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## Lichenicolous fungi from Spitsbergen

**ABSTRACT:** This paper reports on 29 species of lichenicolous fungi collected in the Hornsund region and Sørkapp Land area, Spitsbergen. New to science are *Hystrix* gen. nov., *Stellifraga* gen. nov., *Dactylospora cladoniicola* sp. nov., *Hystrix peltigericola* sp. nov., *Stellifraga cladoniicola* sp. nov. and *Zwackhiomyces macrosporus* sp. nov. A further 15 species are new to Svalbard.

**Key words:** Arctic, lichenicolous fungi, taxonomy, distribution.

## Introduction

The lichenicolous fungi of Svalbard were first studied by Th.M. Fries (1860), but since then only a few papers deal with the subject, e.g. Hertel and Ullrich (1976), Hafellner (1982), Elvebakk (1984), Triebel (1989), Aptroot and Alstrup (1991). The number of lichenicolous fungi known from Svalbard is now 56 species (Alstrup and Elvebakk, in press) but this number is supposed to increase considerably when more detailed studies will be carried out. At least 132 species are presently known from Greenland.

This paper is the first on lichenicolous fungi from Sørkapp Land. The material was collected by the second author during two expeditions of the Jagiellonian University to Spitsbergen in the years 1982 and 1985. The investigations were carried out in connection with studies of the natural environment of Sørkapp Land, coordinated by the Laboratory for Polar Research of the Institute of Geography of the Jagiellonian University. Research was carried out on the north coast of Hornsund and on the NW Sørkapp Land area (Fig. 1).

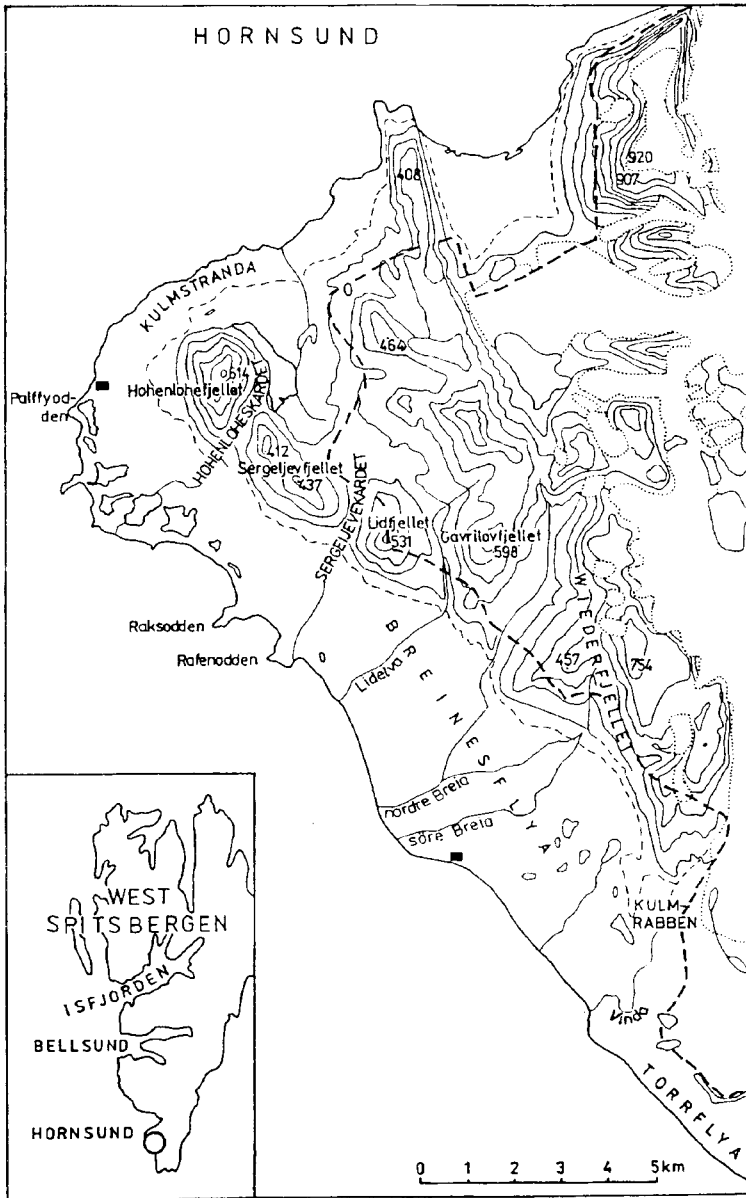


Fig. 1. Topographic sketch of the study area

A description of the plant communities is given by Dubiel and Olech (1990) and data concerning the lichens of the area are given in papers by Nowak (1965), Olech (1987, 1990), Olech and Alstrup (1989) and Dubiel and Olech (1990).

