

Padjelanta National Park in Sweden, a lichen diversity heaven

GÖRAN THOR, ULF ARUP, ANDREAS FRISCH, MARTIN GRUBE, RAUL VICENTE and MARTIN WESTBERG

Thor, G., Arup, U., Frisch, A., Grube, M., Vicente, R. & Westberg, M. 2023. Padjelanta National Park in Sweden, a lichen diversity heaven. *Graphis Scripta* **35** (7): 81–125. Oslo. ISSN 2002-4495.

Padjelanta National Park is the largest national park in Sweden (198 400 ha) and one of five large national parks in northern Sweden. It mainly includes bare mountain regions. Lichen excursions to Padjelanta were arranged in 2020 and 2021. An excursion has also been organized by the Swedish Lichen Society to the National Park in 2004. Ten species, *Arthonia protoparmeliae*, *Arthonia subclemens*, *Athallia saxifragarum*, *Cercidospora decolorella*, *Merismatium thamnoliticola*, *Sarcogyne cyclocarpa*, *S. urceolata*, *Tremella nephromatis*, *Verrucaria othmarbreussii* and *V. oulankaensis* are reported as new to Sweden. *Arthonia protoparmeliae* is also reported new from Norway and this species together with *Arthonia subclemens* and *Tremella nephromatis* are also new to Fennoscandia. A further 98 taxa that are earlier reported from Sweden are new to Lule lappmark. An additional two species (*Arthonia* sp., *Rhizocarpon* sp.) might represent new species (“known unknowns”). Only six red-listed species have been found according to the Swedish Red List, *Gyalidea roseola*, *Pannaria hookeri*, *Pectenia plumbea*, *Peltigera collina*, *Pyrenula coryli* and *Rinodina endophragma*. The low number of red-listed species probably reflects that few lichens occurring in the Swedish mountain regions have been properly assessed. The lichen flora is species rich and includes several species rarely reported from Sweden. The phylogenetic position of *A. protoparmeliae* in Arthoniaceae is demonstrated through Bayesian and Maximum Likelihood analyses of newly generated mtSSU, nrLSU and *RPB2* sequence data. The fungal barcode nrITS has been generated for specimens of *A. protoparmeliae* from Sweden and Norway.

Göran Thor, Department of Ecology, Swedish University of Agricultural Sciences, P.O. Box 7044, SE-750 07 Uppsala, Sweden. E-mail: goran.thor@slu.se (corresponding author).

Ulf Arup, Biological Museum, Lund University, P.O. Box 117, SE-221 00 Lund, Sweden. E-mail: ulf.arup@biol.lu.se.

Andreas Frisch, Department of Natural History, NTNU University Museum, Norwegian University of Science and Technology, 7491 Trondheim, Norway. E-mail: andreas.frisch@ntnu.no.

Martin Grube, Institut für Botanik, Karl-Franzens-Universität, Holteigasse 6, A-8010 Graz, Austria. E-mail: martin.grube@uni-graz.at.

Raul Vicente, Fjellievägen 9A, SE-227 36 Lund, Sweden. E-mail: rvicaligata@gmail.com.

Martin Westberg, Museum of Evolution, Uppsala University, Norbyvägen 16, SE-752 36 Uppsala, Sweden. E-mail: martin.westberg@em.uu.se.

Introduction

Five large national parks are located in northern Sweden, mainly including bare mountain regions. These are Vadvetjåkka (Vádvečohkka), Abisko, Stora Sjöfallet (Stuor Muorkke), Padjelanta (Badjelánnda) and Sarek National Parks. A translation of the sami name Badjelánnda to English is “The higher land”. The knowledge of lichens and lichenicolous fungi (below as “lichens”) in these national parks can be described as fragmentary at best. Our goal is to provide a better knowledge of



Figure 1. View of Padjelanta National Park SE of Ståloluokta showing the rather flat bare mountain plateau.
Photo G. Thor.



Figure 2. Ståloluokta and Mount Unna Dijdder (Unna Titer) on which e.g. *Arthonia didyma*, *Normandina acroglypta*, *Peltigera collina*, *Siphula ceratites*, *Stigmidium cerinae* and *Thelenella pertusariella* were found.
Photo G. Thor.



Figure 3. Small streams are common and at this locality e.g. *Biatora vacciniicola*, *Muellerella erratica*, *M. pygmaea* and *Plectocarpon linitae* were found. Photo G. Thor.



Figure 4. The wooden boards forming the trail on which *Carbonea aggregantula* was found lichenicolous on *Lecanora polytropa*. Photo G. Thor.

the lichen flora of Padjelanta National Park, which has been very rarely visited by lichenologists. This national park was established in 1962 and is, with its size of 198 400 ha, the largest national park in Sweden. It borders Norway in the west, Sarek National Park in the east and Stora Sjöfallet national park in the northeast. In the north and south there are mountain regions which are not protected. The landscape mainly forms a rather flat bare mountain plateau (Fig. 1) ranging from c. 530–900 m elevation, including few high mountain peaks. The lowermost part is a small area west of Vastenjaure at the Norwegian border (c. 465 m) and the highest peak is Mount Jiegnáffo (Jeknaffo) which reaches 1840 m elevation. There is no permanent settlement within Padjelanta but scattered Sámi settlements are in use mainly from spring to autumn, of which Stáلولuokta (Fig. 2) is the largest. Padjelanta is dotted by numerous small lakes (Fig. 1), but includes some large lakes as well, of which Virihaure (Virihavre, 108 km²) and Vastenjaure (Vásstenjávrre, 89 km²) are the biggest. The lakes are connected by small streams (Fig. 3). The area is traversed by several hiking trails, of which the one between Kvikkjokk and Ritsem is most frequented. The hiking trails are often bridged in wet areas and the wooden boards often harbour lichens (Fig. 4). Some mountain lodges are open for tourists during the field season. Padjelanta is an old cultural landscape managed by the Sámi people since centuries through extensive reindeer husbandry. The reindeer grazing strongly affects the lichen flora and fruticose lichens as *Cladonia* spp. generally form only small patches, while larger lichen mats may be found in habitats that are difficult to access.

The annual average temperature in Stáلولuokta is +0.3°C (average between October 1986 to December 1999; SMHI 2021) and the annual precipitation in Stáلولuokta is 579.5 mm (average between October 1986 and October 2001; SMHI 2021). There are distinct talus slopes on many high peaks. The geology in Padjelanta is diverse and complex. Besides different types of siliceous bedrock, basalt/diabase as well as different types of ultramafic (Fig. 5) and calcareous (Figs 6 & 7) bedrock cover parts of the national park. As a result, the vascular plant flora is rich in species, with species such as *Arenaria humifusa* and *Potentilla hyparctica* being only known in Sweden from Padjelanta. *Arenaria humifusa*, *A. norvegica* and *Viola rupestris* ssp. *relicta* are confined to ultramafic rocks.

In slopes exposed to the south, or elsewhere at elevations from around 530 to 650 m where the local climate is favourable, scattered deciduous trees or open deciduous forests dominated by *Betula pubescens* can be found (Fig. 8). Occasionally, scattered *Populus tremula*, *Salix caprea* or *Sorbus aucuparia* trees occur. Low growing *Juniperus communis* is the only coniferous species present in Padjelanta. Otherwise, the landscape is dominated by heathlands or meadow-like flowering plant vegetation. In wet areas, thick carpets of shrubby *Salix* spp. (e.g. *S. glauca*, *S. lanata* and *S. lapponum*) can be found.

Lichen investigations in Padjelanta

The first lichenologist to report an extensive list of lichens (c. 294 species) from Padjelanta was Gunnar Degelius who spent two weeks in Padjelanta in 1941 (Degelius 1943). In 2004, the Swedish Lichen Society visited the surroundings of Stáلولuokta, the N shore of lake Virihaure and Mount Jiegnáffo. In total 331 species were reported from this excursion (Thor 2004, Westberg et al. 2005). In 2020, four of us (UA, MW, RV, GT) visited the surroundings of Mount Unna Duvgge (Unna Toki, Una Tuki) on the SW shore of Lake Virihaure (Thor et al. 2021). One species new to science, *Carbonea tephromelae*, has been described from material collected during that excursion (Svensson & Westberg 2021). Finally, in 2021, two of us (MG, GT) were hiking from Stáلولuokta to the southern end of the national park and also climbed the northern slopes of Mount Gierggevárre (Mount Kierkevare). It can be concluded from these three excursions that the lichen flora of



Figure 5. Small hill with ultramafic bedrock on which e.g. *Lepraria eburnea* and *Rhizocarpon* sp. 42835 were found. Photo G. Thor.



Figure 6. Overview of the landscape 13.4 km SE of Stáloluokta towards NW from the walking trail. The hill in the foreground was partly $\pm$ calcareous with e.g. *Arthonia epiphyscia*, *Lepraria eburnea*, *Lichenodiplis lecanorae*, *Polycoccum tryphelioides* and *Tremella nephromatis*. Photo G. Thor.



Figure 7. Calcareous ground 1.9 km SE of Duottar and SW of the walking trail. Here were e.g. *Agonimia tristicula*, *Cercidospora verrucosaria*, *Polyblastia albida* and *Protomicarea alpestris* found (M. Grube in the background). Photo G. Thor.



Figure 8. At low elevations and at locations with a favourable local climate an open *Betula pubescens* forest can be found. The photograph is from 9.3 km SSE of Darreluoppal nearby where e.g. *Arthopyrenia cerasi*, *Lecanora lecanoricola*, *Lepraria borealis* and *L. caesiocalba* were found. Photo G. Thor.

Padjelanta is exceptionally species rich and includes several rarely reported species in Sweden. The aim of the present publication is to report species new to Sweden or to Lule lappmark as well as all lichens red-listed in the current Swedish Red List (Thor et al. 2020). A more complete species list will be presented in a coming publication after visiting additional parts of Padjelanta.

Material and Methods

The material presented was collected during excursions in 2004, 2020 and 2021. Measurements of ascospores and asci were made in water mounts. Ascospores, paraphyses, ascus walls, hyphae and conidia were measured with 1 µm precision. Secondary lichen compounds were identified with HPTLC (Arup et al. 1993), using the most stable solvent C and/or solvent A. Molecular data from some of the U. Arup specimens were investigated according to the methods in Arup et al. (2015). The procedures for molecular data of *Arthonia protoparmeliae* and phylogenetic analyses followed Frisch & Holien (2018). A total of 78 DNA sequences of three loci (i.e., mtSSU, nrLSU and *RPB2*) from 14 genera and 30 species of Arthoniales were analysed for the study of *Arthonia protoparmeliae*, of which four sequences are new (Table 1). Additionally, the nrITS barcode marker has been amplified for *A. protoparmeliae*, vouchers Grube 21-347 (GenBank OP296534) and Westberg VAR062 (GenBank OP296535). The colour reaction of the thallus was tested using common household bleach (C), 10% aqueous potassium hydroxide (K), Steiner's solution (PD) and short-wave UV light. Nomenclature follows Santesson's checklist (Westberg et al. 2021). Lichenicolous fungi are marked with “*” and non-lichenized species are marked with “+”. The coordinates are in WGS84. The distribution of a species in Sweden and Fennoscandia refers to Westberg et al. (2021), if not otherwise stated. Collections are listed from south to north. Geographical names have been transcribed from Sami to Swedish in different ways over time. In the text, we follow the spelling on Länsstyrelsernas WebbGIS (2022), but we sometimes also give older spellings in parentheses. The spellings on older herbarium material may differ. A few recently used synonyms are included. Dates are given as year-month-day. Material collected by Göran Thor, Raul Vicente and Martin Westberg is located in herbarium UPS, material collected by Ulf Arup is located in herbarium LD and material collected by Martin Grube is located in herbarium GZU.

