was grown in laboratory when reported to Antarctica and is here registered fruiting for the first time in the area. All the remaining species were found also in other areas on the Archipelago indicating a more widespread distribution in the area. More studies are needed as to identify new occurrences to the area and substrate preferences of the registered species, including description of its relationship with the substrate.

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