The present paper reports 29 species of lichenicolous fungi which are reported from Hornsund region and Sørkapp Land for the first time. Most of the species are new to the Svalbard Archipelago: *Cercidospora stereocaulorum*, *Corticifraga peltigerae*, *Geltingia stereocaulorum*, *Lasiosphaeriopsis christiansenii*, *Lichenonium lecanorae*, *L. usneae*, *Merismatium nigrtellum*, *Plectocarpon lichenum*, *Polycoccum tryptelioides*, *Rhagadostoma lichenicola*, *Sphaerellothecium araneosum*, *Stigmatidium peltideae*, *Thelocarpon epibolum*, *Weddelomyces tartaricola* and *Wentiomycetes peltigericola*.

The genera *Hystrix* and *Stellifraga* are new to science as are the species *Dactylospora cladoniicola*, *Hystrix peltigericola*, *Stellifraga cladoniicola* and *Zwackhiomyces macrosporus*.

A further new species from the area, *Chalara lichenicola*, found on *Cladonia gracilis* at the same occasion is being described by M. Skytte Christiansen (in press).

The collection are found in KRA.

## List of species

*Bispora christiansenii* D. Hawksw. On *Lecanora polytropa*, Sørkappneset, alt. 15 m, 11 July 1982.

*Cercidospora lichenicola* (Zopf) Hafellner. On *Psoroma hypnorum*, NW Sørkapp Land, Lisbetelva at Svartvatnet, 24 July 1982. The species was hitherto only known from *Solorina crocea*. The ascospores are 3–4 separate and measure 19–21 × 5.0–5.5 µm.

*Cercidospora stereocaulorum* (Arnold) Hafellner. On *Stereocaulon arcticum*, Sørkapp Land, Wiederfjellet, NW, 130 m, 27 July 1985.

*Corticifraga peltigerae* (Fuckel) D. Hawksw., R. Sant. On *Peltigera canina*, Sørkapp Land, Sergeijevskardet Pass, 60 m, 18 July 1985.

*Dacampia hookeri* (Borr.) Keissler. On *Solorina saccata*, Wiederfjellet, 140 m, 29 July 1985; at the foot of Hilmarfjellet, 15 m, 3 Sept. 1985 and at the foot of Stupryggen, 9 Aug. 1985.

*Dactylospora cladoniicola* Alstrup et Olech sp. nov. (Fig. 2). Apothecia sessilia, plana vel convexa, nigra, ad 0.7 mm diam. Margo persistens, ut subhymenium fuscus. Gelatina hymenialis in 10% KOH tractatacum J coerule-scens. Hymenium circiter 100 µm altum, hyalinum. Paraphyses septate, ad apices fusco-galeatae. Ascosporae octonae, 33–37 × 12–14 µm magnae, ad septum unicum non constrictate, apicibus rotundatis, fuscae.

Apothecia sessile, flat to convex, black, diam. to 0.7 mm. Margin persistent, brown, subhymenium brown. Hymenial gelatine J+ blue after treatment with 10% KOH. Asci J–. Hymenium ca. 100 µm high, hyaline. Paraphyses septate, with brown caps on end-cells. Ascospores 8 per ascus, 33–37 × 12–14 µm, 1-septate, not constricted at the septum, ends rounded, brown.

