

NEW SPECIES AND NEW COMBINATION IN THE FUNGAL GENUS *OCTOSPORA* FROM ANTARCTICA

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(Received: March 8, 2000. Accepted: July 17, 2000)

ABSTRACT

A new species of cup fungus, *Octospora arctowskii* Olech and Mleczko, from South Shetland Islands (Antarctica) is described in this paper. *Octospora miniatopsis* (Spooner) Olech and Mleczko comb. nov. is reported for the first time from South Shetland Islands. Brief notes on their ecology and distribution are also provided.

KEY WORDS: Ascomycotina, taxonomy, distribution, *Octospora arctowskii* sp. nov., *Octospora miniatopsis* comb. nov., Antarctic, South Shetland Islands.

INTRODUCTION

Small fruit-bodies of cup fungi, growing on soil and tussocks of mosses, were found during recent studies on the colonisation and succession on the contemporary moraines in Antarctica. The research was carried out during the XVI and XX Polish Antarctic Expeditions to the Henryk Arctowski station in 1991/93 and 1995/96 which were organized by the Polish Academy of Sciences. The examination of the collected material has revealed two species: a very rare taxon *Octospora miniatopsis* comb. nov. (syn. *Lamprospora miniatopsis*), and a new species of *Octospora*, which is described in this paper.

The flora of the Antarctic macromycetes is rather poor (Singer 1967; Pegler et al. 1980; Horak 1982; Agerer 1984; Gumińska et al. 1994) and there are only scarce data on the diversity and distribution of Ascomycotina in this region (Pegler et al. 1980; Schumacher 1986; Gamundi and Spinedi 1988). The genus *Octospora* has been intensively studied during the past few decades (Caillet and Moyne 1980; Caillet and Moyne 1987; Dennis and Itzerott 1973; Jakobson et al. 1998), however, most of the information obtained concerns the northern hemisphere. The species of the southern hemisphere are poorly known (e.g. Gamundi 1960; Rifai 1968; Pegler et al. 1980; Schumacher 1986).

MATERIAL AND METHODS

The material was collected in austral summer of 1992/93 and 1995/96 on the western shores of Admiralty Bay (King George Island). The study area is located within the Site of Special Scientific Interest (SSSI) No. 8, in the vicinity of the

Henryk Arctowski station. A description of climatological conditions, soil and vegetation of the site is given in the papers by Rakusa-Suszczewski et al. (1993), Tatur (1989) and Olech (1989, 1993).

Species determinations are based on dry material and on the observations of fresh specimens in situ. The sections of apothecia were mounted either in water or in glycerine and investigated under a light microscope using the Nomarski interference contrast (NIC). The air-dried asci and ascospores were also observed and photographed on Jeol JSM-35 and Philips LX 30 scanning electron microscopes.

Samples of moss rhizoids taken from beneath or from the immediate vicinity of *Octospora* fruit-bodies were stained in lactophenol-cotton blue for the presence of intracellular and external hyphae.

RESULTS

Octospora arctowskii Olech and Mleczko sp. nov. (Figs 1, 2a and 3)

Apothecia turbinata, late sessilia et semiimmersa, 1.0-1.5 mm diam., glabra marginata, integra, tota aurantiaca (in statu sicco pallide aurantiaca), cum thecio primum plano dein sat profunde concavo; **excipulum medullosum** textura intricata compositum, hyphis cylindraceutis, 2.1-8.7 (9.5) µm diam.; **excipulum externum** textura globulosa, e cellulis subglobosis ad irregularibus compositum, 15.4-32.0 (46.3) µm diam., nonnunquam crassioribus tunicatis instructum; **margo excipuli** e hyphis parallelis, cylindraceutis, 3.8-5.1 (6.8) µm diam., apice clavato-incrassatae usque ad 9.5 mm crassis, theca ad 2 mm lata. **Asci** cylindraceuti, 240.0-307.0 × (16.4) 17.1-20.9 (25.0) µm, octospori (sporis monostichis), infra in bases attenuati;