Species List

Ten species are reported as new to Sweden and 98 taxa as new to Lule lappmark. An additional two species might represent new species (“known unknowns”), viz. *Arthonia* sp. 42896 and *Rhizocarpon* sp. 42835. *Arthonia protoparmeliae*, *A. subclemens* and *Tremella nephromatis* are new to Fennoscandia. Six red-listed species have been recorded, namely *Gyalidea roseola*, *Pannaria hookeri*, *Pectenia plumbea*, *Peltigera collina*, *Pyrenula coryli* and *Rinodina endophragma*. The low number of red-listed species probably reflects that few lichens in occurring in the Swedish mountain regions have been properly assessed. The potential effects of threats like climate change on the lichen flora of bare mountain regions in Sweden needs to be further studied.

Acarospora rugulosa Körb.

New to Lule lappmark. Previously reported from Småland, Östergötland, Medelpad, Härjedalen and Västerbotten.

Specimen examined: Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, 11 km WNW of Stálluokta, N of the river Duvgejåhkå (Tukijåkkå, Tokijokk), S slope of Mount Unna Duvge (Unna Toki,

Table 1. Voucher information, sequences and their GenBank accession numbers. New sequences are indicated in bold.

Taxon	Voucher	mtSSU	nrLSU	<i>RPB2</i>
<i>Alyxoria varia</i>	Sweden; <i>Frisch 11/Se1</i> (UPS)	KJ851006	KJ851027	KJ851147
<i>Arthonia apatetica</i> 1	Sweden; <i>Svensson 2017</i> (UPS)	KJ850992	KJ851045	KJ851125
<i>Arthonia apatetica</i> 2	Sweden; <i>Svensson 1939</i> (UPS)	KJ850994	KJ851050	KJ851126
<i>Arthonia apotheciorum</i>	Sweden; <i>Frisch 11/Se23</i> (UPS)	KJ850970	–	KJ851148
<i>Arthonia atra</i>	Great Britain (L10170)	KY983978	–	KY983985
<i>Arthonia biatoricola</i>	Japan; <i>Thor 24350</i> (UPS)	KJ850990	–	KJ851149
<i>Arthonia calcarea</i>	France; <i>Ertz 7539</i> (BR)	EU704064	–	EU704028
<i>Arthonia lapidicola</i>	Sweden; <i>Frisch 11/Se47</i> (UPS)	KJ850997	KJ851070	KJ851119
<i>Arthonia molendoi</i>	Sweden; <i>Frisch 11/Se36</i> (UPS)	KJ851000	KJ851051	KJ851117
<i>Arthonia neglectula</i>	Sweden; <i>Frisch 10/Se91</i> (UPS)	KJ850989	KJ851037	KJ851118
<i>Arthonia parietinaria</i>	Norway; <i>Frisch 11/No25</i> (TRH)	MH177778	MH177782	MH177771
<i>Arthonia peltigerina</i>	Sweden; <i>Frisch 11/Se46</i> (UPS)	KJ850998	–	KJ851122
<i>Arthonia phaeophysciae</i>	Japan; <i>Tadome 535</i> (TNS)	MN955428	MN963753	MN947666
<i>Arthonia protoparmeliae</i> 1	<i>Grube 21-347</i> (GZU)	–	OP288168	–
<i>Arthonia protoparmeliae</i> 2	<i>Westberg VAR062</i> (UPS)	OP286860	OP286863	OP297673
<i>Arthonia punctiformis</i>	Sweden; <i>Thor 21658</i> (UPS)	KJ850973	KJ851044	KJ851113
<i>Arthonia radiata</i>	Sweden; <i>Frisch 10/Se25</i> (UPS)	KJ850969	–	KJ851109
<i>Arthothelium spectabile</i>	Japan; <i>Frisch 12/Jp164</i> (TNS)	MN955429	–	MN947670
<i>Arthonia stereocaulina</i>	Sweden; <i>Frisch 11/Se48</i> (UPS)	KJ850999	KJ851062	–
<i>Arthonia toensbergii</i>	Norway; <i>Frisch 17/No131</i> (TRH)	MH177776	MH177780	–
<i>Bryostigma muscigenum</i>	Sweden; <i>Thor 26206</i> (UPS)	KJ850991	KJ851052	KJ851124
<i>Coniocarpon cinnabarinum</i>	Uganda; <i>Frisch 11/Ug297</i> (UPS)	KJ850977	KJ851059	KJ851104
<i>Cryptothecia palaeotropica</i>	Uganda; <i>Frisch 11/Ug457</i> (UPS)	KJ850961	–	KJ851084
<i>Cryptothecia subnidulans</i>	Réunion; v.d. <i>Boom 40613</i> (hb v.d. Boom)	KJ850952	–	KJ851087
<i>Herpothallon inopinatum</i>	Mexico; <i>Rudolphi 12</i> (UPS)	KJ850964	–	KJ851099
<i>Inoderma afromontanum</i>	Uganda; <i>Frisch 11/Ug164</i> (UPS)	KJ850963		KJ851090
<i>Inoderma byssaceum</i>	Japan; <i>Thor 25952</i> (UPS)	KJ850962	KJ851040	KJ851089
<i>Myriostigma candidum</i>	Uganda; <i>Frisch 11/Ug125</i> (UPS)	KJ850959	–	KJ851096
<i>Pachnolepia pruinata</i>	Sweden; <i>Frisch 11/Se34</i> (UPS)	KJ850967	–	KJ851098
<i>Reichlingia zwackhii</i>	Sweden; <i>Thor 26800</i> (UPS)	KF707652	KF707637	KF707662
<i>Sporodophoron cretaceum</i>	France; <i>Ertz 17547</i> (BR)	KP870151	–	KP870165
<i>Tylophoron hibernicum</i>	Uganda; <i>Frisch 11/Ug220</i> (UPS)	KJ850966	KJ851065	KJ851097

Unna Tuki), bare mountain region, 975 m E of small cabin, just above the river, on iron-rich, schistose rock, 67.343449°N, 16.469506°E, elev. 636 m, 2020-08-03, M. Westberg PAD243 (UPS L-1010007).

***Agonimia tristicula* (Nyl.) Zahlbr.**

New to Lule lappmark. Previously reported from Skåne–Bohuslän, Östergötland, Södermanland, Uppland, Dalarna, Gästrikland, Jämtland, Lycksele lappmark and Torne lappmark.

Specimens examined: Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, along the trail between Duottar (Tuottar) and Darreluoppal (Tarraluoppal) mountain lodges, 1.9 km SE of Duottar, 120 m SW of the trail, nearby small stream between a small lake and lake Unna Duottarjávrr, meadow-like vegetation on calcareous bedrock in bare mountain region, 67.2537°N, 17.04608°E, elev. 907 m, 2021-08-01, M. Grube 21-368 (GZU); *ibid.*, 11 km WNW of Stálluokta, N of the river Duvgejähkå (Tukijähkå, Tokijokk), 330 m W of the summit of Mount Unna Duvge (Unna Toki, Unna Tuki), bare mountain region, 1.2 km m NNE of small cabin, on soil, 67.35546°N, 16.43987°E, elev. 780 m, 2020-08-02, M. Westberg PAD172 (UPS L-1010006).

***Aquacidia trachona* (Ach.) Aptroot**

Syn. *Bacidia trachona* (Ach.) Lettau.

New to Lule lappmark. The species is widely distributed in South Sweden, but not reported north of Uppland about 800 km S of the locality in Padjelanta. No apothecia were found, but the thallus and conidia are similar to material found in South Sweden. However, the pycnidia are partly sky blue (microscope) and react K– (not K+ red). These differences should be studied further.

Specimen examined: Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, 1.1 km S of Stálluokta, along the trail between Stálluokta and Stáddájähkå (Staddajäkk) mountain lodges, 20 m NE of the trail, small exposed hill with partly ultramafic gravel surrounded with open *Betula pubescens* forest, under small overhang on stone, 67.31042°N, 16.69664°E, elev. 646 m, 2021-07-28, G. Thor 42711 (UPS).

****Arthonia* sp. 42806**

Lichenicolous on the thallus of *Lecidea ramulosa* and adjacent dead *Saxifraga oppositifolia*. Apothecia <0.2 mm in diameter, black, aggregated in clusters, causing the hosts thallus to darken nearby, slightly convex; epihymenium bluish brown; hypothecium brown; hymenium I+ reddish, K–, K/I+ blue except the epihymenium which becomes pale violet; ascospores 9–10 × 4–5 µm, 1-septate with the upper cell larger; paraphysoid apices to 3 µm wide, brownish.

Specimen examined: Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, 4.9 km SE of Stálluokta, northernmost slope of Mount Gierggevárre (Kierkevare), N of the steep slope, calcareous boulder in ±flat solifluction soil in bare mountain region, on *Lecidea ramulosa* on the boulder, 67.28440°N, 16.76026°E, elev. 1195 m, 2021-07-29, G. Thor 42806 (UPS).

***Arthonia didyma* Körb.**

New to Lule lappmark. The species is widely distributed in South Sweden and reported from Skåne to Ängermanland.

Specimens examined: Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, 1.4 km S of Stálluokta, along the trail between Stálluokta and Stáddájähkå (Staddajäkk) mountain lodges, 65 m W of the trail, dolomite boulder in bare mountain region, on small twigs of *Salix* sp., 67.30824°N, 16.70079°E, elev. 659 m, 2021-07-30, M. Grube 21-350 (GZU); *ibid.*, Stálluokta at the shore of Lake Virihávrr (Virihau), S slope of Mount Unna Dijdder (Unna Titer), bare mountain region at the tree-line, on *Juniperus communis*, 67°19.277'N, 16°42.751'E, elev. 750 m, 2004-08-01, G. Thor 18939c (UPS); *ibid.*, Stálluokta at the shore of Lake Virihávrr (Virihau), SW slope of Mount Unna Dijdder (Unna Titer), mountain region near the tree-line with scattered deciduous trees (mainly *Betula* and *Salix* spp.), on *Salix* sp., 67°19.290'N, 16°42.169'E, elev. 600–650 m, 2004-08-01, G. Thor 18931a (UPS); *ibid.*, 10 km NNW of Stálluokta, N shore of Lake Virihávrr (Virihau), S slope of Mount Allak, mountain region near the tree-line with scattered *Betula* and *Salix* spp., along the steep shore 0–300 m E of a small bay, bedrock calcareous micaceous slate, on *Salix* sp., 67°24.545'N, 16°38.937'E, elev. 580 m, 2004-07-31, G. Thor 18877c (UPS).