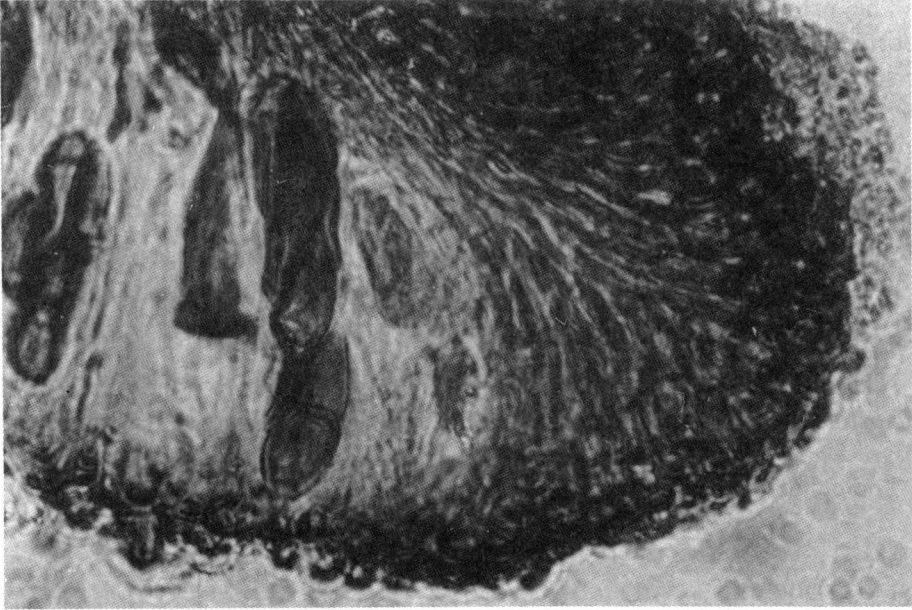


Fig. 2. *Dactylospora cladoniicola*, holotype. Part of apothecial section

Holotype: Svalbard, Spitsbergen, Sørkapp Land, Lidfjellet, alt. 380 m, 18 July 1985, Olech (KRA).

The species is parasitic on *Cladonia macrophyllodes*, the squamules of which are broken down but retain their colour during the attack.

Only one other known species of *Dactylospora* has 1-septate ascospores of a comparable size, viz. *D. allantoidea* Alstrup, D. Hawksw., which is known from *Parmelia pulla* in Greenland. The spores of that species are allantoid and measure  $26-28 \times 8-9 \mu\text{m}$ . The new species is known only from the type collection.

*Dactylospora deminuta* (Th. Fr.) Triebel. On *Biatora vernalis* and *Lecanora epibryon*, Sergejevskardet, 180 m, 17 July 1985.

*Endococcus rugulosus* Nyl. On *Aspicilia* sp., Sørkapp Land, near Kulmraben, 10 m, 5 Aug. 1985.

*Endococcus* sp. On *Rhizocarpon inarense*, Hornsund, Treskelen, 15 m, 22 Aug. 1985. The spores are thick-walled with rounded ends and measure  $17-20 \times 8-9 \mu\text{m}$ . Triebel (1989) referred specimens on yellow *Rhizocarpon* species with such big spores to *E. perpusillus* Nyl. although she claimed that species to have thin-walled, narrowly ellipsoid ascospores. The shape of the spores are similar to *E. rugulosus*, which she claims to have smaller spores. A possible name is *E. macrosporus* (*Tichothecium* m. Hepp ex Arn.).

*Geltingia stereocaulorum* Alstrup, D. Hawksw. On *Stereocaulon rivulorum*, Sørkapp Land, Lidfjellet near Sergejevffjellet, 520 m, 22 July 1985.

The species was recently described from Greenland (Alstrup and Hawksworth 1990) and is here reported for the second time.

*Hystrix* Alstrup et Olech gen. nov.

*Pyrenomyces* lichenicola peritheciis spinosis, hamathecio non viso, ascis subcylindricis, tholus nullis, ascosporis filiformibus.

Lichenicolous pyrenomycete with spiny perithecia, hamathecium not seen, asci subcylindrical, tholus absent, ascospores filiform.

Type species: *H. peltigericola* Alstrup et Olech. The new genus is named after the porcupine because of the numerous long and stout spines, which virtually cover the whole perithecium.