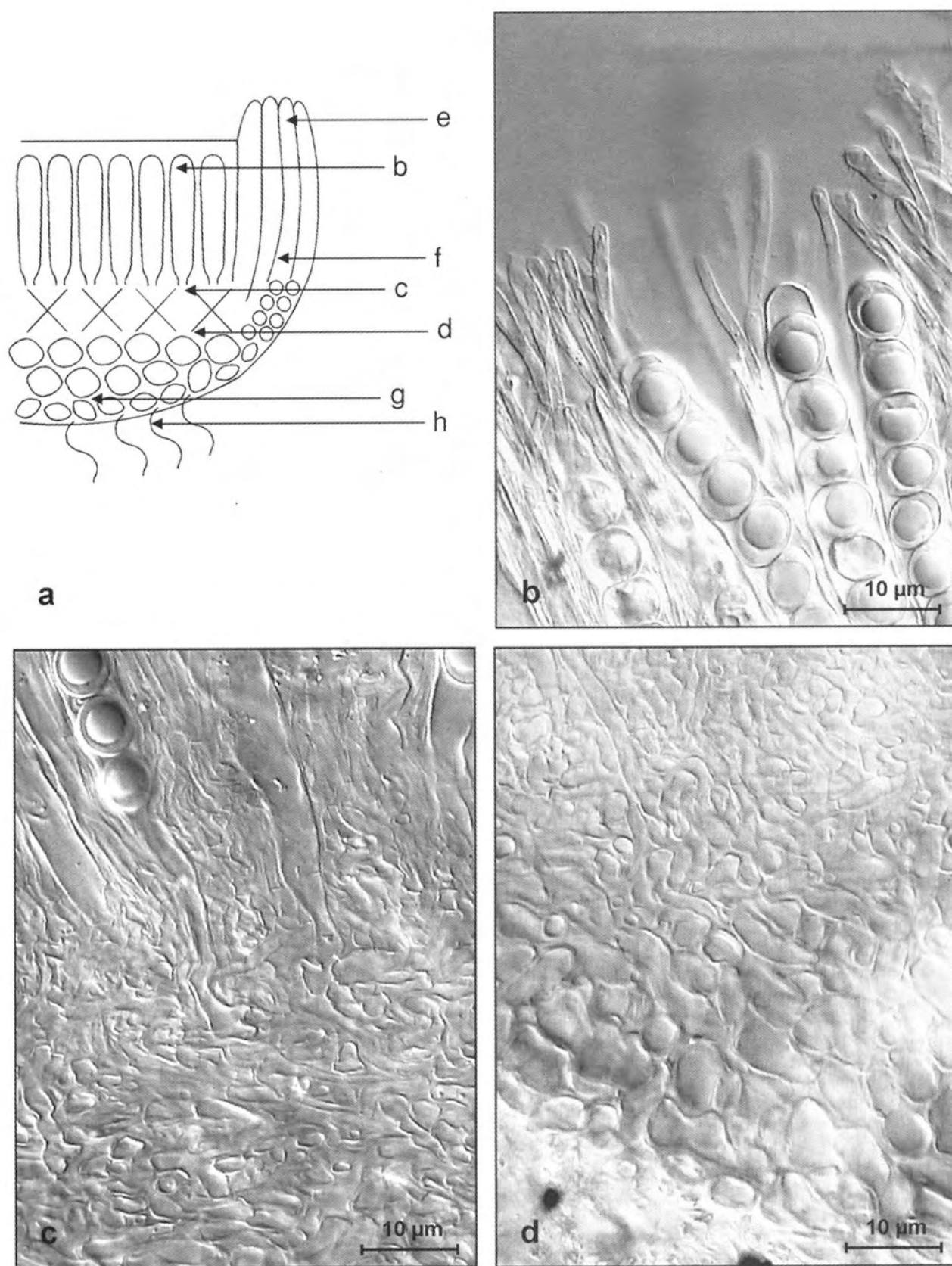


Fig. 1. *Octospora arctowskii* – the structure of apothecium.

a. Schematic drawing of the fruit-body with references to the photos of apothecial structures.

b. The apices of asci and paraphyses.

c. The subhymenial region with basal parts of asci.

d. Medullar and ectal excipula in sections.

(all Figs. from the type collection, Sph. 552, in the herbarium of the Institute of Botany, Jagiellonian University – KRA).