****Arthonia epiphyscia* Nyl.**

New to Lule lappmark. Widespread and previously reported from Småland, Östergötland, Närke, Västmanland, Uppland, Härjedalen, Jämtland, Åsele lappmark and Torne lappmark.

Specimens examined: Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, along the Nordkalott trail c. 7.5 km S of the Stáلولuokta cabins, on *Physcia dubia* on calcareous boulder, 67.25442°N, 16.65270°E, elev. 705 m, 2004-07-30, U. Arup L04266 (LD); *ibid.*, along the trail between Stáلولuokta and Duottar (Tuottar) mountain lodges, 13.4 km SE of Stáلولuokta, 40 m NE of the trail, exposed partly calcareous hill in bare mountain region, on *Physcia caesia* on the ground, 67.27402°N, 16.98134°E, elev. 842 m, 2021-07-31, G. Thor 42953 (UPS). *ibid.*, 1.5 km S of Stáلولuokta, along the trail between Stáلولuokta and Stáddájáhkå (Staddajåkk) mountain lodges, 65 m W of the trail, small exposed hill with siliceous bedrock in bare mountain region, on *Physcia* sp., 67.30716°N, 16.70003°E, elev. 653 m, 2021-07-30, M. Grube 21-359 (GZU).

****Arthonia peltigerea* Th.Fr.**

New to Lule lappmark. Previously reported from Härjedalen, Jämtland and Torne lappmark.

Specimens examined: Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, 1.1 km S of Stáلولuokta, along the trail between Stáلولuokta and Stáddájáhkå (Staddajåkk) mountain lodges, 20 m NE of the trail, small exposed hill with partly ultramafic gravel surrounded with open *Betula pubescens* forest, on *Peltigera* sp., 67.30824°N, 16.70079°E, 2021-07-28, elev. 650 m, M. Grube 21-308 (GZU); *ibid.*, 11 km WNW of Stáلولuokta, N of the river Duvgejåhkå, 1.9 km S of the peak of Unna Duvge, on moist soil on sloping slate rock at rapids between lakes, on *Solorina bispora*, 67.33883°N, 16.44710°E, elev. c. 730 m, 2020-08-01, U. Arup L20238 (LD); *ibid.*, 11 km WNW of Stáلولuokta, N of the river Duvgejåhkå (Tukijåkkå, Tokijokk), S slope of Mount Unna Duvge (Unna Toki, Unna Tuki), bare mountain region, 660 m ESE of small cabin, just above the river, on *Solorina bispora* on the ground, 67.343646°N, 16.462248°E, elev. 667 m, 2020-08-03, M. Westberg PAD204 (UPS L-1009758); *ibid.*, 11 km WNW of Stáلولuokta, N of the river Duvgejåhkå (Tukijåkkå, Tokijokk), E slope of Mount Unna Duvge (Unna Toki, Unna Tuki), 1080 m NE of small cabin, heath on exposed hill in bare mountain region, on *Peltigera* sp. on calcareous ground, 67.35267°N, 16.46198°E, elev. 772 m, 2020-08-04, G. Thor 41504 (UPS).

****Arthonia phaeophysciae* Grube & Matzer**

New to Lule lappmark. Previously reported from Småland, Västmanland, Uppland and Torne lappmark.

Specimen examined: Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, 11 km WNW of Stáلولuokta, N of the river Duvgejåhkå (Tukijåkkå, Tokijokk), E slope of Mount Stuurra Duvge (Stuor Tokivare, Stuurra Tuki), 525 m SW of small cabin, heath in bare mountain region, on *Phaeophyscia sciastra*, 67.34113°N, 16.44006°E, elev. 772 m, 2020-08-01, G. Thor 41145 (UPS).

****Arthonia protoparmeliae* Etayo**

Fig. 9

New to Sweden and Norway. The species was described by Etayo (2010) from one locality in the Pyrenees, Spain, at an elevation of 2000–2080 m. Since then, it has apparently only been reported from Shetland in Great Britain (Hitch 2015). The species is lichenicolous on *Protoparmelia badia*. Both the epihymenium and the hypothecium are brown. The paraphysoid apices are up to 4 µm wide and brown. The hymenium is I+ reddish, K– and K/I+ blue. The ascospores are reported to be 12–14.5 × 4–5 µm (Etayo 2010, Hitch 2015). The material from Padjelanta has ascospores measuring (12–)13–15(–16) × (4–)4–5(–5) µm (length: X = 14.00 µm, SD = 1.3 µm, n = 20; width: X = 4.85 µm, SD = 0.4 µm, n = 20). Even larger ascospores have been measured for the specimens from Norway cited below, 14–18(–20) × 4–6 µm.



Figure 9. *Arthonia protoparmeliae* on apothecia of *Protoparmelia badia*. M. Grube 21-347 (GZU). Scale bar: 250 μ m. Photo M. Grube.

The phylogenetic position of *Arthonia protoparmeliae* in Arthoniaceae was studied through Bayesian and Maximum Likelihood analysis (using RaxML) of mtSSU, nrLSU and *RPB2* sequence data. *Arthonia protoparmeliae* is recovered in the Bryostigma-clade of the Arthoniaceae (Frisch et al. 2014) as sister to *Arthonia toensbergii* Holien & Frisch in a phylogenetic clade additionally including *Bryostigma muscigenum* (Th. Fr.) Frisch & G. Thor and *A. peltigerina* (Almq.) H.Olivier (Fig. 10). The Bryostigma-clade accommodates a majority of lichenicolous Arthoniaceae, in addition to lichenized species with a green coccal photobiont. The two sequenced specimens, Grube 21-347 from Padjelanta and Westberg VAR062 from northern Norway, show high sequence similarity for the nrITS barcode (GenBank OP296534, OP296535), and identical nrLSU gene loci.

Arthonia protoparmeliae is apparently a rare species in Scandinavia. It was intensively searched for in Padjelanta but was only found on two boulders in a single locality. Likewise, only five collections from different localities are known for the species from Norway, despite considerable efforts in mapping lichenicolous fungi in Norway in recent years. The recent collections of *A. protoparmeliae* were made in exposed situations in low alpine and alpine heath. The bedrock on the locality in Padjelanta is ultramafic but with a few $\pm$ siliceous boulders. The Norwegian specimens were collected from a dolomite pebble and from calcareous schistose rocks. The ecology of the species should be further studied.

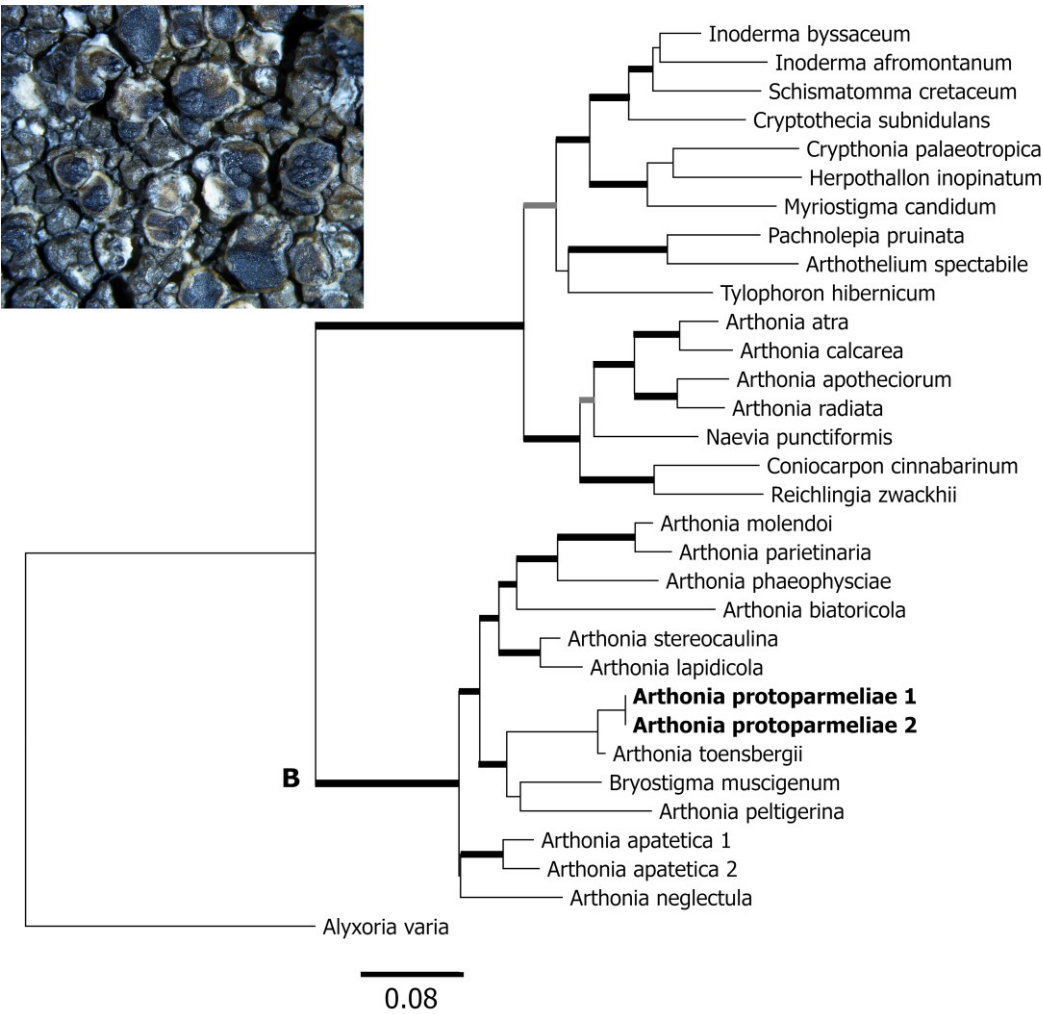


Figure 10. Maximum likelihood tree of selected genera and species in the Arthoniaceae showing the position of *Arthonia protoparmeliae* in the Bryostigma-clade (B). *Alyxoria varia* (Lecanographaceae) is the operational outgroup. Branch support ≥ 70 ML BS and ≥ 0.95 BPP is indicated by thick black lines. ML BS support only is indicated by thick grey lines. The inlay picture shows specimen Westberg VAR062.

