

## Notes on Swedish lichenicolous fungi

by

Per G. Ihlen\* and Mats Wedin

Department of Ecology and Environmental Science, Umeå University,  
SE-901 87 Umeå, Sweden

With 2 figures

Ihlen, P.G. & Wedin, M. (2005): Notes on Swedish lichenicolous fungi. - Nova Hedwigia 81: 493-499.

**Abstract:** The new lichenicolous species *Epicladonia lapponica* Ihlen and *Teloggalla physciicola* Ihlen & R. Sant. are described from Sweden. *Arthonia digitatae* Hafellner and *Phaeospora arctica* Horáková & Alstrup are reported as new to Scandinavia and *Cercidospora cecidiiformans* Grube & Hafellner and *Pronectria xanthoriae* Lowen & Diederich are reported new to Sweden. Notes have been given on the ecology of these species.

**Zusammenfassung:** Die neuen lichenikolen Arten *Epicladonia lapponica* Ihlen und *Teloggalla physciicola* Ihlen & R. Sant. werden für Schweden beschrieben. Neu für Skandinavien werden *Arthonia digitatae* Hafellner und *Phaeospora arctica* Horáková & Alstrup beschrieben und für Schweden *Cercidospora cecidiiformans* und *Pronectria xanthoriae* Lowen & Diederich. Anmerkungen zur Ökologie dieser Arten sind enthalten.

**Key words:** Scandinavia, lichenicolous fungi, new species, distribution.

### Introduction

During herbarium studies and recent fieldwork in northern Sweden, several lichenicolous fungi were collected that either proved to be undescribed, insufficiently known, or new to the Scandinavian or Swedish flora of lichenicolous fungi as they were not listed in the recent checklist for Sweden (Santesson et al. 2004) or, to our knowledge, in any other paper dealing with Scandinavian lichenicolous fungi. The aim of this paper is to report on these findings.

\*Author for correspondence.

## Material and methods

All specimens are deposited in UPS. For anatomical studies, a Zeiss light microscope with magnifications of  $\times 400$ ,  $\times 630$ , and  $\times 1000$ , equipped with a blue filter, was used. Microscopic examinations required sections, mostly 10-20  $\mu\text{m}$  thick, cut with a freezing microtome. Microscopic examinations of all structures were done in water and in K (i.e., a 10% solution of potassium hydroxide), except for the examination of the details of conidiogenesis, where a temporary erythrosine mountant (0.5 g erythrosine: 10 ml 10% ammonia), was applied. All Swedish specimens labelled *Pleopsidium chlorophanum* (Wahlenb.) Zopf in UPS were screened for lichenicolous fungi.

## Results and discussion

### ***Arthonia digitatae* Hafellner**

Linzer biol. Beitr. 31: 509 (1999).

*Arthonia digitatae* was described from Austria where it occurred on the basal squamules of *Cladonia digitata* (L.) Hoffm. (Hafellner 1999). As the species contains asci with a K/I+ faintly blue ring structure in the tholus, hyaline and 1-septate ascospores, and distinctly pigmented epithecium, not reactive in K, it clearly belongs in the *Arthonia radiata*-group sensu Grube & Matzer (1997). Furthermore, the ascomata are black in surface view and frequently grouped together, the hymenium is I+ rust-red, and the ascospores have the size 9.0-11.0  $\times$  3.0-5.0  $\mu\text{m}$ . Hafellner (op. cit.) should be consulted for further morphological details.

In Pite Lappmark (northern Sweden), *Arthonia digitatae* was found on *Cladonia pleurota* (Flörke) Schaer. on a decayed trunk of *Betula* in a subalpine *Betula*-dominated forest, 600 m a.s.l. *Arthonia digitatae* is, to our knowledge, only known from Austria (Hafellner op. cit.) where it was found on *Cladonia digitata*, and is here reported new to Scandinavia from a new host species.

Specimen examined: SWEDEN: Pite Lappmark, Arjeplog, Hornavan-Sädvajaure Fjällurskogs Naturreservat, between Mt. Rissåjvve and place Vouggatjålme, 2003, Ihlen 1150b (UPS).