*Hystrix peltigericola* Alstrup et Olech, sp. nov. (Figs. 3, 4). Perithecia globularia, sessilia, nigra, 200–300  $\mu\text{m}$  diam., spinis numerosis nigris, ad circiter 150  $\mu\text{m}$  longis, cellulis basalibus suffultis 20  $\mu\text{m}$  altis, ad bases 20  $\mu\text{m}$ , ad

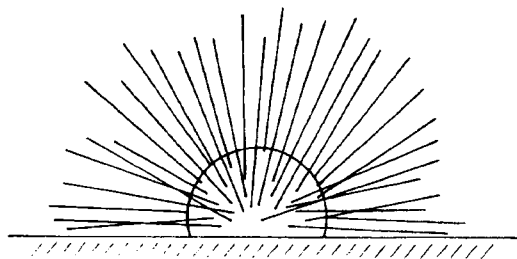


Fig. 3. *Hystrix peltigericola*, holotype, habitus

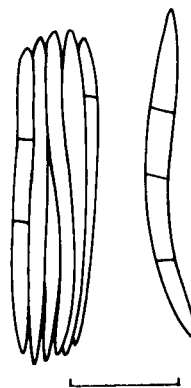


Fig. 4. *Hystrix peltigericola*, holotype, ascospores

apices rotundatos circiter 5  $\mu\text{m}$  diam. Paries perithecii ex duobus vel tribus stratis cellularum angulararum pseudoparenchymaticarum circiter 13–16  $\times$  8–10  $\mu\text{m}$  magnarum formatus, intus strato 10  $\mu\text{m}$  crasso cellularum pseudoprosenchymaticarum 2–3  $\mu\text{m}$  magnarum tectus cellulas ascogenes proferente. Asci subcylindrici, membranis omnino tenuibus, tholis nullis, circiter 40  $\times$  8  $\mu\text{m}$  magni, octospori, cum J non colorati. Ascosporae in asco parallelae, filiformes, 3–5 septis segre visibilibus divisae, hyalinae, 25–33  $\times$  2.0–2.5  $\mu\text{m}$  magnae.

Perithecia globose, sessile, black, 200–300  $\mu\text{m}$  diam., with numerous black spines to ca. 150  $\mu\text{m}$  long. Spines sitting on a basal cell 20  $\times$  20  $\mu\text{m}$ , 1-celled, tapering to ca. 5  $\mu\text{m}$  near the top, top rounded. Perithecial wall of 2–3 layers of angular pseudoparenchymatic cells ca. 13–16  $\times$  8–10  $\mu\text{m}$ , cavity lined by a layer 10  $\mu\text{m}$  thick of pseudosclerenchymatic cells 2–3  $\mu\text{m}$  thick, from which the ascogenous cells arise. Asci subcylindrical, thin-walled throughout, tholus absent, ca. 40  $\times$  8  $\mu\text{m}$ , 8-spored, J-. Ascospores parallel in ascus, filiform, 3–5-septate, septa difficult to see, hyaline, 25–33  $\times$  2.0–2.5  $\mu\text{m}$ .

Holotype; Svalbard, Spitsbergen, NW Sørkapp Land, Palflyodden, on *Peltigera scabrosa*, 12 July 1982, Olech (KRA).

The affinity of the new genus is obscure. The species is easily separated from other spiny species on *Peltigera* by its numerous long spines, and by its subcylindrical asci and filiform ascospores. Old perithecia collapse and their form is obscured by the spines.

The new species is known only from the type collection with certainty. However, a specimen from Greenland with empty perithecia (Alstrup and Hawksworth 1990 — as *Capronia peltigerae*) probably belong here.

*Lasiosphaeriopsis christiansenii* Alstrup, D. Hawksw. On *Lecanora polytropa*, thallus, Sørkapp Land, nordre Sergeijevfjellet, SW., 160 m, 9 Aug. 1982. The host is dead also in parts not affected by the fungus, probably due to shade after being overgrown. The fungus was so far known from *Porpidia tuberculosa* in Greenland. Also the fungus looks old, the perithecia are mostly empty, but the general appearance and the spore characters are in accordance with the type specimen.

*Lasiosphaeriopsis stereocaulicola* (Lindsay) O. Eriksson, R. Sant. On *Stereocaulon alpinum*, Sørkapp Land, Hornsundnesset, 24 July 1982. On *S. rivulorum*, Breinesflya, 7 Aug. 1985. On *S. alpinum*, W-scrree of Hohenlohefjellet, W, 60 m, 12 July 1982, and Sørkappnesset, 12 July 1982. On *S. condensatum*, Lisbetelva near outlet from Svartvatnet, polygon soil, 30 m, 21 July 1982.