Specimens examined: **Sweden.** *Lule lappmark:* Jokkmokk par., Padjelanta National Park, 1.4 km SSE of Ståloluokta, along the trail between Ståloluokta and Stáddájáhkå (Staddajäkk) mountain lodges, hill 80 m E of the trail, exposed ultramafic rock in bare mountain region, on *Protoparmelia badia*, 67.30764°N, 16.70310°E, elev. 662 m, 2021-07-30, G. Thor 42852 (UPS); *ibid.*, 1.4 km S of Ståloluokta, along the trail between Ståloluokta and Stáddájáhkå (Staddajäkk) mountain lodges, 65 m E of the trail, boulder in bare mountain region, on *Protoparmelia badia*, 67.30824°N, 16.70079°E, elev. 659 m, 2021-07-30, M. Grube 21-347 (GZU). **Norway.** *Oppland:* Dovre, Grimsdalen, NW of Grimsdalshytta, on schistose rock in low alpine heath, 62.0926°N, 9.6286°E, 2011-07-05, H. Holien 13165 (TRH-L-14537, filed sub *Rhizocarpon geographicum*). *Sør-Trøndelag:* Oppdal, Riaren, saxicolous on schistose boulder in alpine heath, 62.75496°N, 9.26228°E, elev. 1274 m, 2022-09-05, A. Frisch 22/No1160 (TRH-L-34500); *Nordland:* Bodø, Skjevlfjellet N, on pebble on the

ground in low alpine heath (dolomite), on *Protoparmelia badia*, 67.01167°N, 15.12833°E, elev. 685 m, 2021-07-14, J.T. Klepsland 21/No1722 (TRH-L-24957); *Troms*: Kåfjord, Kåfjorddalen, Guolášjávri: W of Goddejávri, on large boulder in alpine heath, 69.35073°N, 20.88295°E, elev. 923 m, 2022-08-13, A. Frisch 22/No740 (TRH-L-34501); *Finnmark*: Varanger Peninsula, Båtsfjord, Båtsfjorddalen, near the exit to Syltefjord, on dolomite, 70.58°N 29.66°E, elev. 82 m, 2014-07-02, M. Westberg VAR062 (S).

****Arthonia subclemens* Hafellner et al.**

New to Sweden. Recently described and previously reported from Austria, Greece, North Macedonia and Spain (Hafellner & Grube 2023). It grow on the apothecia of *Lecanora polytropia* and is similar to the also recently described *Arthonia epipolytropia* Hafellner & Grube but is distinguished by dispersed ascomata that are sunken in the host's hymenia. The ascospores are 12–15 (–16) × 4–5 (–6) µm with septum closer to the lower end and the cells are therefore distinctly unequal (Hafellner & Grube 2023).

Specimen examined: Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, 1.4 km SSE of Ståloluokta, along the trail between Ståloluokta and Stáddájáhkå (Staddajákk) mountain lodges, hill 80 m E of the trail, exposed ultramafic rock in bare mountain region, on *Lecanora polytropia* under overhang, 67.30764°N, 16.70310°E, elev. 662 m, 2021-07-30, G. Thor 42858 (UPS).

****Arthonia varians* (Davies) Nyl.**

Syn. *Arthonia glaucomaria* Nyl.

New to Lule lappmark. Previously reported from Skåne to Uppland, Jämtland and Torne lappmark. *Lecanora bicincta* is a new host.

Specimen examined: Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, along the trail between Ståloluokta and Duottar (Tuottar) mountain lodges, 7.9 km SE of Ståloluokta, 5 m N of the trail, exposed *Empetrum hermaphroditum* heath on siliceous bedrock in bare mountain region, on *Lecanora bicincta*, 67.28547°N, 16.8559°E, elev. 745 m, 2021-07-31, M. Grube 21-322 (GZU).

***Arthopyrenia cerasi* (Schröd.) A.Massal.**

New to Lule lappmark. Previously reported from Skåne to Uppland. The finding in Padjelanta indicates that the species might be more widespread in Sweden. In Norway, it is only reported from Nordland which is located W of Padjelanta. A study comparing the genetic diversity within the North European material would be interesting.

Specimen examined: Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, along the trail between Darreluoppal (Tarraluoppal) and Sámmarlappastugan mountain lodges, 9.3 km SSE of Darreluoppal, 10 m E of the trail, open deciduous forest dominated by *Betula pubescens*, on old *B. pubescens*, 67.11106°N, 17.16331°E, elev. 660 m, 2021-08-02, G. Thor 43121 (UPS).

***Aspicilia virginea* Hue**

New to Lule lappmark. In Fennoscandia previously reported from Torne lappmark in Sweden and from Troms in Norway.

Specimen examined: Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, 11 km WNW of Ståloluokta, N of the river Duvgejåhkå, 1.55 km ESE of the peak of Unna Duvge, on siliceous slate boulders near the rapids, 67.34351°N, 16.46962°E, elev. c. 650 m, 2020-08-03, U. Arup L20364 (LD, identity confirmed by molecular data (ITS, Genbank acc.nr. ON380910)).



Figure 11. *Athallia saxifragarum*. Habitus of typical apothecia with bright yellow-orange to orange disc, clearly brighter than in the similar *Parvoplaca tirolensis*. U. Arup L20246 (LD). Scale bar: 0.5 mm. Photo U. Arup.

***Athallia saxifragarum* (Poelt) Arup et al.**

Fig. 11

New to Sweden. In Fennoscandia previously reported from Finland and Norway. The occurrence in Sweden was expected, but the species seems to be rare (Arup et al. 2014). The apothecia have bright yellow-orange to orange discs, clearly brighter than in the similar *Parvoplaca tirolensis*.

Specimens examined: Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, 11 km WNW of Stálluokta, N of the river Duvggejähkå (Tukijähkå, Tokijokk), S slope of Mount Unna Duvge (Unna Toki, Unna Tuki), bare mountain region, 1030 m NNE of small cabin, on *Saxifraga oppositifolia*, 67.353998°N, 16.451641°E, elev. 815 m, 2020-08-02, U. Arup L20246 (LD, identity confirmed by molecular data (ITS, Genbank acc.nr. ON380911)) & M. Westberg PAD148 (UPS L-1013280); *ibid.*, foot of Allak c. 3.5 km SSW of the peak Alláktjähkkå, on *Saxifraga oppositifolia* on the ground, 67.41283°N, 16.64797°E, elev. 695 m, 2004-07-31, U. Arup L04353 (LD).

***Biatora radicola* Printzen et al.**

New to Lule lappmark and Jämtland. From Fennoscandia previously reported from Åsele lappmark and Torne lappmark in Sweden, from Finnmark in Norway (Ekman et al. 2019) and from Koillismaa (incorrectly as Northern Ostrobothnia) in Finland (Printzen et al. 2016). The specimens from

Padjelanta and Jämtland was collected on stone, which is in concordance with the previous finds in Sweden and Norway, but in central Europe, the species mainly grows on bark.

Specimens examined: Sweden. Jämtland: Kall par., Gulån, NW of Smedjevikén, on siliceous schistose rock in the creek, 63.54673°N, 12.95788°E, elev. c. 395 m, 2020-08-09, U. Arup L20529 (LD); *Lule lappmark:* Jokkmokk par., Padjelanta National Park, 11 km WNW of Stálluokta, N of the river Duvgejåhkå, 435 m ESE of the peak of Unna Duvge, on boulder of siliceous rock, 67.35455°N, 16.46023°E, elev. c. 780 m, 2020-08-05, U. Arup L20498 (LD, identity confirmed by molecular data (ITS, Genbank acc.nr. ON380912)).

***Biatora vacciniicola* (Tønsberg) Printzen**

New to Lule lappmark. Previously reported from Dalarna, Åsele lappmark, Lycksele lappmark and Torne lappmark.

Specimen examined: Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, along the trail between Darreluoppal (Tarraluoppal) and Sámmarlappastugan mountain lodges, 4.2 km S of Darreluoppal, 70 m W of the trail, at S shore of small stream, exposed heath on siliceous bedrock in bare mountain region, on bark of *Salix* sp., 67.15542°N, 17.12621°E, elev. 711 m, 2021-08-03, G. Thor 43200 (UPS, c.ap., HPTLC: gyrophoric acid).

***Biatorella hemisphaerica* Anzi**

New to Lule lappmark. Previously reported from Gotland, Dalarna, Härjedalen, Jämtland and Lycksele lappmark.

Specimens examined: Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, 11 km WNW of Stálluokta, N of the river Duvgejåhkå (Tukijåkkå, Tokijokk), E slope of Mount Unna Duvge (Unna Toki, Unna Tuki), bare mountain region, 1.05 km NE of small cabin, on bryophytes under a boulder, 67.343449°N, 16.469506°E, elev. 636 m, 2020-08-04, M. Westberg PAD350 (UPS L-1009984); *ibid.*, N of the river Duvgejåhkå, 630 m SE of the peak of Unna Duvge., on calcareous soil under large boulder, 67.36258°N, 16.46224°E, elev. c. 775 m, 2020-08-04, U. Arup L20456 (LD).

***Biatorella tirolensis* H.Magn.**

New to Lule lappmark. In Fennoscandia earlier noted once in Torne lappmark.

Specimen examined: Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, 11 km WNW of Stálluokta, N of the river Duvgejåhkå (Tukijåkkå, Tokijokk), E slope of Mount Stuurra Duvge (Stuor Tokivare, Stuurra Tuki), bare mountain region, 190 m SW of small cabin, on bryophytes/plant debris on the ground in alpine *Dryas* heath, 67.344043°N, 16.443321°E, elev. 698 m, 2020-08-01, M. Westberg PAD041 (UPS L-1009990).

***Calogaya bryochryson* (Poelt) Vondrák**

New to Lule lappmark. From Fennoscandia previously reported from Torne lappmark in Sweden, and in Finland from Kajaani (Søchting et al. 2008, as *Caloplaca alaskensis* Wetm.) and Varsinais-Suomi (Stenroos et al. 2016). Vondrák et al. (2016) showed that *C. alaskensis* and *C. bryochryson* are synonyms and that the latter name has priority.

Specimen examined: Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, 11 km WNW of Stálluokta, c. 275 m W of peak of Unna Duvge, on dry *Dryas octopetala* under overhang of limestone slate, 67.35610°N, 16.44392°E, elev. c. 825 m, 2020-08-02, U. Arup L20285 (LD).

***Caloplaca leptocheila* H.Magn.**

New to Lule lappmark. This rare lichen was previously reported from Jämtland and Torne lappmark in Sweden, and tentatively from Oppland (Innlandet) in Norway (with a question mark). A previously unpublished locality is reported here from Nordland, thus confirming its occurrence in Norway.

Specimens examined: **Sweden.** *Lule lappmark:* Jokkmokk par., Padjelanta National Park, E-slope of Jiegnáffo SE of the N peak (1436 m), under overhanging rock of slate, 67.22498°N, 16.63608°E, elev. 1320 m, 2004-07-29, U. Arup L04171 (LD). **Norway.** *Nordland:* Saltdal kommune, Graddis, c. 200 m E of the houses, along trail to Sweden, at a brook, on iron-rich rocks at the brook, rather shady, 66.74181°N, 15.74265°E, elev. 440 m, 2003-08-10, U. Arup L03559 (LD).

****Carbonea aggregantula* (Müll.Arg.) Diederich & Triebel**

New to Lule lappmark. Previously reported from Jämtland and Lycksele lappmark.

Specimen examined: **Sweden.** *Lule lappmark:* Jokkmokk par., Padjelanta National Park, along the trail between Duottar (Tuottar) and Darreluoppal (Tarraluoppal) mountain lodges, 900 m SE of Duottar, at the trail, wet meadow-like vegetation in bare mountain region, on *Lecanora polytropa* on the wooden boards forming the trail, 67.26275°N, 17.04177°E, elev. 912 m, 2021-07-31, G. Thor 42992 (UPS).

