

A fungus collected in the Antarctic.

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With 1 Textfig.

During a Chilean expedition in 1952, F. Behn collected a species of agarics among a small population of mosses on rocky soil near the Argentine Base on one of the islands of the South Shetlands. This material was sent to the author, and was tentatively determined as a species of *Omphalina* (see Singer 1954 a). Further studies, especially a comparison with other species of the genus such as collected in similar localities in nearby Tierra del Fuego, were carried out at the Biological Station of the University of Michigan at Cheboygan U.S.A. and at the Instituto Miguel Lillo in Tucuman (Argentina). It was then decided that this antarctic species is apparently new to science although very closely related to other boreal, montane-alpine, or subarctic-subantarctic species of the same genus.

The locality is one of the islands neighboring the Antarctic Continent, and belongs to the sector of the Antarctic claimed by Argentina, Chile, and Great Britain. It is the first species of a native fungus collected in the Antarctic (as far as the author is aware), if marine fungi and fungi introduced with timber, or otherwise, are discarded (although even of those no published record exists). It may be expected that this is not the only species existing in the antarctic regions since it is highly probable that dung-inhabiting species and fungi parasitic on lichens are likewise native to that continent.

Omphalina antarctica Sing. spec. nov.

Pileo obscure fusco vel fusco-griseo, glabro, convexo, haud virgato nec profunde nec longe sulcato, e convexo subplano, semper umbilicato, 17—23 mm. lato. — Lamellis pileo concoloribus, sublatis, subdecurrentibus, confertiusculis, haud intervenosis; sporis $7.5-9 \approx 4.5-6 \mu$; basidiis plerumque tetrasporis; tramata hymenophorali ex hyphis hyalinis et saepe fusco-incrustatis consistente. — Stipite fuscidulo-pallido vel subpallido, levi, glabro, solido, dein anguste cavo, subaequali vel basin versus angustato, $9-12 \approx 4-5$ mm. — Carne partim subfuscata sed pallida in stipite; hyphis omnibus fibulatis. — Habitat ad Bryophyta (non inter *Sphagna*) supra basin rupestrem in zona nivali subgregatim aestate, in insula Decepción, Shetlands Meridionales, Antarctis. Leg. F. Behn, comm. B. Sparre, det. R. Singer T 2009 (LIL).

Pileus brown when fresh (must have been deep fuscous brown since the formalin and alcohol material is dark fuscous fuliginous with the exception of the largest carpophore which must have dried out slightly *in situ*), apparently hygrophanous and becoming paler (the preparation appears fuscous gray after drying, if the fresh material had been dry instead of watersoaked), smooth or with short sulcate or short-striate margin, eventually sometimes somewhat uneven but never finely grooved-streaked or squamulose, neither velutinous nor pruinose when young, convex-umbilicate, then almost flat and umbilicate, 17–23 mm. broad. — Lamellae of the same color as the pileus but not noticeably pallescent, remaining deep brownish fuscous in alcohol or formalin, about 3.5 mm. broad, i. e. moderately broad to rather broad (not outright broad), sickle to triangle shaped, subdecurrent to decurrent but never very deeply decurrent, close to subclose (25–39 through-lamellae, and, in addition numerous — much more than three — lamellulae), not anastomosing or intervenose and not regularly forked. — Stipe fuscidulous pallid to almost pallid, smooth, glabrous, solid, becoming narrowly hollow in age, subequal to strongly tapering downwards, 9–12 \Rightarrow 4–5 mm. (at apex); basal mycelium not very abundant, pallid white; veil none. Context at least partly colored (i. e. concolorous with the surface), but apparently entirely pallid in the stipe.

Spores $8 \Rightarrow 5 \mu$, or $7.5-9 \Rightarrow 4.5-6 \mu$, hyaline, smooth, thin-walled, inamyloid; basidia $25-30 \Rightarrow 7.5-9 \mu$, (2–)4-spored, clavate, with clamped base; occasionally some broader (than the basidia) bodies observed in the hymenium, reaching 10.8μ in diameter, but always without sterigmata, scattered, hyaline, apparently cystidioles; cystidia proper absent; subhymenium filamentous, brown-fuscous, strongly irregularly interwoven, distinct; hymenophoral trama consisting of interwoven hyphae which run in occasional strands of hyphae parallel with each other, and varying from subhyaline to distinctly brown fuscous from a membrana-pigment incrusting the walls on their outside, varying from 2 to 12μ in diameter, and, as a consequence, appearing almost intermixed; all hyphae, even those of the equally incrusting (often in spiral bands) surface layers of the pileus, with even walls (not visibly differentiated in the epicutis except for pigmentation), inamyloid, with clamp connections.