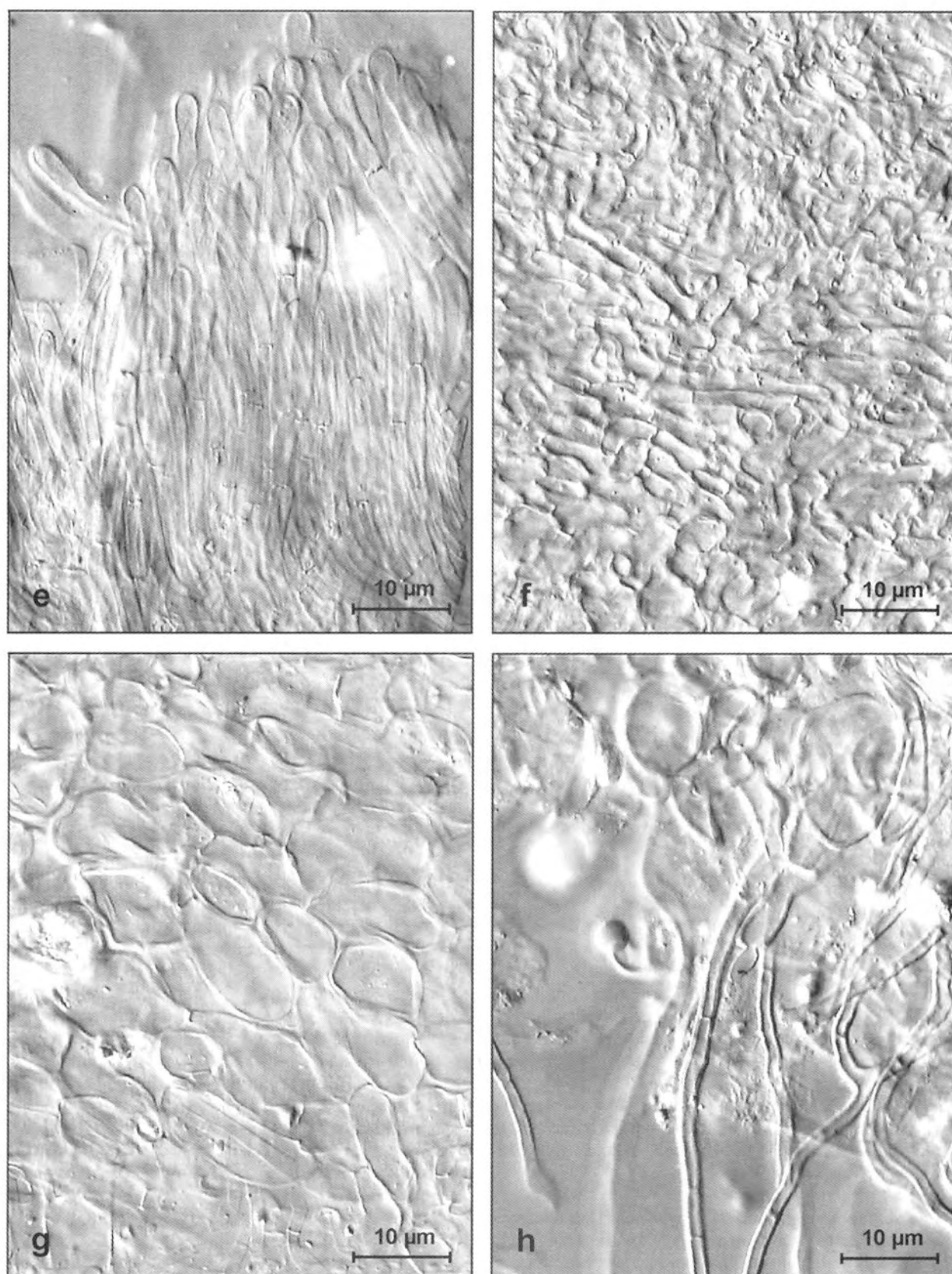


Fig. 1. cont.

e. The margin of the apothecium (**textura porrecta**) in plan view.

f. The region beneath the margin (dense **textura intricata**).

g. The structure of ectal excipulum on the bottom side of the apothecium in plan view (**textura globulosa**).

h. Emanating hyphae growing out from ectal excipulum.

(all Figs. from the type collection, Sph. 552, in the herbarium of the Institute of Botany, Jagiellonian University – KRA).