***Catillaria scotinodes* (Nyl.) Coppins**

New to Lule lappmark. This is a rarely reported species known previously from Dalarna, Jämtland and Lycksele lappmark in Sweden, and from Finnmark in Norway. It is further known from the British Isles, where it is a rare species with its main occurrence in Scotland. Two ITS sequences are available from Genbank that differ by almost 6 % from each other, indicating that there may be more than one species involved. Our ITS sequence differs by 0.4 % from the most similar sequence (AM292673; Scotland) and by 6.3% from the second *C. scotinodes* (MG925964; Norway), that is also the second most similar sequence in Genbank. This difference should be studied further.

Specimen examined: **Sweden.** *Lule lappmark:* Jokkmokk par., Padjelanta National Park, 11 km WNW of Stálluokta, S slope of Unna Duvgge 285 m SSE of the peak, on sloping calciferous siliceous rock, 67.35378°N, 16.45231°E, elev. c. 835 m, 2020-08-02, U. Arup L20273 (LD, identity confirmed by molecular data (ITS, Genbank acc.nr. ON380913)).

****Cecidonia umbonella* (Nyl.) Triebel & Rambold**

New to Lule lappmark. Previously reported from Södermanland, Härjedalen, Jämtland, Pite lappmark and Torne lappmark.

Specimens examined: **Sweden.** *Lule lappmark:* Jokkmokk par., Padjelanta National Park, Sweden, along the trail between Duottar (Tuottar) and Darreluoppal (Tarraluoppal) mountain lodges, 3 km SE of Duottar, 5 m N of the trail, leaning siliceous cliff exposed to SW in bare mountain region, on sterile lichen thallus (probably *Lecidea* sp.), 67.24522°N, 17.06684°E, elev. 949 m, 2021-08-01, M. Grube 21-346 (GZU); *ibid.*, Jiegnáffo, N-facing slope at brook leading to Jiegnáffojáhkå, on *Lecidea* sp. on slate boulder, 67.23287°N, 16.64815°E, elev. 1080 m, 2004-07-28, U. Arup L04262 (LD).

****Cercidospora decolorella* (Nyl.) O.E.Erikss. & J.Z.Yue**

New to Sweden. In Fennoscandia previously reported from Norway and Finland. The species is recognized by the 5-septate ascospores and by growing on terricolous algal films and bryophytes, possibly also on lichens.

Specimen examined. Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, 11 km WNW Stáloluokta, W of Lake Virihavre, south slope of Unna Duvgge (Unna Toki), c. 315 m NE of small cabin, on dead bryophytes on the ground, 67.34682°N, 16.45254°E, elev. 686 m, 2020-08-05, M. Westberg PAD374 (UPS L-1010024).

****Cercidospora epipolytropa* (Mudd) Arnold**

New to Lule lappmark. Previously reported from Öland, Gotland, Närke, Hälsingland, Härjedalen, Jämtland, Västerbotten, Åsele lappmark, Lycksele lappmark and Torne lappmark.

Specimens examined. Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, 1.4 km SSE of Stáloluokta, along the trail between Stáloluokta and Stáddájáhkå (Staddajákk) mountain lodges, hill 80 m E of the trail, exposed ultramafic rock in bare mountain region, on *Lecanora polytropa* on slate, 67.30764°N, 16.70310°E, elev. 662 m, 2021-07-30, G. Thor 42847 (UPS); *ibid.*, 11 km WNW of Stáloluokta, 725 m S of small cabin, E slope of Mount Stuurra Duvgge (Stuor Tokivare, Stuurra Tuki), N shore of the river Duvggejáhkå (Tukijáhkå, Tokijokk) in bare mountain region, on *Lecanora polytropa*, 67.33833°N, 16.44618°E, elev. 751 m, 2020-08-01, G. Thor 41208a (UPS).

****Cercidospora punctillata* (Nyl.) R.Sant.**

New to Lule lappmark. Previously reported from Härjedalen, Jämtland, Åsele lappmark and Torne lappmark.

Specimens examined. Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, 5.2 km SE of Stáloluokta, northernmost top plateau of Mount Gierggevárre (Kierkevare), exposed flat heath on siliceous bedrock in bare mountain region, on *Solorina crocea*, 67.28183°N, 16.76169°E, elev. 1350 m, 2021-07-29, M. Grube 21-389 (GZU).

****Cercidospora trypteliza* (Nyl.) Hafellner & Obermayer**

New to Lule lappmark. In Fennoscandia previously reported from Jämtland in Sweden and Troms in Norway.

Specimen examined. Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, 11 km WNW of Stáloluokta, N of the river Duvggejáhkå, 630 m SE of the peak of Unna Duvgge, on *Arthrorhaphis* sp. on soil over calcareous rock on ridge, 67.36258°N, 16.46224°E, elev. c. 785 m, 2020-08-04, U. Arup L20445 (LD).

****Cercidospora verrucosaria* (Linds.) Arnold**

New to Lule lappmark. Previously reported from Gotland, Jämtland, Lycksele lappmark and Torne lappmark.

Specimen examined. Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, along the trail between Duottar (Tuottar) and Darreluoppal (Tarraluoppal) mountain lodges, 1.9 km SE of Duottar, 120 m SW of the trail, nearby small stream between small lake and lake Unna Duottarjávrre, meadow-like vegetation on calcareous bedrock in bare mountain region, on *Megaspora verrucosa*, 67.2537°N, 17.04608°E, elev. 907 m, 2021-08-01, M. Grube 21-361 (GZU).

***Cladonia imbricarica* Kristinsson**

New to Lule lappmark. Previously reported from Torne lappmark (Ahti et al. 2013).

Specimen examined: Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, 11 km WNW of Stálluokta, N of the river Duvggejåhkå (Tukijåkkå, Tokijokk), E slope of Mount Unna Duvgge (Unna Toki, Unna Tuki), 970 m NE of small cabin, talus slope in bare mountain region, on boulder, 67.35217°N, 16.45931°E, elev. 782 m, 2020-08-05, G. Thor 41548 (UPS, HPTLC: sphaerophorin).

***Enchylium coccophorum* (Tuck.) Otálora et al.**

New to Lule lappmark. Previously reported from Småland and Torne lappmark.

Specimen examined: Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, 11 km WNW of Stálluokta, N of the river Duvggejåhkå (Tukijåkkå, Tokijokk), E slope of Mount Unna Duvgge (Unna Toki, Unna Tuki), 920 m NE of small cabin, talus slope in bare mountain region, on calcareous ground, 67.35153°N, 16.45969°E, elev. 771 m, 2020-08-04, G. Thor 41461 (UPS).

****Endococcus perpusillus* Nyl.**

New to Lule lappmark. Previously reported from Skåne, Bohuslän, Södermanland and Jämtland. *Myriospora scabrída* is a new host as otherwise growing on *Schaereria fuscocinerea*.

Specimen examined: Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, 11 km WNW of Stálluokta, N of the river Duvggejåhkå (Tukijåkkå, Tokijokk), S slope of Mount Unna Duvgge (Unna Toki, Unna Tuki), bare mountain region, 1030 m NNE of small cabin, on *Myriospora scabrída* on calcareous rock, 67.353998°N, 16.45164°E, elev. 815 m, 2020-08-02, M. Westberg PAD147 (UPS L-1009766).

****Endococcus pseudocarpus* Nyl.**

New to Lule lappmark. Previously reported from Gotland, Västergötland and Uppland.

Specimen examined: Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, 11 km WNW of Stálluokta, N of the river Duvggejåhkå (Tukijåkkå, Tokijokk), S slope of Mount Unna Duvgge (Unna Toki, Unna Tuki), bare mountain region, 660 m ESE of small cabin, just above the river, on *Collema* sp. on vertical schistose rock by the river, 67.343646°N, 16.462248°E, elev. 667 m, 2020-08-03, M. Westberg PAD203 (UPS L-1009988).

***Farnoldia hypocrita* (A.Massal.) Fröberg**

New to Lule lappmark. Previously reported from Öland, Gotland, Södermanland and Torne lappmark.

Specimen examined: Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, N of the river Duvggejåhkå, 630 m SE of the peak of Unna Duvgge, on exposed marble boulder, 67.35289°N, 16.46309°E, elev. c. 760 m, 2020-08-05, U. Arup L20491 (LD).

***Farnoldia micropsis* (A.Massal.) Hertel**

New to Lule lappmark. Previously reported from Åsele lappmark and Torne lappmark.

Specimens examined: Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, 11 km WNW of Stálluokta, N of the river Duvggejåhkå, 2.1 km SSW of the peak of Unna Duvgge, on calciferous slate at rapids at E end of lake, 67.33754°N, 16.43946°E, elev. c. 745 m, 2020-08-01, U. Arup L20214 (LD); *ibid.*, S

slope of Unna Duvgge 285 m SSE of the peak, on sloping siliceous rock, 67.35378°N, 16.45232°E, elev. c. 860 m, 2020-08-02, U. Arup L20266 (LD).

***Frigidopyrenia bryospila* (Nyl.) Grube**

Fig. 12

New to Lule lappmark. Previously reported from Härjedalen, Lycksele lappmark and Torne lappmark. The thallus morphology is unique, consisting of loose to aggregated dark olive to brownish black thallus squamules, which are roundish to cushion-like (Grube 2005). The squamules grow over plant debris, decaying mosses or cyanobacterial carpets in subarctic habitats.

Specimens examined: Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, 4.8 km SE of Ståloluokta, northernmost slope of Mount Gierggevårre (Kierkevare), siliceous boulder exposed to N in bare mountain region, on the ground, 67.28311°N, 16.75472°E, elev. 1265 m, 2021-07-29, M. Grube 21-336 (GZU); *ibid.*, 4.9 km SE of Ståloluokta, northernmost slope of Mount Gierggevårre (Kierkevare), wet vertical calcareous rock face exposed to N in bare mountain region, on the ground, 67.28347°N, 16.75811°E, elev. 1241 m, 2021-07-29, M. Grube 21-380 (GZU); *ibid.*, 4.9 km SE of Ståloluokta, northernmost slope of Mount Gierggevårre (Kierkevare), wet vertical calcareous rock face exposed to N in bare mountain region, on the ground, 67.28366°N, 16.75672°E, elev. 1244 m, 2021-07-29, M. Grube 21-341 (GZU).

***Gyalidea roseola* (Arnold) Lettau**

Red-listed as Data Deficient (DD). Previously reported from Padjelanta by Westberg et al. (2005).

Specimen examined: Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, Jiegnáffo, NE-slope just NE of the S peak, on thin crust of soil/mosses over rock, 67.20049°N, 16.69711°E, elev. c. 1600 m, 2004-07-29, M. Westberg 3022 (LD 1273986).

***Gyalolechia xanthostigmoidea* (Räsänen) Søchting et al.**

New to Lule lappmark. Previously reported from Jämtland, Åsele lappmark, Pite lappmark and Torne lappmark.