On or among mosses (not *Sphagnum*) over rocky ground in the frigid zone of the Antarctic, rather gregarious, Isla Decepción. East of the Argentine Base, South Shetlands, Collected by F. B e h n, sent to the author by B. S p a r r e, identified and incorporated in the herbarium (LIL, type) by R. S i n g e r no. 2009.

This species is obviously closely related to the clamp-bearing species of the true *Omphalinas* (formerly *Omphalia* (Fr.) Kummer, cf. synonymy in Singer 1951¹), a generally boreal group of species),

and particularly to those with a similar (fuscous bister, gray black, etc.) pigmentation. Among these it seems to be most closely related to the species where the hyphae of the hymenophoral trama are colored by incrusting particles of the pigment.

Consequently, we have to compare *O. oniscus* (Fr.) Quél. (sensu Favre 1948), *O. obatra* Favre (1955), *O. griseopallida* f. *tetraspora* Sing., *O. umbratilis* (Fr.) Quél. var. *minor* (Fr. ex Møller, 1945), *O. obscurata* (Kühner in Yen Hsun Chu ut *Omphalia*), and the less pigmented (in the hymenophore) species *O. rustica* (Fr.) Quél. sensu Singer (1952), Sing. & Digilio (1952), and *O. chilensis* (Mont.) Sing. (1954 b); furthermore the clampless species (or those clampless in the bisporous form) *O. grisella* (Weinmann) Moser in Gams, *O. oreades* Sing.,

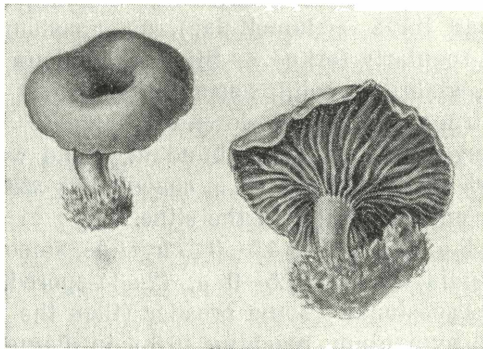


Fig. 1. Carpophores in natural size, from type of *Omphalina antarctica*.
Del. M. L. V. del Pino.

and *O. defibulata* Sing. All three of the latter category, aside from the absence of the clamp connections (at least in the bisporous form), differ in smaller carpophores with more distant and broader lamellae. Of these species, undoubtedly quite different from *O. antarctica*, one is alpine, occurring in the zone above timberline in the White Mountains of North America (*O. oreades*), while another, *O. defibulata*, is subantarctic. *O. philonotis* and its relatives (forming a group of closely related forms or microspecies characteristic for the boreal bogs of the Northern Hemisphere) differ not only by their habitat

¹⁾ This genus contains three subgenera, *Omphalina*, *Romagnesia* (here also *O. fibula*, formerly often considered as a *Mycena*, *Hemimycena*, or *Marasmiellus*), and *Omphaliopsis*. The species considered here for comparison with the new antarctic species, all belong in the first of the three subgenera, more precisely in the section *Fibulatae* Romagnesi among which we shall consider only the species without bright pigment but excluding those without or with very little pale ochraceous) pigment.

but by their finely radially grooved-streaked or squamulose surface, somewhat different colors, and more distant lamellae. *O. obatra*, assuming that its hyphae have clamp connections (Favre omits any indication regarding this important item, but considers the species most closely related to *O. obscurata* which is described as having clamp connections) differs in the smaller size of all its parts, relatively darker stipe, and relatively broader and much fewer lamellae. This species is characteristic of the alpine zone in the Swiss Alps, and is observed in the associations with herbaceous willows. *O. griseopallida* (Desm. ex Fr.) Quél. forma *tetraspora* Sing. is likewise smaller than the antarctic species, and, although reaching the zone of subantarctic woods (but growing outside the forested area), it has never been observed in the frigid zone of the Arctic, at least in specimens confirmed by a modern author, nor has it been observed in the truly alpine zone of the larger mountain ranges. The spores of this form are perhaps slightly larger than those of *O. antarctica* although there is considerable overlapping. The color of the pileus is rather slightly deeper in the antarctic fungus the stipe rather less slender and perhaps paler, the lamellae most definitely much closer and with more lamellulae than in the four-spored *O. griseopallida*. It is not fully clear whether *O. griseopallida* f. *tetraspora* Sing. is sufficiently different from *O. obscurata*, although the descriptions available tend to indicate that the two are macroscopically different. Unfortunately, I cannot find any indication whether *O. obscurata* has pigment-incrusted hyphae in the hymenophoral trama, or not. If it has, it would be closest to *O. griseopallida*, as indicated by Kühner & Romagnesi in their *Flore analytique* (1953); if not it would be just as uncomfortably close to *O. rustica* (Fr.) Quél. sensu Sing., and would, in addition, differ from *O. antarctica*, in the additional character of lacking pigment on the outside the hyphae of the hymenophoral trama. If close to *O. griseopallida* f. *tetraspora*, *O. obscurata* would differ from *O. antarctica* in the same characters as *O. griseopallida* f. *tetraspora*, viz. the habitat outside the frigid and truly alpine zones, the slightly larger spores, the paler pileus, the slender stipe, the distant lamellae, the scarcity of lamellulae, and the smaller size of the carpophores.