### ***Cercidospora cecidiiformans* Grube & Hafellner**

Herzogia 9: 751 (1993).

*Cercidospora cecidiiformans* is characterized by the formation of gall-like structures (cecidia) on the host thallus (*Rhizocarpon* subgen. *Rhizocarpon*). Furthermore, the perithecia are immersed and in section brown or green (and K-) in the upper part of the wall, in lower part they are hyaline and indistinctly separated from the host. The ascospores are hyaline, 1-septate, slightly halonate, and 15.0-17.0  $\times$  5.0-7.0  $\mu\text{m}$  in size. The description and illustrations provided by Hafellner (1993) should be consulted for further details.

In Sweden, *Cercidospora cecidiiformans* was found on *Rhizocarpon geographicum* s. lat. in both Västerbotten and Lycksele Lappmark provinces. In the former province the host was collected once on seashore rock and in the latter it was found at two localities, growing on ridges in the lower alpine zone at altitudes ranging from 750 m to 850 m. At one of these localities the host was found on siliceous rock and on the other, it was found on calcareous rock. *Cercidospora cecidiiformans* was formerly

known from Austria, Switzerland, Norway (Hafellner op. cit.), and Greenland (Hafellner et al. 2002) and is here reported new to Sweden.

Specimens examined: SWEDEN: Västerbotten, Nordmaling, Långron, south of place Rundvik, 2003, Ihlen 1433 (UPS). Lycksele Lappmark, Sorsele, Mt. Årjel Biergenis, c. 10 km NNE of Ammarnäs, Ihlen 1335 (UPS); Mt. Geunjavardo, 4 km west of the west end of lake Stor-Tjulträsket, 6 km west of Ammarnäs, 2003, Ihlen 1323 (UPS).

***Epicladonia lapponica* Ihlen sp. nov.**

Fig. 1

Fungus lichenicola. Conidiomata in thallo et apothecio *Pleopdidii chlorophani* immersa, (200-)300-600 µm diam., pariete bruneo. Cellulae conidiophora absentia. Cellulae conidiogenae subcylindricae. Conidia bacilliformia, 5-7(-9) × (1.5-)2-3 µm.

Type: SWEDEN: Torne Lappmark, [Torne Träsk], Pällmoviken [Pålnoviken], 23.VII.1906, Th. M. Fries (UPS-holotype).

Conidiomata pycnidial, (200-)300-600 µm in diameter, arising singly or in groups, at first subglobose and immersed (Fig. 2A), then ostiolate, later erumpent and cupulate (Fig. 2B, C) and causing cracks in the host thallus; wall in section dark brown, (6-)10-20(-25) µm thick, continuous, distinctly delimited from the host tissue, composed of both rounded and elongated cells. Conidiophores absent. Conidiogenous cells lining the inner wall of the pycnidial cavity, subcylindrical to elongate-ampulliform, 7-12(-15) × (1.5-)2-3(-5) µm, proliferating, usually unbranched, rarely slightly branched, tapering towards the apex, hyaline. Conidia (Fig. 2D) formed at the apex of the conidiogenous cells, arising singly, simple, bacilliform with rounded ends or sometimes with one cell truncated, 5-7(-9) × (1.5-)2-3 µm ( $n = 15$ ).

ECOLOGY AND DISTRIBUTION: *Epicladonia lapponica* has been found on the thallus and apothecia in four collections of *Pleopsidium chlorophanum* (Wahlenb.) Zopf all growing on schistose rock. Three specimens were collected on vertical rocks close to wet places like lakes or small streams. *E. lapponica* is known from Lycksele Lappmark, Lule Lappmark, and Torne Lappmark (hence the epithet) in Sweden at altitudes ranging from 400-700 m.