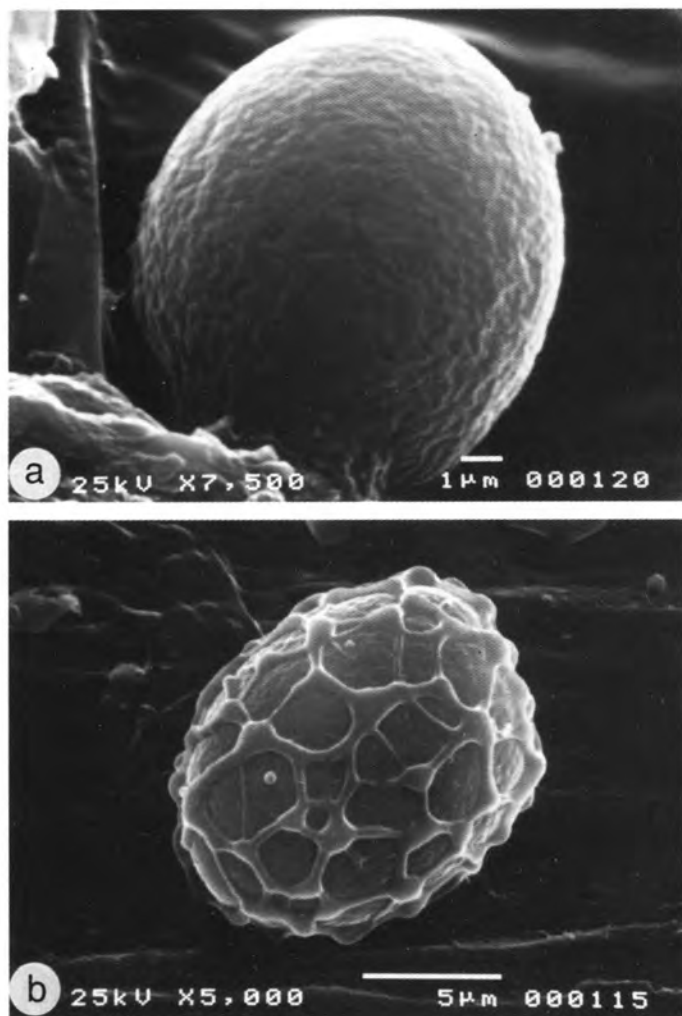


Fig. 2.

a. The spore of *Octospora arctowskii* (SEM, from type collection, Sph. 552, in the herbarium of the Institute of Botany, Jagiellonian University – KRA),

b. The spore of *Octospora miniatopsis* (SEM, from the type collection, Sph. 552, in the herbarium of the Institute of Botany, Jagiellonian University – KRA).

paraphyses filiformes, septate, apice rectae, clavato-incrasatae (usque ad 3.1 µm late), granulis aurantiacis impletae. **Sporae** 15.0–19.1 × 13.6–15.1 µm, late ellipsoideae, glabrae, guttula unica magna instructae. **Habitatio** ad terram humidam inter muscosam.

Type: Antarctica, South Shetland Islands, King George Island, Admiralty Bay region, forefield of Sphinx Glacier, on soil, 26 January 1996, leg. M. Olech, coll. design. Sph. 552 (KRA – holotypus).

Apothecia sessile and gregarious, discoid and flat, concave when dried, 1–1.5 mm in diameter, orange (paler when dry), deeply mounted in substratum. The external surface smooth or minutely downy, margin smooth and slightly raised above the hymenium. The basal part tomentose due to the hyphae anchoring the fruit-body in substratum.

Excipulum in section distinctively two layered. **Medullary excipulum** together with subhymenium composed of a **textura intricata** of densely interwoven, hyaline and thin-walled, septate hyphae, 2.1–8.7 (9.5) µm in diameter. The border between the medullary and the ectal excipulum is not clear-cut.

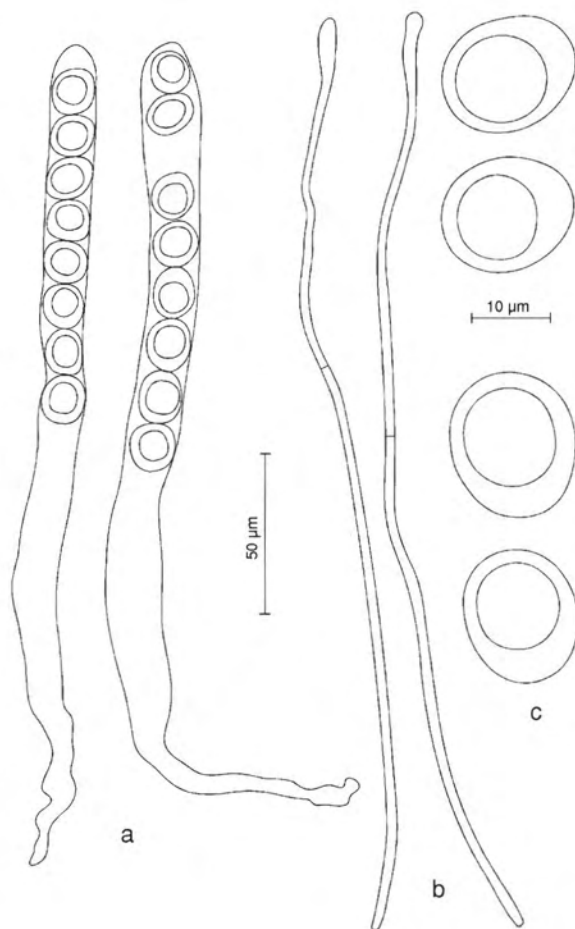


Fig. 3. Hymenial structures of *Octospora arctowskii* (a – asci, b – paraphyses, c – spores).