*Lichenocodium lecanorae* (Jaap) D. Hawksw. On *Arctopeltis thuleana*, Hornsund, Hyttevika, rock near house, 30 June 1985.

*Lichenocodium usneae* (Anzi) D. Hawksw. On *Cladonia gracilis*, Sørkapp Land, Raksodden, 10 m, 5 July 1985.

*Merismatium nigritelum* (Nyl.) Vouaux. On *Pannaria pezizoides*, Sørkapp Land, near Rafenodden 20 m, 8 July 1985.

*Phaeosporobolus alpinus* R. Sant., Alstrup, D. Hawksw. On *Ochrolechia frigida*, Sørkapp Land, Raksodden, 5 m, 13 July 1985; Breinesflya, alt. 0–5 m, 30 July 1985; Kulmrabben, 70 m, 5 Aug. 1985. N coast of Hornsund, Fuglebergsletta, 15 m, 24 June 1985.

*Plectocarpon lichenum* (Sommerf.) D. Hawksw. On *Lobaria linita*, on a stone ridge below Wiederfjellet, 20 m, 29 July 1985; rocks below Sergeijevfjellet, 50 m, 16 Aug. 1985.

*Polycoccum trypteliodes* (Th.Fr.) R. Sant. On *Stereocaulon condensatum*, Sørkapp Land, Lisbetelva at Svartvatnet, 30 m, 21 July 1982.

*Pronectia robergei* (Mont. et Dez.) Lowen. On *Solorina bispora*, thallus and possibly apothecia, Sørkapp Land, W-slope of Wiederfjellet, 120 m, 9 Aug. 1985.

*Rhagadostoma lichenicola* (de Not.) Keissler. On *Solorina crocea*, Sørkapp Land, Wiederfjellet, Slaklidalen, 180 m, 22 July 1985.

*Scutula stereocaulorum* (Anzi) Körber. On *Stereocaulon alpinum*, Sørkapp Land, Sergeijevfjellet, W, 165 m, 6 Sept. 1982. W-scrree of Hohenlohefjellet, 60 m, 20 July 1982.

*Sphaerellothecium araneosum* (Rehm et Arnold) Zopf. (*Echinothecium glabrum* M.S. Christ., Alstrup, D. Hawksw.). On *Ochrolechia frigida*, søre Sergeijevfjellet, W, 120 m, 31 July 1985. On *O. grimmiae*, Hornsund, Fuglebergsletta, 15 m, 24 July 1985.

*Stellifraga* Alstrup et Olech gen. nov.

Ascomycetes lichenicola peritheciis immersis per corticem hostis erumpentibus. Asci subcylindrici apice complanati, tholis manifestis quoque intra fovae centrali impresso, filamentis hamathecialibus dense circumdati ad ascos ut videtur agglutiantis. Parietes apicales ascorum 10% KOH tractati cum liquore Meltzeri colorem coeruleum induentes, gelatina circumdans colorem dilute coeruleum. Ascospores hyalinae, septatae.

Lichenicolous ascomycete with immersed perithecia breaking through the cortex of the host; asci subcylindrical, with distinct tholus and pierced by a "chambre oculaire", densely surrounded by hamathecial filaments apparently glued to the asci. Apical part of the ascal wall blue and surrounding gel pale blue with Melzer after K. Ascospores hyaline, septate.

Type species: *Stellifraga cladoniicola* Alstrup et Olech. The new genus from *Cercidospora* Körber and related genera in the rather flat-topped asci and in the reactions with Melzer's solution.

*Stellifraga cladoniicola* Alstrup et Olech sp. nov. (Fig. 5). Perithecia 100–150  $\mu\text{m}$  diam., dispersa, in medulla hostis formata, corticem stellatim