O. umbratilis var. *minor* was indicated from the Faröes by Møller (1945) and the alpine zone of the Swiss Alps by Favre (1955). The identity of this species or variety is a rather involved problem. In the first place, Fries originally described as *Agaricus umbratilis* a species which is definitely not of this group, but, considering the fact that he subordinated to it the species we now know as *Lyophyllum ambustum*, might have been a *Lyophyllum*, or else, according to Ricken's interpretation, a *Lyophyllum* on *Mycena*. It was found by Fries only at the time when he wrote the *Systema*

(before 1821); later on, he found a similar but smaller fungus which he considered a smaller form of the original *A. umbratilis*, and redescribed and figured (Icones pl. 77, fig. 3) distinctly enough to make it quite probable that, here, we have an example of a true *Omphalina*, and most probably of the group treated in the present paper. But it should be fully clear, before an attempt at identification of this form is made, that this forma minor is most certainly specifically, and most probably also generically different from the original species, and, consequently, must, if need be, obtain a new name. An interpretation of the "variety", not the original form, was given by Møller and another similar one by Favre, and the former suggested the formal varietal name minor, accepted by Favre in view of the similarity of Fries's picture in Icones Selectae. Fries's later interpretation is based on material collected on the shores of lakes in Smoland, Southern Sweden, consequently not in places typical for a vegetation of the alpine or subarctic type. Nevertheless, Møller's as well as Favre's fungus does not differ in any obvious manner from Fries's interpretation of his own original species, and might therefore be expected to be possibly not exclusively arctic-alpine. However this be, there is a further discrepancy between Møller's and Favre's interpretation, explained, however, by Favre as being actually non-existent, since the color difference is probably a linguistic rather than physical one, and the "cheilocystidia" indicated by Møller would be basidioles according to Favre (or perhaps — cystidioles, see our description above). Favre indicates the lamellae as "peu serrées" while Fries calls them close. As a matter of fact, in the alpine specimens, there are only 14—20 through-lamellae and 1—3 lamellulae whereas in *O. antarctica* as well as in the Friesian interpretation of small forms of *Agaricus umbratilis* the lamellae are much more numerous. It would seem, then, that Fries's fungus from South Sweden and *O. antarctica* are the two most closely related ones in the entire group. Yet, in the first place, it would seem strange that the same form was observed only twice, once in Europe, and once in the Antarctic. It is much more probable that the form depicted by Fries is somewhat aberrant or an extreme lusus of a more common species — which is a matter of guessing since no microscopical characters are known. But even assuming the improbable case that in spite of certain differences as e. g. the pallid covering of the stipe, the number of lamellae and lamellulae, the relative measurements of the stipe, and the habitat, all four descriptions (Fries, Møller, Favre, Singer as *O. antarctica*) should refer to various lusus of the same species, the valid name for that species would be *O. antarctica* since, as we have seen, the epitheton *umbratilis* cannot be used for any of these forms. If such a variable boreal-arctic-alpine-antarctic species should exist, it would

be a new example of arctic-antarctic area disjunction as observed in *Galerina vittaeformis*, *Melanoleuca evenosa*, *Hygrophoropsis aurantiaca* among the fungi of less extreme frigid localities (see Singer 1953). But even if *O. umbratilis* var. *minor* in the sense of Møller and/or Favre are merely the forms or species most closely related to *O. antarctica* among all the *Omphalinas* of this group, a similar conclusion regarding their strange distribution must be reached.

In Tierra del Fuego and other adjacent regions of the sub-antarctic zone, where special attention has been paid (Singer 1952, 1954 b) to the representatives of the genus *Omphalina* in the narrower sense, we have not been able to discover a species identical with the new species described above, or even a species as closely related as the *O. umbratica* var. *minor* of Møller and Favre. Aside from *O. griseopallida* f. *tetraspora*, already commented on, we have also observed: *O. chilensis* (Mont.) Sing. and *O. defibulata* Sing. (Singer 1952, resp. 1954 b), but both differ from *O. antarctica* in having non-incrusted hyphae in the hymenophoral trama. They both have a much more slender stipe and more distant lamellae, and are likewise smaller in all parts. *O. chilensis* has, in addition, definitely more elongated spores, and *O. defibulata* a deeper colored stipe. The latter also differs from all other species compared thus far with *O. antarctica*, and from *O. antarctica* itself, by lacking clamp connections.