Specimens examined: Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, 11 km WNW of Ståloluokta, c. 275 m W of peak of Unna Duvgge, on perpendicular slate rock under overhang, 67.35610°N, 16.44392°E, elev. c. 825 m, 2020-08-02, U. Arup L20287 (LD); *ibid.*, N of the river Duvggejåhkå, 1.5 km ESE of the peak of Unna Duvgge, on side of calciferous boulder near the rapids, 67.34368°N, 16.46566°E, elev. c. 660 m, 2020-08-03, U. Arup L20352 (LD); *ibid.*, N of the river Duvggejåhkå, 670 m SE of the peak of Unna Duvgge, on calcareous rock on slope, 67.35225°N, 16.46269°E, elev. c. 760 m, 2020-08-04, U. Arup L20461 (LD).

****Halospora diminuta* (Arnold) Tomas. & Ciff.**

Syn. *Polyblastia diminuta* Arnold

New to Lule lappmark. Previously reported from Öland, Gotland and Torne lappmark. For a review of the genus *Halospora*, see Hafellner (2011).

Specimens examined: Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, 4.9 km SE of Ståloluokta, northernmost slope of Mount Gierggevårre (Kierkevare), on the thallus of *Protoplastenia* sp. on calcareous boulder (1.5 m high) in bare mountain region, 67.28297°N, 16.75491°E, elev. 1254 m, 2021-07-29, G. Thor 42766 (UPS); *ibid.*, 4.8 km SE of Ståloluokta, northernmost slope of Mount Gierggevårre (Kierkevare), on boulder exposed to N in bare mountain region, 67.28311°N, 16.75472°E, elev. 1265 m, 2021-07-29, M. Grube 21-339 (GZU).



Figure 12. *Frigidopyrenia bryospila* on the northernmost slope of Mount Gierggevárre. Scale bar: 250 μ m. Photo M. Grube.

***Henrica theleodes* (Sommerf.) Savič et al.**

New to Lule lappmark. Previously reported from Jämtland, Lycksele lappmark and Torne lappmark.

Specimens examined: **Sweden.** *Lule lappmark:* Jokkmokk par., Padjelanta National Park, along the trail between Stáloluokta and Duottar (Tuottar) mountain lodges, 14.9 km SE of Stáloluokta, 10–30 m S of the trail, exposed snowbed on siliceous bedrock in mountain pass in bare mountain region, 67.27068°N, 17.01652°E, elev. 889 m, 2021-07-31, M. Grube 21-385 (GZU); *ibid.*, 11 km WNW of Stáloluokta, 1.7 km SSE of the peak of Unna Duvgge, on schistose cliffs close to the river Duvggejåhkå in open alpine heath, 67.34387°N, 16.46521°E, elev. c. 670 m, 2020-08-03, R. Vicente (UPS); *ibid.*, N of the river Duvggejåhkå, 1.35 km SSW of the peak of Unna Duvgge, on NE-facing slope, on calciferous slate pebble in open alpine heath, 67.34411°N, 16.44338°E, elev. c. 705 m, 2020-08-01, U. Arup L20193 (LD).

***Kiliasia tristis* (Müll.Arg.) Hafellner**

New to Lule lappmark. Previously reported mainly from southern Sweden (Öland, Närke to Uppland), but one northern locality exists in Torne lappmark.

Specimen examined: **Sweden.** *Lule lappmark:* Jokkmokk par., Padjelanta National Park, 11 km WNW of Stáloluokta, N of the river Duvggejåhkå, 1.4 km ESE of the peak of Unna Duvgge, on calciferous rock, 67.34429°N, 16.46012°E, elev. c. 690 m, 2020-08-03, U. Arup L20316 (LD).

****Lasiosphaeriopsis stereocaulicola* (Linds.) O.E.Erikss. & R.Sant.**

New to Lule lappmark. Previously reported from Härjedalen, Jämtland and Torne lappmark.

Specimen examined: Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, 11 km WNW of Stáloruokta, N of the river Duvggejåhkå, 1.9 km S of the peak of Unna Duvgge, on *Stereocaulon* sp. on moist soil on sloping slate rock at rapids between lakes, 67.33883°N, 16.44711°E, elev. c. 730 m, 2020-08-01, U. Arup L20240 (LD).

***Lecanora bicincta* Ramond**

New to Lule lappmark. Previously reported from Dalarna, Härjedalen and Jämtland.

Specimens examined: Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, along the trail between Stáloruokta and Duottar (Tuottar) mountain lodges, 7.9 km SE of Stáloruokta, 5 m N of the trail, exposed *Empetrum hermaphroditum* heath on siliceous bedrock in bare mountain region, 67.28547°N, 16.8559°E, elev. 745 m, 2021-07-31, M. Grube 21-323 (GZU); *ibid.*, 11 km WNW of Stáloruokta, N of the river Duvggejåhkå (Tukijåhkå, Tokijokk), E slope of Mount Stuurra Duvgge (Stuor Tokivare, Stuurra Tuki), bare mountain region, 250 m SW of small cabin, alpine heath, on a large exposed boulder, 67.34311°N, 16.443686°E, elev. 709 m, 2020-08-01, M. Westberg PAD060 & PAD064 (UPS L-1009813 & L-1009748).

****Lecanora latro* Poelt**

New to Lule lappmark. Previously reported from Härjedalen, Jämtland and Torne lappmark.

Specimens examined: Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, 11 km WNW of Stáloruokta, 1.4 km ESE of the peak of Unna Duvgge, on *Miriquidica nigroleprosa* on siliceous rock, 67.24429°N, 16.46011°E, elev. c. 690 m, 2020-08-03, U. Arup L20324 (LD); *ibid.*, N of the river Duvggejåhkå, 2.1 km SSW of the peak of Unna Duvgge, on *Miriquidica nigroleprosa* on slate at rapids at E end of lake, 67.33754°N, 16.43947°E, elev. c. 745 m, 2020-08-01, U. Arup L20213 (LD).

****Lecanora lecanoricola* (Alstrup et al.) Rambold & Triebel**

New to Lule lappmark. Previously reported from Lycksele lappmark and Torne lappmark.

Specimens examined: Sweden. Lule lappmark: Jokkmokk parish, Padjelanta National Park, along the trail between Darreluoppal (Tarraluoppal) and Sámmarlappastugan mountain lodges, 9.3 km SSE of Darreluoppal, 5 m E of the trail, open deciduous forest dominated by *Betula pubescens*, on *Lecanora cenisea* on boulder, 67.11103°N, 17.16294°E, elev. 656 m, 2021-08-02, G. Thor 43117 (UPS); *ibid.*, at foot of Mount Allak c. 3.5 km SSW of the peak Allaktjåhkå, on the hook-formed peninsula at the lake Virihaure, on *Lecanora cenisea* on S-exposed calcareous mica schist rocks on the shore, 67.40988°N, 16.64230°E, elev. 580 m, 2004-07-31, U. Arup L04320 (LD).

***Lecanora stenotropa* Nyl.**

New to Lule lappmark. Previously reported from Gästrikland and Härjedalen.

Specimens examined: Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, along the trail between Duottar (Tuottar) and Darreluoppal (Tarraluoppal) mountain lodges, 3 km SE of Duottar, 5 m N of the trail, leaning siliceous cliff exposed to SW in bare mountain region, 67.24522°N, 17.06684°E, elev. 949 m, 2021-08-01, M. Grube 21-343 (GZU).

***Lecidea degeliana* Hertel**

New to Lule lappmark. Previously only reported from Torne lappmark. The species was reported as new to Sweden by Westberg et al. (2015b) where it is also illustrated by a photograph.

Specimen examined: Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, 11 km WNW of Stálluokta, N of the river Duvgejåhkå (Tukijåkkå, Tokijokk), S slope of Mount Unna Duvge (Unna Toki, Unna Tuki), 1.0 km NNW of small cabin, on iron-rich rock, 67.353898°N, 16.452386°E, elev. 818 m, 2020-08-02, M. Westberg PAD121 (UPS L-1010069).

****Lecidea verruca* Poelt**

New to Lule lappmark. Previously reported from Jämtland and Torne lappmark. The species is said to be parasitic on *Sagedia simoënsis* and *Aspicilia grisea*. The host species of our collection could not be identified.

Specimen examined: Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, 11 km WNW of Stálluokta, N of the river Duvgejåhkå, 560 m SE of the peak of Unna Duvge, on grey crustose thallus on schistose boulder, 67.35218°N, 16.45911°E, elev. c. 790 m, 2020-08-04, U. Arup L20424 (LD).

***Lecidella subcongrua* R.Sant.**

New to Lule lappmark. Previously reported from Norrbotten, Lycksele lappmark, Pite lappmark and Torne lappmark.

Specimen examined: Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, 11 km WNW of Stálluokta, N of the river Duvgejåhkå (Tukijåkkå, Tokijokk), S slope of Mount Unna Duvge (Unna Toki, Unna Tuki), 970 m NNW of small cabin, on iron-rich rock, 67.35319°N, 16.44°E, elev. 727 m, 2020-08-02, M. Westberg PAD143 (UPS L-1009643).

***Leciophysma furfurascens* (Nyl.) Gyeln.**

New to Lule lappmark. Previously reported from Jämtland, Lycksele lappmark and Torne lappmark. A common but overlooked lichen on plant debris on calcareous ground in bare mountain regions.

Specimens examined: Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, 11 km WNW of Stálluokta, W of Lake Virihavvre, south slope of Unna Duvge (Unna Toki), c. 770 m E of small cabin, on bryophytes/plant debris on the ground, 67.345404°N, 16.46535°E, elev. 660 m, 2020-08-03, M. Westberg PAD276 (UPS L-1009784); *ibid.*, 11 km WNW of Stálluokta, N of the river Duvgejåhkå (Tukijåkkå, Tokijokk), E slope of Mount Unna Duvge (Unna Toki, Unna Tuki), bare mountain region, 1.05 km NE of small cabin, on bryophytes/plant debris, 67.352205°N, 16.462798°E, elev. 741 m, 2020-08-04, M. Westberg PAD351a (UPS L-1009711); N of the river Duvgejåhkå (Tukijåkkå, Tokijokk), S slope of Mount Unna Duvge (Unna Toki, Unna Tuki), bare mountain region, 830 m NNE of small cabin, alpine meadow, on bryophytes on the ground, 67.352332°N, 16.451243°E, elev. 780 m, 2020-08-01, M. Westberg PAD118a (UPS L-1009757).

***Lempholemma dispansum* H.Magn.**

New to Lule lappmark. Previously reported from Dalsland, Västergötland, Jämtland, Lycksele lappmark and Torne lappmark.

Specimen examined: Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, 11 km WNW of Stálluokta, N of the river Duvgejåhkå, 580 m SE of the peak of Unna Duvge, on calciferous schistose rock, 67.35286°N, 16.46126°E, elev. c. 775 m, 2020-08-04, U. Arup L20435 (LD).

***Lepraria borealis* Lohtander & Tønsberg**

New to Lule lappmark. Widely distributed from Skåne to Dalarna but not reported further north. The findings in Padjelanta indicate a wider distribution of the species in Sweden. The thallus varies from whitish to greyish. Greyish morphotypes are close to *L. neglecta* and difficult to separate without TLC. However, it is notable that *L. neglecta* is not noted by us in Padjelanta.