The hyphae become irregular in shape and their diameter increases gradually. **Ectal excipulum** is a **textura globulosa**, however, the shape of hyphal cells may vary from oval to irregularly lobed or somewhat elongated. Hyphae range from 15.4 to 32.0 (46.3) µm long and 10.0–24.5 (37.6) µm in diameter, the walls up to 2.9 (3.5) µm thick. The hyphae in deeper layers of the ectal excipulum thin-walled. The hyphal cells of the outermost layer of the excipulum bare branched, septated hyphae at 4.2–5.6 (6.0) µm in diameter, with walls up to 1.6 (2.0) µm thick, which anchor the fruit-body into the substratum.

The margin of apothecium is formed by **textura intricata** composed of interwoven hyphae, 3.8–5.1 (6.8) µm in diameter, with walls up to 2.0 µm thick. The hyphae arranged parallelly towards the edge of the margin to form a **textura porrecta**, composed of clavate hyphae, up to 9.5 µm in diameter at their tips.

The hymenium 201–288(384) µm thick. **The asci** operculate, J-, cylindrical and thin-walled, are up to (240) 307 µm long and (16.4) 17.1–20.9 µm in diameter at maturity. Opened asci wider, up to 25.2 µm. The basal part constricted and elongated, bent or curved. Asci normally 8-spored, however, aborted spores sometimes occur. **Paraphyses** filiform, clavate, straight, septated, usually without side branches, up to 278 µm long and 2.5–3.1 µm in diameter. The apices of paraphyses rounded, slightly swollen, up to 4.7 (6.2) µm wide.

Paraphyses and hyphae of the excipulum filled with pigmented (orange) droplets which dissolve quickly in lactic acid but remain preserved in glycerine. **Spores** uniseriate which are broadly oval, 15.0-19.1 μm long and 13.6-15.1 μm wide, smooth and hyaline, contain one large guttule.

Ecology: The fruit-bodies were growing on sandy-gravel soil on the flat ground of the glacier forefield, at a distance of app. 20 m from the sea shore, and app. 550 m from the glacier. The pH (H_2O) of the soil was 8.93. The area is periodically inundated by a small, temporary stream and sprayed by sea water, which creates special and very characteristic environmental conditions. The ground was 50% covered by mosses and the fungus was found among *Hennediella antarctica* (Ångstr.) Ochyra and Matteri and *Bryum pseudotriquetrum* (Hedw.) C.F. Gaertn., B. Mey and Schreb.

Note: The species is well characterised by smooth, broad ellipsoid spores possessing one large guttule. This is a structure of ectal excipulum which consists of inflated, globular to irregular in shape hyphal cells and margin of the apothecium made up of parallel hyphae with slightly thickened walls glued together. The species is also characterised by the unique habitat.

The species belongs to the group of *Octospora* producing oval and smooth spores (together with *O. leucoloma* Hedw.: Gray, the type species, e.g. Caillet and Moyne 1987). *O. rubens* (Boud.) M. Moser and *O. rustica* (Velen.) J. Moravec seem to be related but they differ in the structure of excipulum (medullary excipulum – textura intricata with slightly swollen hyphal cells, ectal excipulum – textura intricata), the colour (red in *O. rubens*) and spore dimensions (*O. rubens*: 15-19 $\times$ 9-10 μm , *O. rustica*: 13-16 (18) $\times$ 9-11 μm). However, some discrepancies in descriptions of these species occur according to different authors (regarding the structure of excipulum layers; e.g. Itzerott 1981; Caillet and Moyne 1987; Yao and Spooner 1996; Jakobson et al. 1998).

Gamundi (1960) found that a South American discomycete, *Humaria argentina* Speg., is an *Octospora* species. This seems to be the closest relative to the new species from Antarctica. However, the apothecia of *O. argentina* can reach 5 mm in diameter, and possess asci which are less than 180 μm long. Additionally, the spores of *O. argentina* are longer (reaching up to 24.7 μm) and its paraphyses are densely septate.