REMARKS: This new species has, with some hesitation, been placed in *Epicladonia* D. Hawksw. (Hawksworth 1981). It differs, however, from *E. sandstedei* (Zopf) D. Hawksw. and *E. simplex* D. Hawksw. by not forming any distinct galls on the host thallus and from all by having a continuous and brown wall. In the three other species described in this genus, the wall is subhyaline except for the vicinity of the ostiole or at exposed parts of the wall (see Hawksworth op. cit.). It is also noteworthy that those species are restricted to *Cladonia* spp. Furthermore, *Epicladonia lapponica* can be separated from *E. sandstedei* (Zopf) D. Hawksw. and *E. stenospora* (Harmand) D. Hawksw. by having simple and bacilliform conidia. In *E. sandstedei* they are 1-septate and in *E. stenospora* they are subcylindrical to almost cymbiform and rarely 1-septate. *Epicladonia simplex* seems to be morphologically most similar to *E. lapponica*, but can also be separated by its much longer conidia (8.5-12.0 µm).

To our knowledge, the only other lichenicolous fungus reported on *Pleopsidium chlorophanum* is *Dactylospora rimulicola* (Müll. Arg.) Hafellner (see Alstrup 1991). In northern Europe, this lichen has a scattered but widely arctic-alpine distribution (Magnusson 1929), and then consequently, *Epicladonia lapponica* may prove to be quite common in these areas.

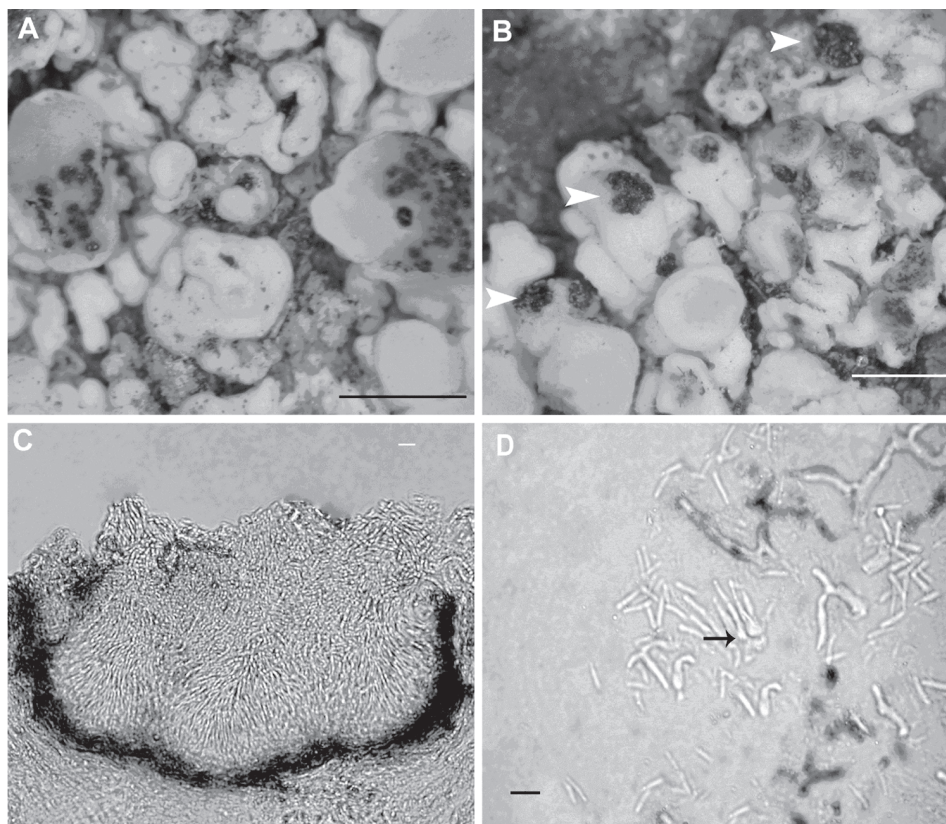


Fig. 1. *Epicladonia lapponica* (holotype). A and B: Apothecia and thallus of *Pleopsidium chlorophanum* infected by the conidiomata of *Epicladonia lapponica* (indicated by arrows). C: Conidioma in section. D: Conidia and conidiogenous cells (arrow). Scale bars: A = 1.0 mm, B = 0.7 mm, C = 10  $\mu$ m and D = 5.0  $\mu$ m.