In other mountain ranges, near or above the tree line, we have observed *O. oreades*, *O. grisella*, and *O. rustica* sensu Sing. The first of these differs from *O. antarctica* in smaller size, absence of clamp connections, and the characteristically curved spores; the second by the smaller spores, smaller size of the carpophores, the paler young lamellae which are also less close and broader, the usually bisporous basidia and clamp-less hyphae, at least in the alpine forms, etc. *O. rustica* in Singer's sense — which is perhaps too close to *O. obscurata*, — has already been compared with *O. antarctica* (see above).

Consequently, the antarctic species deserves a new species name. Its relationship regarding other species of the same group (omitting all wood-inhabiting or bright colored to pallid species) will be illustrated by the following survey given in form of a key:

- A. Hyphae without clamp connections in four-spored races.
 - B. Spores tilda-shaped or curved at the hilar end. Northern Hemisphere *O. oreina* Sing.
 - B. Spores differently shaped; Southern Hemisphere. (If European, see „C“: *O. grisella* and *O. obscurata*) *O. defibulata* Sing.
- A. Hyphae of the four-spored race always with clamp connections.
 - C. Bog-inhabiting species with squamulose-streaked pileus, Northern Hemisphere *O. philonotis* (Lasch) Quél.
and allied sphagnicolous species.

Species not participating in the flora of the Sphagneta of the Northern Hemisphere; pileus striate or slightly sulcate but not distinctly squamulose or radially furrowed-streaked.

D. Alpine form usually 2-spored and then without clamp connections; lamellae whitish when young, then very slightly brownish or grayish shaded, broad, distant; pileus strongly sulcate. *O. grisella* (Weinm.) Moser.

D. Not combining these characters.

E. Spores only 4–5 μ broad; lamellae gray (from “seaside” to “mastic”, Maerz & Paul, 1 st ed.); hyphae of the hymenophoral trama proper not incrustated by dark pigment; pileus hygrophanous, and when drying out in situ, neither quite pallid nor deep fuscous or gray, but rather pale sordid gray. *O. chilensis* (Mont.) Sing.

E. Spores often broader, broader in an average, and often reaching 6 or 7 μ in breadth; lamellae as above, or different; hyphae as above or different; pileus dry pallid, or deeper colored, or as indicated as above; fungus never combining all the characters indicated above.

F. Pileus partly or entirely whitish pallid when dry (not dried) and also rather pallid when dried rapidly from the dehydrated condition; lamellae usually the darkest portion of the carpophore, never close or sub-close; hyphae of the hymenophoral trama pigment-incrustated.

G. Basidia 2-spored; spores large

O. griseopallida (Desm. ex Fr.) Quél. f. *griseopallida* (f. *bispora*).

G. Basidia 4-spored; spores 8–9.5(10.2) \Rightarrow 4–6.2 μ ; *O. griseopallida* f. *tetraspora* Sing.

F. Not combining the characters indicated above.

G. Hyphae of the hymenophoral trama not incrustated by pigment.

H. Pileus up to 16 mm. broad; spores up to 10 or even sometimes up to 13.2 μ long; through-lamellae 12–20, with 1–3 lamellulae; surface of pileus not finely tomentosulous and light gray when dry (in situ)

O. obscurata (Kühner in Yen Hsun Chu, as *Omphalia*)

H. Pileus up to 11 mm. broad; spores 6.5–9.2 \Rightarrow 5.5–7.2 μ ; through-lamellae 11–12, lamellulae 0–3; surface of pileus finely tomentosulous and light gray when dry (in situ)

O. rustica (Fr.) Quél. sensu Sing.

G. Hyphae of the hymenophoral trama incrustated by pigment.

- I. Pileus broader than 16 mm.; spores $7.5-9 \Rightarrow 4.5-6 \mu$; stipe $9-18 \Rightarrow 3.5-5$ mm; stipe considerably paler than bister brown to dark brown gray, or else with pallid hispid covering all over; lamellae close to subdistant, 14—39 through-lamellae, (1) 3 to numerous lamellulae.
J. Antarctic species. *O. antarctica* Sing.
J. Arctic-subarctic-alpine species, possibly also in South Sweden. "*Omphalia umbratilis* var. minor" Møller.
- I. Pileus less than 16 mm. broad; spores as above or slightly larger; stipe as above or darker, or without hispidity, or more slender; lamellae never close to subclose, but rather subdistant to distant, lamellulae 0—3, never more.
K. Pileus up to 16 mm. broad; spores up to 10μ or more long; through-lamellae 12—20, with 1—3 lamellulae; forming part of associations outside the alpine zone in Europe
(see "H": *O. obscurata*!)
K. Pileus up to 12 mm. broad; spores $7-9 \Rightarrow 5-6 \mu$; through-lamellae 11—15, with usually one lamellula; alpine species of Europe.
O. obatra Favre.

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