Specimens examined: Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, along the trail between Darreluoppal (Tarraluoppal) and Sámmarlappastugan mountain lodges, 9.3 km SSE of Darreluoppal, 5 m E of the trail, open deciduous forest dominated by *Betula pubescens*, on bryophytes on the ground, 67.11103°N, 17.16294°E, elev. 656 m, 2021-08-02, G. Thor 43106 (UPS, HPTLC: atranorin, fatty acid); *ibid.*, along the trail between Darreluoppal (Tarraluoppal) and Sámmarlappastugan mountain lodges, 8.7 km SSE of Darreluoppal, 5 m E of the trail, open deciduous forest edge dominated by *Betula pubescens*, on boulder, 67.11558°N, 17.16168°E, elev. 650 m, 2021-08-02, G. Thor 43130 (UPS, HPTLC: atranorin); *ibid.*, along the trail between Stálluokta and Duottar (Tuottar) mountain lodges, 9.9 km SE of Stálluokta, 50 m N of the trail, exposed siliceous peak in heath in bare mountain region, on soil, 67.28323°N, 16.90388°E, elev. 840 m, 2021-07-31, G. Thor 42934 (UPS, HPTLC: atranorin); *ibid.*, Stálluokta, the rapid between the lakes Luoppal and Virihavre (Virihavre), on the S shore of the river Gieddejáhká (Kieddejákká) N of the bridge, exposed siliceous rocks in bare mountain region, on boulder, 67.31930°N, 16.69344°E, elev. 576 m, 2021-07-31, G. Thor 42875 & 42876 (UPS, 42875: white morphotype, HPTLC: atranorin, fatty acid; 42876: greyish morphotype, HPTLC: atranorin, fatty acid); *ibid.*, 11 km WNW of Stálluokta, N of the river Duvgejáhkká (Tukijákká, Tokijokk), between Mount Stuorra Duvge (Stuor Tokivare, Stuorra Tuki) and Mount Unna Duvge (Unna Toki, Unna Tuki), E slope of Mount Stuorra Duvge (Stuor Tokivare, Stuorra Tuki), 700 m S of small cabin, heath in bare mountain region at the river, on vertical 2 m high rock, 67.33858°N, 16.44703°E, elev. 748 m, 2020-08-01, G. Thor 41216 (UPS, HPTLC: atranorin, fatty acid); *ibid.*, 11 km WNW of Stálluokta, N of the river Duvgejáhkká (Tukijákká, Tokijokk), between Mount Stuorra Duvge (Stuor Tokivare, Stuorra Tuki) and Mount Unna Duvge (Unna Toki, Unna Tuki), 260 m SE of small cabin, heath in bare mountain region near the shore of the river, on the ground, 67.34413°N, 16.45288°E, elev. 672 m, 2020-07-31, G. Thor 41044 (UPS, HPTLC: atranorin, trace of fatty acid); *ibid.*, 11 km WNW of Stálluokta, N of the river Duvgejáhkká (Tukijákká, Tokijokk), E slope of Mount Stuorra Duvge (Stuor Tokivare, Stuorra Tuki), bare mountain region, 170 m SW of small cabin, at late snowbed in alpine heath, on soil, 67.34416°N, 16.44374°E, elev. 693 m, 2020-08-01, G. Thor 41076 (UPS; HPTLC: atranorin); *ibid.*, 11 km WNW of Stálluokta, N of the river Duvgejáhkká (Tukijákká, Tokijokk), E slope of Mount Unna Duvge (Unna Toki, Unna Tuki), 700 m NE of small cabin, at late snowbed in heath in bare mountain region, on the ground, 67.34939°N, 16.45828°E, elev. 723 m, 2020-08-05, G. Thor 41532 (UPS, HPTLC: atranorin, fatty acid).

***Lepraria caesiocalba* (B.de Lesd.) J.R.Laundon**

New to Lule lappmark. Widespread in South Sweden, where it is reported north to Jämtland. The finding in Padjelanta indicates a wider distribution in Sweden.

Specimens examined: Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, Sweden, along the trail between Darreluoppal (Tarraluoppal) and Sámmarlappastugan mountain lodges, 9.3 km SSE of Darreluoppal, 5 m E of the trail, open deciduous forest dominated by *Betula pubescens*, on bryophytes on stone, 67.11103°N, 17.16294°E, elev. 656 m, 2021-08-02, G. Thor 43118 (UPS, HPTLC: atranorin, fatty acid, stictic acid); *ibid.*, along the trail between Stálluokta and Duottar (Tuottar) mountain lodges, 6.4 km SE of Stálluokta, below rapid in the river Bállávrjáhká (Pállaurjákká), vertical siliceous rocks in bare mountain region, on vertical rock, 67.29517°N, 16.82763°E, elev. 685 m, 2021-07-30, G. Thor 42887 (UPS, HPTLC: atranorin, fatty acid, stictic acid); *ibid.*, 11 km WNW of Stálluokta, N of the river Duvgejáhkká (Tukijákká, Tokijokk), E slope of Mount Unna Duvge (Unna Toki, Unna Tuki), 380 m NE of small cabin, at late snowbed in bare mountain region, on the ground, 67.34654°N, 16.45494°E, elev. 712 m, 2020-08-03, G. Thor 41329 (UPS, HPTLC: atranorin, fatty acid, stictic acid).

Lepraria diffusa* (J.R.Laundon) Kukwa var. *diffusa

New to Lule lappmark. Previously reported from Dalsland, Värmland, Dalarna and Jämtland. *Lepraria diffusa* var. *chrysodetoides*, which has a deeper cream to strong yellow colour, is reported from Lule lappmark.

Specimens examined. Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, along the trail between Duottar (Tuottar) and Darreluoppal (Tarraluoppal) mountain lodges, 7 km SE of Duottar, 20 m W of the trail, small exposed hills with at least partly calcareous bedrock in bare mountain region, on the ground, 67.21389°N, 17.10726°E, elev. 932 m, 2021-08-01, G. Thor 43037 (UPS, HPTLC: 4-oxypannaric acid 2-methyl ester (major), 4-oxypannaric acid (minor)); *ibid.*, 11 km WNW of Ståloluokta, N of the river Duvgejåhkå (Tukijåkkå, Tokijokk), E slope of Mount Stuorra Duvge (Stuor Tokivare, Stuorra Tuki), 900 m SW of small cabin, heath in bare mountain region, at the outlet of Lake Gásakluoppal, on vertical shaded 1.5 m high rock, 67.33749°N, 16.43954°E, elev. 753 m, 2020-08-01, G. Thor 41172 (UPS, HPTLC: 4-oxypannaric acid 2-methyl ester (major), 4-oxypannaric acid (minor)).

***Lepraria eburnea* J.R.Laundon**

Syn. *Lepraria frigida* J.R.Laundon

New to Lule lappmark. Previously reported from Östergötland, Uppland, Dalarna and Torne lappmark.

Specimens examined. Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, along the trail between Darreluoppal (Tarraluoppal) and Sámmarlappastugan mountain lodges, 1.9 km S of Darreluoppal, 2–10 m E of the trail, small exposed hill with siliceous bedrock in heath in bare mountain region, on the ground, 67.17554°N, 17.12659°E, elev. 719 m, 2021-08-03, G. Thor 43222 (UPS, HPTLC: alectorialic, barbatolic, protocetraric acids, zeorin); *ibid.*, along the trail between Ståloluokta and Duottar (Tuottar) mountain lodges, 13.4 km SE of Ståloluokta, 40 m NE of the trail, exposed partly calcareous hill in bare mountain region, on soil, 67.27402°N, 16.98134°E, elev. 842 m, 2021-07-31, G. Thor 42954 (UPS, alectorialic acid, barbatolic, protocetraric acids); *ibid.*, 4.9 km SE of Ståloluokta, northernmost slope of Mount Gierggevårre (Kierkevare), wet vertical calcareous rockface exposed to N in bare mountain region, on shaded rock, 67.28364°N, 16.75678°E, elev. 1241 m, 2021-07-29, G. Thor 42787 (UPS, HPTLC: alectorialic, barbatolic, protocetraric acids); *ibid.*, 1.5 km SSE of Ståloluokta, along the trail between Ståloluokta and Stáddájåhkå (Staddajåkk) mountain lodges, 15 m W of the trail, on small hill with meadow-like vegetation on ultramafic bedrock in bare mountain region, on soil, 67.30705°N, 16.70136°E, elev. 664 m, 2021-07-30, G. Thor 42834 (UPS, HPTLC: alectorialic, barbatolic, protocetraric acids); *ibid.*, 11 km WNW of Ståloluokta, N of the river Duvgejåhkå (Tukijåkkå, Tokijokk), E slope of Mount Unna Duvge (Unna Toki, Unna Tuki), 920 m NE of small cabin, talus slope in bare mountain region, on calcareous ground, 67.35153°N, 16.45969°E, elev. 771 m, 2020-08-04, G. Thor 41462 (UPS, HPTLC: alectorialic barbatolic, protocetraric acids).

***Lepraria elobata* Tønsberg**

New to Lule lappmark. Widely distributed and frequently reported from Skåne to Ångermanland, but not reported further north. The finding in Padjelanta indicates a wider distribution of the species in Sweden.

Specimen examined. Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, 11 km WNW of Ståloluokta, N of the river Duvgejåhkå (Tukijåkkå, Tokijokk), between Mount Stuorra Duvge (Stuor Tokivare, Stuorra Tuki) and Mount Unna Duvge (Unna Toki, Unna Tuki), 260 m SE of small cabin, heath in bare mountain region near the shore of the river, on the ground, 67.34413°N, 16.45288°E, elev. 672 m, 2020-07-31, G. Thor 41054 (UPS, HPTLC: atranorin, zeorin, stictic acid).

****Lichenodiplis lecanorae* (Vouaux) Dyko & D.Hawksw.**

New to Lule lappmark. Previously reported from Gotland, Västergötland, Uppland, Jämtland and Torne lappmark. *Lecanora epibryon* is a new host.

Specimen examined. Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, along the trail between Stáloruokta and Duottar (Tuottar) mountain lodges, 13.4 km SE of Stáloruokta, 40 m NE of the trail, exposed partly calcareous hill in bare mountain region, on *Lecanora epibryon*, 67.27388°N, 16.98191°E, elev. 837 m, 2021-07-31, M. Grube 21-313 (GZU).

****Lichenostigma alpinum* (R.Sant. et al.) Ertz & Diederich**

Syn. *Phaeosporobolus alpinus* R.Sant. et al.

New to Lule lappmark. Previously reported from Öland, Gotland, Östergötland, Uppland, Härjedalen, Jämtland, Lycksele lappmark, Pite lappmark and Torne lappmark.