Additional specimens examined: SWEDEN: Lycksele Lappmark, Tärna, vid Abelvattnets västända, 1968, Lohammar (UPS). Lule Lappmark, Jokkmokk, Vallerkårså, 4 km NO Njunjjes, 7 km VNV Kvikkjokk, 1990, Hermansson 2462e (UPS). Torne Lappmark, Jukkasjärvi, Torneträsk area, Vuoskåjve (Stordalen stn), 1967, Moberg 820 (UPS).

### ***Phaeospora arctica* Horáková & Alstrup**

Graphis Scripta 6: 61 (1994).

*Phaeospora arctica*, described by Horáková & Alstrup (1994), is mainly characterized by having immersed, perithecioid ascomata not exceeding 0.1 mm in diameter, brown and pseudoparenchymatous wall, asci containing a long internal apical beak, and brown and 3-septate ascospores. It should be noted that hamathecial filaments are present in *P. arctica*, contrary to the statement by Horáková & Alstrup (op. cit.), but contains short pendant interascal filaments (see Calatayud & Triebel 2003: 104)

near the ostiole. The species is known from Alaska and Greenland where it has been collected on *Arctocetraria andrejevii* (Oxner) Kärnefelt & Thell and *Arctoparmelia centrifuga* (L.) Hale (Horáková & Alstrup op. cit.).

In Pite Lappmark (in northern Sweden), *Phaeospora arctica* was found growing on *Arctoparmelia centrifuga* on exposed rock in the lower alpine zone, about 800 m a. s. l. The species is here reported new to Scandinavia.

Specimen examined: SWEDEN: Pite Lappmark, Arjeplog, Hornavan-Sädvajaure Fjällurskogs Natursreservat, on Mt. Rissåjvve, 2 km NE of Vouggatjälme, 2003, Ihlen 1141 (UPS).

Specimens of *Phaeospora arctica* used for comparison: USA: Alaska, Bering Strait District, Ogotoruk Creek drainage, 1960, Viereck & Bucknell 4557b (UPS). Greenland. South Greenland: Ivigut, 1946, Christiansen 5450 (C).

### ***Pronectria xanthoriae* Lowen & Diederich**

Mycologia 82: 788 (1990).

*Pronectria xanthoriae* (Lowen & Diederich 1990) is characterized by the bright orange perithecia, and the relatively long, verruculose, ellipsoid, one-septate ascospores. The size range of the spores is somewhat larger in our material than given in the original description (ca 15-30 × 4-6 µm). The otherwise similar *P. tincta* (Fuckel) Lowen, which grows on *Anaptychia ciliaris*, differs by having fusiform ascospores with unequal cells.

The specimen from Västerbotten was referred to as from 'Northern Sweden, Wedin pers. commun.' in Santesson et al. (2004: 266) without indicating any known province. We take the opportunity to report it as new to Sweden here, with detailed locality data from two Swedish provinces.

Specimens examined: SWEDEN: Gotland, Visby, Visby City, Cramérgatan 6, 2002, Wedin 6747 (UPS); Ardre, ca 1 km SW of Ardre church, 2002, Wedin 6769 (UPS). Västerbotten, Vindeln, along river Vindelälven, Vindelforsarna Nature Reserve, close to the old mill, 2001, Wedin 6744 (UPS).

### ***Telogalla physciicola* Ihlen & R. Sant. sp. nov.**

Fig. 2

Fungus lichenicola, cecidogena. Ascomata perithecioidea, in thallo *Physciae dubiae* immersa, pariete brunneo. Filamenta periphysioidea pendula in ostiolum. Filamenta interascalialia deficiente. Ascosporae, hyalinae, 1-septatae, 11-13(-14) × 7-9 µm.

Type: SWEDEN: Medelpad, Alnö socken, Slädaviken. På sjenityta av flyttblock (fågeltupp) vid stranden av havsvik, stormsbeltet [On the zenith side of a boulder (birdtop) by the beach of the bay, the stormbelt]. 21.VII.1935, Efr. Eriksson (UPS-holotype).