The species of *Octospora* are closely associated with mosses, their relationships ranging from neutral to parasitic (Benkert 1995). The hyphal structures formed by the fungi on rhizoids, cauloids and sometimes leaves of mosses have been studied by Döbbeler (1979, 1993), Döbbeler and Itzerott (1981) and Itzerott and Döbbeler (1982). They found that the structure of fungal appresoria, haustoria and hyphae growing inside plant cells may be used as an additional character in systematics of the genus. In the present study, however, no clear evidence was found for the parasitic relationship between *O. arctowskii* and surrounding mosses.

Octospora miniatopsis (Spooner) Olech and Mleczko, comb. nov. (Figs 2b and 4)

Basionym: *Lamprospora miniatopsis* Spooner, in Pegler et al., Kew Bull., 35: 539, 1980.

Locality: South Shetland Islands, King George Island, Admiralty Bay region, Ecology Glacier moraines; H-85 (6 December 1992), H-111 (10 December 1992), F-97 15 m (8 April 1992), D-1 80 m (24 January 1996), D-2 80 m (2 February 1996); Ubocz SE 90 m (10 February 1996).

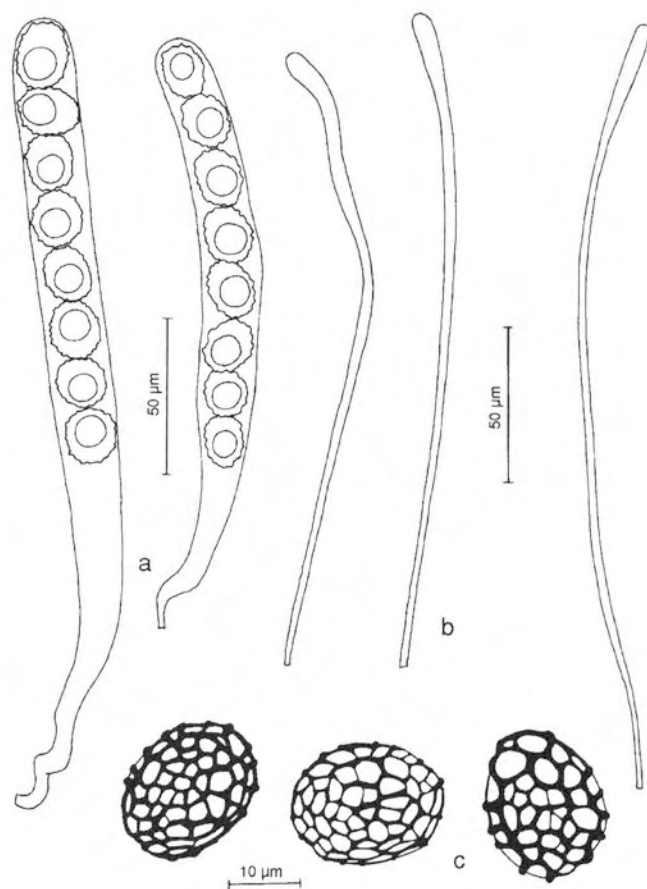


Fig. 4. Hymenial structures of *Octospora miniatopsis* (a – asci, b – paraphyses, c – spores).

The description of apothecial structure and species ecology can be found in the papers of Pegler et al. (1980) and Schumacher (1986).

Ecology: The specimens of *Octospora miniatopsis* from King George Island were found on scree slopes, generally exposed to the south, at elevations of between 15 m and 90 m a.s.l., several hundred meters from the sea.

The fruit-bodies were growing on moss *Syntrichia princeps* (de Not.) Mitt. or on soil among mosses in specific ecological conditions. They occurred in caves between or under stones. Such sheltered, protected habitats provide special microclimatic conditions. *Octospora miniatopsis* was often associated with such lichen species as: *Bacidia trachona* (Ach.) Lettau; bryophytes: *Bartramia patens* Brid., *Barbilophozia hatcheri* (Evans.) Loeske, *Cephaloziella varians* (Gott.) Steph.; and algae: *Muriella terrestris* Boye-Pet. *Pseudococcomyxa simplex* (Mainx) Fott, *Lobococcus irregularis* (Boye-Pet.) Reissig.

Notes: *Octospora miniatopsis* is associated with mosses of the genus *Syntrichia* (Tortula) eg. *S. saxicola* (South Orkney Islands – Pegler et al. 1980), *S. filaris* (Bouvetoya – Schumacher 1986) and *S. princeps* (South Shetland Islands – Olech, Mleczko).