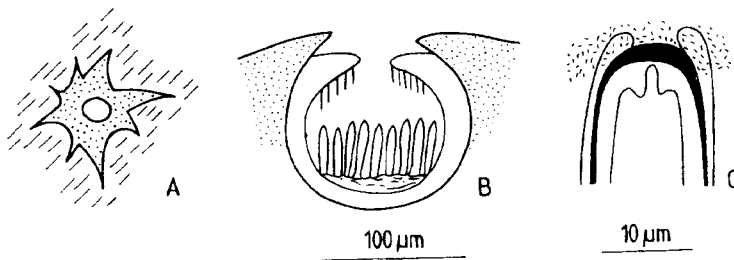


Fig. 5. *Stellifraga cladoniicola*, holotype. A: habitus seen from above; B: skematic section of host and fungus; C: ascustop surrounded by hamathecial, paraphysis-like, filaments. (Black: blue in Meltzer's solution, dotted: pale blue in Meltzer's solution)

rumpentia. Excipulum fuscum, 15–20  $\mu\text{m}$  crassum, e cellulis pseudoprosenchymaticis vel pseudoparenchymaticis 4–6  $\times$  6–10  $\mu\text{m}$  magnis formatum, circum ostiolum 30–40  $\mu\text{m}$  crassum, fuscum vel nigrum, poro intra cellulis 5–7  $\mu\text{m}$  diam. strato. Hamathecium e filis circiter 1.5  $\mu\text{m}$ , supra ad 2.5  $\mu\text{m}$  crassis formatum parum ramificatis, raro anastomosantibus (ut videtur ad ascos agglutinatis). Asci octospori 55–60  $\times$  10–12  $\mu\text{m}$  magni, maximam diametrum circiter 20  $\mu\text{m}$  supra bases attingentes. Ascospores in ascis distiche dispositae, ellipsoides, 13–14  $\times$  5–5.5  $\mu\text{m}$  magna, ternis septis divisae.

Holotype: Spitsbergen, Sørkapp Land, below Hohenloheskardet Pass, 40 m, on *Cladonia gracilis*, 11 July 1985, Olech (KRA)?

Perithecia 100–150  $\mu\text{m}$  diam., dispersed, formed in the host's medulla, at maturity breaking the cortex, which splits in a starlike way. Excipulum brown, 15–20  $\mu\text{m}$  thick, of short pseudoprosenchymatic to pseudoparenchymatic cells ca. 4–6  $\times$  6–10  $\mu\text{m}$ , around the ostiole 30–40  $\mu\text{m}$  thick, dark brown to black, the pore lined by cells 5–7  $\mu\text{m}$  diam. Periphyses not seen. Hamathecium of little branched filaments ca. 1.5  $\mu\text{m}$  thick, at top to 2.5  $\mu\text{m}$ , apparently glued to the asci. Asci 8-spored, 55–60  $\times$  10–12  $\mu\text{m}$ , thickest ca. 20  $\mu\text{m}$  from base. Ascospores distichously arranged in the asci, ellipsoid, 3-septate, 13–14  $\times$  5–5.5  $\mu\text{m}$ .

The new species is known only from the type collection. It is apparently parasymbiotic, as the host looks healthy around the infected area, in spite of the deep infection and the broken cortex. Superficially it has some resemblance to *Corticifraga* D. Hawksw., R. Sant.

*Stigmidium peltideae* (Vainio) R. Sant. On *Peltigera rufescens*, Sørkapp Land, Stupryggen, NW, 250 m, 9 Aug. 1985. On *P. canina*, Lisbetelva at outlet from Svartvatnet, 24 July 1982. On *Solorina crocea*, Wiederfjellet, Slaklidalen, 180 m, 22 July 1985.

*Thelocarpon epibolum* Nyl. On *Peltigera aphthosa*, Sørkapp Land, Sergejevskardet, 60 m, 18 July 1982.

*Weddellomyces tartaricola* (Lindsay) Alstrup, D. Hawksw. On *Ochrolechia frigida*, at the foot of Hohenlohefjellet, 14 July 1982. The species was known only from the type collection from Greenland. The specimen deviates from the type collection in having up to 20 ascomata aggregated in gall-like thickenings of the thallus. The ascospores varies within an ascus being 2–5-septate to submuriform.

*Wentiomyces peltigericola* D. Hawksw. On *Peltigera aphthosa*, Sørkapp Land, Sergejevskardet, 60 m, 18 July 1982.

*Zwackhiomyces macrosporus* Alstrup et Olech sp. nov. (Fig. 6).