Fungus gall-forming the host; galls globose, at first dark brown to black, brown when mature. Ascomata perithecia, immersed in the galls of the host thallus, 110-150 µm broad, 180-350 µm high; wall in section brown, K+ greenish brown, 7-20 µm thick, in basal part up to 40 µm thick, composed of textura prismatica type of hyphal tissue, except for the upper basal part that is textura angularis; wall clearly delimited from the host thallus. Hymenial gel I-. Hamathecial filaments periphyses, present at the upper half part of the perithecia, sparsely septate, unbranched to



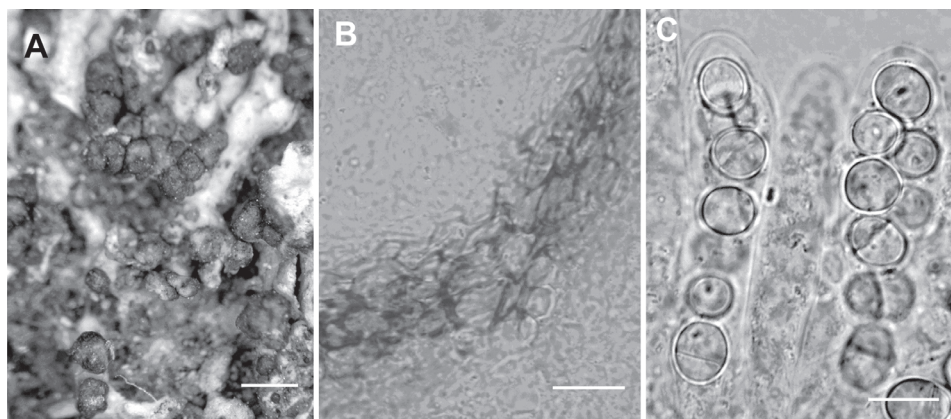


Fig. 2. *Telogalla physciicola*. (holotype). A: Dark coloured gall-formations on thallus of *Physcia dubia*. B: Ascoma wall, C: Asci and ascospores. Scale bars: A = 0.6 mm, B = 10.0  $\mu$ m, C = 9.0  $\mu$ m.

sparingly branched, 2-3  $\mu$ m wide, hyaline, upper part of the upper periphyses brown; interascal filaments absent. Asci cylindrical to elongate-clavate, 70-90  $\times$  20-23  $\mu$ m, bitunicate, thick-walled, I-, K/I-. Ascospores hyaline, broadly ellipsoid, simple to 1-septate, 11-13(-14)  $\times$  7-9  $\mu$ m ( $n = 10$ ), with a thin perispore.

**ECOLOGY AND DISTRIBUTION:** *Telogalla physciicola* grows on thallus of *Physcia dubia* (Hoffm.) Lettau. The host was found once on siliceous rock with bird droppings at sea level (holotype) and once on dolomite in the lower alpine zone. The species is so far known from Medelpad and Torne Lappmark provinces in northern Sweden.

**REMARKS:** Due to the gall-formation of the host tissue, the textura prismatica type of the perithecial wall, the absence of interascal filaments, presence of periphyses, thick-walled and 8-spored asci, reacting I- and K/I-, and hyaline and 1-septate ascospores with a thin perispore, this species is placed in *Telogalla* Nik. Hoffm. & Hafellner (see Hoffmann & Hafellner 2000). However, two characters that do not fit *Telogalla* as circumscribed by Hoffmann & Hafellner (2000) is the non-amyloid reaction of the hymenial gel (in *Telogalla* it is hemi-amyloid) and the brown perithecial wall. Other closely related genera that lack a hemi-amyloid reaction of the hymenial gel are for example *Gyrophthorus* Hafellner & Sancho and *Thamnogalla* D. Hawksw. However, they have both interascal filaments and simple ascospores without a perispore. *Telogalla physciicola* is the second species so far known from this genus. The other one, *T. olivieri* (Vouaux) Nik. Hoffm. & Hafellner, can be separated from *T. physciicola* by its hemi-amyloid reaction of the hymenial gel and oval to fusiform ascospores that only rarely are 1-septate.