The genus *Lamprospora* De Not. has been treated for a long time as a separate taxon, closely related to *Octospora*, *Inermisia*, *Leucoscypha* and *Neotiella* (e.g. Dennis and Itzerott 1973; Benkert 1976, 1987, 1990, 1995; Schumacher

1993). In recent taxonomic revisions of Caillet and Moyne (1980) and Wang and Kimbrough (1992) it has been transferred to *Octospora*, which was done earlier by Le Gal (1969) and suggested by Korf (1973). They pointed out that no differences could be found concerning excipulum structure in these two genera. The only difference is the shape and ornamentation of spores but even these features are highly variable. Additionally, Wang and Kimbrough (1992), after cladistic analysis, stated that *Lamprospora* forms a paraphyletic group if treated separately from *Octospora*. Therefore, in this work we suggest to transfer *Lamprospora miniatopsis* into genus *Octospora*.

Distribution: the species was known to date from two sites in Antarctica: South Orkney Islands (Pegler et al. 1980) and Bouvetoya (Schumacher 1986).

ACKNOWLEDGEMENTS

The authors are grateful to Małgorzata Matyjaszkiewicz, M. Sc., for excellent technical assistance, to Dr. M. Wayda for checking the Latin description and to J. Faber for help with the scanning electron microscope photograph. Part of this work was supported by a Grant PB 319/P04/97/13 from the State Committee for Scientific Research (KBN).