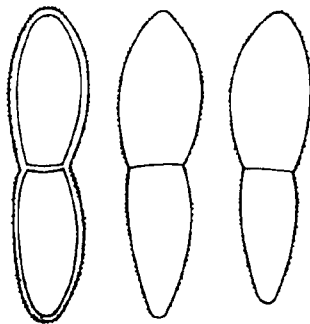


Fig. 6. *Zwackhiomyces macrosporus*, holotype, ascospores.

Scale 10  $\mu\text{m}$

Ascomycetes lichenicola sporas in peritheciis gignens per superficiem hostis dispersis, ostiolatis, nigris, circiter 100  $\mu\text{m}$  diam. Paries perithecii fuscus vel



niger, intus pallidior, circiter 15–22  $\mu\text{m}$  crassus. Asci cylindrici, fissitunicati, 95–100  $\times$  16–19  $\mu\text{m}$  magni, octospori. Cytoplasma ascorum in solutione Meltzeri aurantiacum. Ascosporae in ascis distiche dispositae, ellipsoides, ad septum unicum constrictatae, cellula superiore majore, laeves vel paulum verrucosae, hyalinae, 37–43  $\times$  8.5–10  $\mu\text{m}$  magnae. Hamathecium ex hyphis compositum circiter 1  $\mu\text{m}$  crassis, parum ramificatis, raro anastomosantibus.

Lichenicolous ascomycete. Ascomata perithecia, sitting on the host. Perithecia dispersed, spherical, ostiolate, black, ca. 100  $\mu\text{m}$  diam. Perithecial wall dark-brown to black, inner part paler, about 15–22  $\mu\text{m}$  thick. Asci cylindrical, fissitunicate, 95–100  $\times$  16–19  $\mu\text{m}$ , 8-spored. Ascal cytoplasma orange in Meltzer's solution. Ascospores distichous, ellipsoid, 1-septate, constricted at the septum, the upper cell bigger than the lower one, smooth or slightly verruculose, hyaline, 37–43  $\times$  8.5–10  $\mu\text{m}$ . Hamathecium of little branched hyphae ca. 1  $\mu\text{m}$  thick, septate, rarely anastomosing.

Holotype: Spitsbergen, Sørkapp Land, Lidfjellet, at foot of the west slope, 70 m, on *Pannaria pezizoides*, 8 Aug. 1985, Olech (KRA).

The genus was recently described by Grube and Hafellner (1990) in a revision of *Didymella* s.l. The present species is easily separated from other species in the genus by the size of the ascospores. Two of the other *Didymella* species excluded by their revision have also big spores, viz. *D. bryospila* (Nyl.) Magnusson, a lichenized species of unsettled relationship having ascospores 28–35  $\times$  10–12  $\mu\text{m}$  which become light brownish, and *D. collematum* var. *cladoniae* Keissler, which apparently is found on *Pannaria* sp., with immersed perithecia, black ostioles, functionally unitunicate asci and ascospores 20–30  $\times$  4–5(8)  $\mu\text{m}$ . Both of these species are well separated from the present species.

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## Streszczenie

W pracy podano stanowiska 28 grzybów pasożytujących na plechach porostów nieznanych dotąd z terenu południowo-zachodniego Spitsbergenu. Kilkanaście z nich to gatunki nowe dla całego Archipelagu Svalbard: *Cercidospora stereocaulorum*, *Corticifraga peltigerae*, *Geltingia stereocaulorum*, *Lasiosphaeriopsis christiansenii*, *Lichenocodium lecanorae*, *Merismatium nigrillum*, *Plectocarpon lichenum*, *Polycoccum tryptelioides*, *Rhagadostoma lichenicola*, *Spaerellothecium araosum*, *Stigmatidium peltideae*, *Thelocarpon epibolum*, *Weddellomyces tartaricola* i *Wentomyces peltigericola*. Dwa nowe dla nauki rodzaje: *Hystrix* i *Stellifraga* oraz 4 nowe dla nauki gatunki: *Dactylospora cladoniicola*, *Hystrix peltigericola*, *Stellifraga cladoniicola* i *Zwackhiomyces macroporus* zostały opisane z tego terenu. Materiały zebrane przez drugiego z autorów podczas dwu ekspedycji Uniwersytetu Jagiellońskiego na Spitsbergen w latach 1982 i 1985 zostały złożone w zbiorach zielnikowych Instytutu Botaniki U.J. (KRA).