As *Telogalla physciicola* is known from both sea level and the lower alpine zone and the fact that the host is quite widespread (Moberg 2002), it might prove to be quite common.

Additional specimen seen: SWEDEN: Torne Lappmark, Jukkasjärvi, Rautasjärvi-området, namlösa lågfjället NW om Ruotatjåkko, 1947, Hasselrot (UPS).

## Acknowledgements

Financial support was provided by The Swedish Taxonomy Initiative (Svenska artprojektet), via the Swedish Species Information Centre (ArtDatabanken). Additional support was given by "Gunnar och Ruth Björkmans fond för norrländsk botanisk forskning". We thank Rolf Santesson (Uppsala) for valuable comments on the manuscript.

## References

- ALSTRUP, V. (1991): Lichens and lichenicolous fungi from the Torneträsk area. - *Graphis Scripta* **3**: 54-67.
- CALATAYUD, V. & D. TRIEBEL (2003): Three new species of *Stigmidium* s. l. (lichenicolous ascomycetes) on *Acarospora* and *Squamarina*. - *Lichenologist* **35**: 103-116.
- GRUBE, M. & M. MATZER (1997): Taxonomic concepts of lichenicolous *Arthonia* species. - *Bibliotheca Lichenologica* **68**: 1-17.
- HAFELLNER, J. (1993): Über Funde von lichenicolen Pilzen und Flechten im südlichen Norwegen. - *Herzogia* **9**: 794-768.
- HAFELLNER, J. (1999): Beiträge zu einem Prodromus der lichenicolen Pilze Österreichs und angrenzender Gebiete. IV. Drei neue Arten und weitere bemerkenswerte Funde hauptsächlich in der Steiermark. - *Linzer biol. Beitr.* **31**: 507-532.
- HAFELLNER, J., D. TRIEBEL, B.D. RYAN & T.H. NASH III (2002): On lichenicolous fungi from North America. II. - *Mycotaxon* **84**: 293-329.
- HAWKSWORTH, D.L. (1981): The lichenicolous coelomycetes. - *Bull. Br. Mus. Nat. Hist.* **9**: 1-98.
- HENSSEN, A. (1963): Eine revision der Flechtenfamilien Lichinaceae und Ephebeaceae. - *Symbolae Botanicae Upsalienses* **18**: 1-123.
- HOFFMANN, N. & J. HAFELLNER (2000): Eine Revision der lichenicolen Arten der Sammelgattungen *Guignardia* und *Physalospora* (Ascomycotina). - *Bibliotheca Lichenologica* **77**: 1-181.
- HORÁKOVÁ, J. & V. ALSTRUP (1994): *Phaeospora arctica*, a new lichenicolous fungus. - *Graphis Scripta* **6**: 61-63.
- LOWEN, R. & P. DIEDERICH (1990): *Pronectria xanthoriae* and *P. terrestris*, two new lichenicolous fungi (Hypocreales). - *Mycologia* **82**: 788-791.
- MAGNUSSON, A.H. (1929): A monograph of the genus *Acarospora*. - *Kongl. Svenska Vetenskaps-Akademiens Handlingar*, Stockholm **7**: 1-400.
- MOBERG, R. (2002): *Physcia*. - *Nordic Lichen Flora* **2**: 33-38.
- SANTESSON, R., R. MOBERG, A. NORDIN, T. TØNSBERG & O. VITIKAINEN (2004): Lichen-forming and lichenicolous fungi of Fennoscandia. Museum of Evolution, Uppsala University, Uppsala.
- SÉRUSIAUX, E., P. DIEDERICH, A. M. BRAND & P. VAN DEN BOOM (1999): New or interesting lichens and lichenicolous fungi from Belgium and Luxembourg. VIII. - *Lejeunia* **162**: 1-95.

Received 5 April 2004, accepted in revised form 14 February 2005.