LITERATURE CITED

- AGERER R. 1984. *Leptoglossum omnivorum* sp. nov. from Antarctica. Transactions of the British Mycological Society 82: 184-186.
- BENKERT D. 1976. Bemerenswerte Ascomyceten der DDR. I. Zu einigen Arten der Gattung *Lamprospora* De Not. Feddes Repertorium 87(9-10): 611-642.
- BENKERT D. 1987. Beiträge zur Taxonomie der Gattung *Lamprospora* (Pezizales). Zeitschrift für Mykologie 53: 195-271.
- BENKERT D. 1990. Zwei neue Arten der gattung *Lamprospora* (Pezizales, Ascomycetes). Feddes Repertorium 101: 631-637.
- BENKERT D. 1995. Becherlinge als Moosparasiten. Boletus 19(4): 97-127.
- CAILLET M., MOYNE G. 1980. Contribution à l'étude du genre *Octospora* Hedw. ex S.F. Gray emend. Le Gal. Espèces à spores ornementées, globuleuses ou subglobuleuses. Bulletin Trimestriel de la Société Mycologique de France. 96(2): 175-212.
- CAILLET M., MOYNE G. 1987. Contribution à l'étude du genre *Octospora* Hedw. ex S.F. Gray (Pezizales). Espèces à spores elliptiques ou fusiformes. Bulletin Trimestriel de la Société Mycologique de France 103(3): 179-226.
- DENNIS R.W.G., ITZEROTT H. 1973. *Octospora* and *Inermisia* in Western Europe. Kew Bulletin 28(1): 3-23.
- DÖBBELER P. 1979. Untersuchungen an moosparasitischen *Pezizales* aus der Verwandtschaft von *Octospora*. Nova Hedwigia 31(4): 817-864.
- DÖBBELER P. 1993. The infecting structures of *Octospora roxheimii* (Pezizales). Arnoldia 6: 12-14.
- DÖBBELER P., ITZEROTT H. 1981. Zur Biologie von *Octospora libussae* und *O. humosa*, zwei Moosprotonema wachsend *Pezizales*. Nova Hedwigia 34: 127-136.
- GAMUNDI I.J. 1960. *Discomycetes* Operculados de Argentina: Familias *Pezizaceae* y *Humariaceae*. Lilloa 30: 257-338.
- GAMUNDI I.J., SPINEDI H.A. 1988. *Ascomycotina* from Antarctica. New species and interesting collections from Danco Coast, Antarctic Peninsula. Mycotaxon 33: 467-482.
- GUMIŃSKA B., HEINRICH Z., OLECH M. 1994. Macromycetes of the South Shetland Islands (Antarctica). Polish Polar Research 15(3-4): 103-109.
- HORAK 1982. *Agaricales* in Antarctica and Subantarctica: distribution, ecology and taxonomy. In: Arctic and alpine mycology. Laursen G.A., Ammirati J.F. (eds.), University of Washington Press, Seattle, London, p. 82-122.
- ITZEROTT H. 1981. Die Gattung *Octospora* mit besonderer Berücksichtigung der Pfälzer Arten. Nova Hedwigia 34: 265-283.
- ITZEROTT H., DÖBBELER P. 1982. *Octospora meslinii* und *O. rubens* (Pezizales), zwei weitere Bryophile Gallbildner. Mitteilungen Bot. München 18: 201-212.
- JAKOBSON A., KULLMAN B., HUHTINEN S. 1998. Genus *Octospora* (Pezizales) in Estonia and Finland. Karstenia 38: 1-25.
- KORF R. P. 1973. *Discomycetes* and *Tuberales*. In: The Fungi. An Advanced Treatise. T. IVA. Taxonomic Review with Keys: Ascomycetes and Lower Fungi. Aisworth G.C., Sparrow F.K., Sussman A.S. (eds.), Academic Press: New York, London: 249.
- LE GAL M. 1969. Position taxonomique du genre *Phaedropezia* Le Gal et révision de la famille de *Humariaceae*. Bulletin Trimestriel de la Société Mycologique de France 85: 5-19.
- OLECH M. 1989. Preliminary botanical studies in Johnson Dock area (Livingston, Antarctica). Bulletin of the Polish Academy of Sciences, Biological Sciences, 37(7-9): 223-230.
- OLECH M. 1993. Lower Plants. In: The Maritime Antarctic Coastal Ecosystems of Admiralty Bay. Rakusa-Suszczewski S. (ed.), Department of Antarctic Biology, Polish Academy of Sciences, Warsaw, s. 173-179.
- PEGLER D.N., SPOONER B.M., SMITH R.I.L. 1980. Higher fungi of Antarctica, the Subantarctic zone and Falkland Islands. Kew Bulletin 35: 499-562.
- RAKUSA-SUSZCZEWSKI S., MIETUS M., PIASECKI J. 1993. Weather and climate. In: The Maritime Antarctic Coastal Ecosystems of Admiralty Bay. Rakusa-Suszczewski S. (ed.), Department of Antarctic Biology, Polish Academy of Sciences, Warsaw, s. 19-25.
- RIFAI M.A. 1968. The australasian *Pezizales* in the herbarium of the Royal Botanic Gardens Kew. Verhandelingen der Koninklijke Nederlandse Akademie van Wetenschappen, Afd. Natuurkunde, Tweede Reeks, 57(3): 7-295.
- SCHUMACHER T. 1986. *Lamprospora miniatopsis* Spooner, a bryophilous discomycete from Bouvetoya. Norske Polarinstitutt Skifter 185: 61-64.
- SCHUMACHER T. 1993. Studies in Arctic and alpine *Lamprospora* species. Sydowia 45: 307-337.
- SINGER R. 1967. Fungi distribution. In: Terrestrial life of Antarctica. Bushnell V.C. (ed.). Antarctic Map Folio Series, Folio 5, 5-7. American Geographical Society, New York.
- TATUR A. 1989. Ornithogenic soils of the maritime Antarctic. Polish Polar Research 10: 481-532.
- WANG Y.Z., KIMBROUGH J.W. 1992. Monographic studies of American species of *Octospora* previously ascribed to *Lamprospora* (Pezizales, Ascomycetes). Special Publications of National Museum of Natural Sciences of Taiwan 4: 1-68.
- YAO Y.-J., SPOONER B.M. 1996. Notes on British species of *Octospora*. Mycological Research 100(2): 175-178.

NOWY GATUNEK I NOWA KOMBINACJA
W OBRĘBIE RODZAJU *OCTOSPORA* Z ANTARKTYKI

STRESZCZENIE

Z terenu Wyspy Króla Jerzego (Szetlandy Południowe, Antarktyka) opisano nowy dla nauki gatunek workowca *Octospora arctowskii*. Owocniki występowały na przedpolu lodowca, w bliskim sąsiedztwie morza, na glebie wśród mchów *Hennediella antarctica* i *Bryum pseudotriquetrum*. Charakterystyczne dla tego gatunku są gładkie, szerokoeliptyczne zarodniki z jedną dużą kroplą tłuszczową.

Drugi z podanych gatunków, *Octospora miniatopsis* (syn. *Lamprospora miniatopsis*), dotychczas znany jedynie z Orkadów Południowych i Wyspy Bouveta, został znaleziony na Wyspie Króla Jerzego na kilku stanowiskach. Na badanym terenie występował na mchu *Syntrichia princeps*, w bardzo charakterystycznych mikrosiedliskach.

SŁOWA KLUCZOWE: *Ascomycotina*, taksonomia, rozmieszczenie, *Octospora arctowskii* sp. nov., *Octospora miniatopsis* comb. nov., Antarktyka, Szetlandy Południowe.