Specimens examined. Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, 1.4 km SSE of Stáloruokta, along the trail between Stáloruokta and Stáddájáhkå (Staddajäkk) mountain lodges, hill 80 m E of the trail, exposed ultramafic rock in bare mountain region, on sterile lichen thallus on slate, 67.30764°N, 16.70310°E, elev. 662 m, 2021-07-30, G. Thor 42850 (UPS); *ibid.*, 11 km WNW of Stáloruokta, N of the river Duvggejáhkå (Tukijáhkå, Tokijokk), E slope of Mount Unna Duvgge (Unna Toki, Unna Tuki), 810 m E of small cabin, at mire in bare mountain region, on *Ochrolechia frigida* on *Juniperus communis*, 67.34566°N, 16.46589°E, elev. 653 m, 2020-08-03, G. Thor 41417 (UPS).

****Merismatium heterophractum* (Nyl.) Vouaux**

New to Lule lappmark. A rarely reported species in Fennoscandia previously reported from Uppland and Torne lappmark in Sweden, Troms in Norway and Etelä-Häme (Tavastia australis) in Finland.

Specimen examined. Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, 11 km WNW of Stáloruokta, N of the river Duvggejáhkå, 1.45 km ESE of the peak of Unna Duvgge, on *Biatora* sp. on mosses on the ground, 67.34453°N, 16.46507°E, elev. c. 675 m, 2020-08-03, U. Arup L20382 (LD).

****Merismatium nigrtellum* (Nyl.) Vouaux**

New to Lule lappmark. Previously reported from Härjedalen, Jämtland, Lycksele lappmark and Torne lappmark. In Norway it is reported from Hordaland and Troms, and in Finland from Pohjois-Savo (Savonia borealis).

Specimens examined. Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, Sweden, 4.8 km SE of Stáloruokta, northernmost slope of Mount Gierggevárre (Kierkevare), boulder exposed to N in bare mountain region, on sterile lichen on moss remnants, 67.28311°N, 16.75472°E, elev. 1265 m, 2021-07-29, M. Grube 21-305 (GZU); *ibid.*, 11 km WNW of Stáloruokta, c. 1.4 km S–SE of the peak Unna Duvgge, N of the river Duvggejáhkå, on dead *Fuscopannaria* sp. and dead mosses on the ground in alpine heath, 67.34395°N, 16.46305°E, elev. c. 700 m, 2020-08-03, R. Vicente (UPS F-988911); *ibid.*, N of the river Duvggejáhkå, 1.2 km S of the peak of Unna Duvgge, 205 m E of small cabin, on *Lopadium pezizoideum* on dead mosses on the ground in open alpine heath, 67.34502°N, 16.45211°E, elev. c. 690 m, 2020-07-31, U. Arup L20158 (LD).

****Merismatium thamnoliicola* Alstrup & E.S.Hansen**

New to Sweden. In Fennoscandia previously reported from Norway. *M. thamnoliicola* was described by Alstrup & Hansen (2001). The species is best recognized by having perithecioid ascomata, brown,

muriform, smooth-walled ascospores measuring $(14-16.5-24.0(-34) \times (6-6.5-8.5(-9) \mu\text{m}$ and by lacking interascal filaments (Zhurbenko 2012).

Specimen examined. Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, 11 km WNW of Stáloruokta, N of the river Duvgejåhkå (Tukijåkkå, Tokijokk), E slope of Mount Unna Duvge (Unna Toki, Unna Tuki), 1080 m NE of small cabin, heath on exposed hill in bare mountain region, on *Thamnotia vermicularis* on the ground, 67.35267°N, 16.46198°E, elev. 772 m, 2020-08-04, G. Thor 41502 (UPS).

****Muellerella erratica* (Müll.Arg.) Hafellner & V.John**

New to Lule lappmark. Previously reported from Öland, Gotland, Västergötland, Östergötland, Härjedalen, Jämtland and Torne lappmark.

Specimens examined. Sweden. Lule lappmark: Jokkmokk parish, Padjelanta National Park, along the trail between Darreluoppal (Tarraluoppal) and Sámmlarlappastugan mountain lodges, 4.2 km S of Darreluoppal, 70 m W of the trail, at S shore of small stream, exposed heath on siliceous bedrock in bare mountain region, on *Bellemerea alpina*, 67.15542°N, 17.12621°E, elev. 711 m, 2021-08-03, G. Thor 43198 (UPS); *ibid.*, 11 km WNW of Stáloruokta, N of the river Duvgejåhkå (Tukijåkkå, Tokijokk), 1.4 km SSE of Mount Unna Duvge (Unna Toki, Unna Tuki) 560 m E of small cabin, on *Protoblastenia* sp. on schistose rock close to river Duvgejåhkå, 67.34421°N, 16.46020°E, elev. c. 700 m, 2020-08-03, R. Vicente (UPS).

****Muellerella lichenicola* (Sommerf.:Fr.) D.Hawksw.**

New to Lule lappmark. Previously reported from Öland, Gotland, Östergötland, Uppland, Hälsingland, Härjedalen, Jämtland, Åsele lappmark, Lycksele lappmark and Torne lappmark.

Specimens examined. Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, along the trail between Duottar (Tuottar) and Darreluoppal (Tarraluoppal) mountain lodges, 3 km SE of Duottar, 5 m N of the trail, leaning siliceous cliff exposed to SW in bare mountain region, on sterile lichen thallus, 67.24510°N, 17.06640°E, elev. 941 m, 2021-08-01, G. Thor 43025 (UPS); *ibid.*, 11 km WNW of Stáloruokta, N of the river Duvgejåhkå (Tukijåkkå, Tokijokk), between Mount Stuurra Duvge (Stuor Tokivare, Stuurra Tuki) and Mount Unna Duvge (Unna Toki, Unna Tuki), bare mountain region, 150 m ENE of small cabin, on *Caloplaca* sp. on a boulder, 67.34538°N, 16.45051°E, elev. 682 m, 2020-07-31, M. Westberg PAD017 (UPS L-1009778); *ibid.*, 11 km WNW of Stáloruokta, N of the river Duvgejåhkå (Tukijåkkå, Tokijokk), S slope of Mount Unna Duvge (Unna Toki, Unna Tuki), 1030 m NNE of small cabin, steep slightly calcareous rock exposed to S in bare mountain region, on *Rusavskia elegans* on shaded rock, 67.35378°N, 16.45225°E, elev. 837 m, 2020-08-02, G. Thor 41275 (UPS).

****Muellerella pygmaea* (Körb.) D.Hawksw.**

New to Lule lappmark. Previously reported from Öland, Halland, Östergötland, Västmanland, Uppland, Härjedalen, Jämtland, Lycksele lappmark and Torne lappmark.

Specimen examined. Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, along the trail between Darreluoppal (Tarraluoppal) and Sámmlarlappastugan mountain lodges, 4.2 km S of Darreluoppal, 70 m W of the trail, at N shore of small stream, on *Bellemerea cinereorufescens* on siliceous rock in bare mountain region, 67.15569°N, 17.12592°E, elev. 710 m, 2021-08-03, G. Thor 43182 (UPS).

***Myriolecis crenulata* (Hook.) Sliwa et al.**

New to Lule lappmark. The species is common in most limestone areas in Sweden. This record extends the northern limit in Sweden from the earlier one in Lycksele lappmark.

Specimen examined. Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, 11 km WNW of Ståloluokta, c. 275 m W of peak of Unna Duvgge, on perpendicular limestone rock under overhang, 67.35611°N, 16.44392°E, elev. c. 825 m, 2020-08-02, U. Arup L20283 (LD).

***Normandina acroglypta* (Norman) Aptroot**

New to Lule lappmark. Previously reported from Skåne, Öland, Gotland, Halland to Östergötland, Västmanland, Uppland, Dalarna and Jämtland.

Specimen examined. Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, Ståloluokta at the shore of Lake Virihávrrre (Virihaure), S slope of Mount Unna Dijdde (Unna Titer), bare mountain region at the tree-line, in connection to *Parmeliella triptophylla* on *Juniperus communis*, 67°19.277'N, 16°42.751'E, elev. 750 m, 2004-08-01, G. Thor 18939a (UPS).

***Pannaria hookeri* (Borrer ex Sm.) Nyl.**

Red-listed as Near Threatened (NT). Previously reported from Padjelanta by Westberg et al. (2005).

Specimens examined. Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, 13 km S of Ståloluokta, the mountain Jiegnáffo (Jeknafo), N slope 400 m N of the top with the height 1836 m, bare mountain region, calcareous micaceous slate, on exposed, ±wet rock near snowbed, 67°12.037'N, 16°41.794'E, elev. 1600 m, 2004-07-29, G. Thor 18774a (UPS); *ibid.*, 12 km SSW of Ståloluokta, the mountain Jiegnáffo (Jeknafo), 500 m south of the N top area, bare mountain region, with outcrops of slightly calcareous micaceous slate, on exposed rock, 67°13.415'N, 16°37.746'E, elev. 1400 m, 2004-07-29, G. Thor 18707 (UPS); *ibid.*, Jiegnáffo east slope c. 12 km SSW of Ståloluokta, on soil in alpine heath with outcrop of calciferous slate, 67.20062°N, 16.69658°E, elev. 1600 m, 2004-07-29, A. Koffman 696 (UPS L-158309); *ibid.*, Jiegnáffo, on the crest c. 200 m SE of the N peak (1436 m), on soil/rock, 67.22703°N, 16.62989°E, elev. 1395 m, 2004-07-29, M. Westberg 2997 (LD 1277046); *ibid.*, Virihaure-området, Jalkok (Stalotjåkk), klippra (tämligen riklig), elev. 1300 m, 1941-08-04, G. Degelius (UPS L-144926).

***Pectenium plumbeum* (Lightf.) P.M.Jørg. et al.**

Red-listed as Endangered (EN). First reported from Padjelanta by Degelius (1943), who noticed *P. plumbeum* on one boulder. Most probably, we refound it on the same boulder 3×5×5 m large (Thor et al. 2021). Two thalli close to each other, together covering an area of 18 cm², were present on the N side of the boulder (Thor et al. 2021, with photograph of the thalli). *Candelariella vitellina*, *Ophioparma ventosa*, *Parmelia saxatilis* and *Tephromela atra* were noted nearby on the same boulder, among others. As *P. plumbeum* is red-listed and the population is small, it was not collected. A collection from Padjelanta made by G. Degelius is present in UPS. The occurrence of *P. plumbeum* in Padjelanta is not surprising as the locality is only 43 km distant the bird path from the nearest localities of the species at the seashore of Saltfjorden, Fauske, in Norway. The boulder is further located downstream a rapid in the river Duvggejåhkå (Tukijåkkå, Tokijokk), which has its source from the glaciers at Sulitelma in Norway and provides mist from splashing water in the rapid. The area surrounding the boulder thus receives a stable humid microclimate all summer.

Specimen examined. Sweden. Lule Lappmark: Jokkmokk par., Padjelanta National Park, 11 km WNW of Ståloluokta, N of the river Duvggejåhkå (Tukijåkkå, Tokijokk), E slope of Mount Unna Duvgge (Unna Toki, Unna Tuki), 810 m ESE of small cabin, heath just above the river in bare mountain region, with mist from splashing water in the rapid, 67.34365°N, 16.46589°E (±5 m), elev. 653 m, 2020-08-03 (not collected).

***Peltigera collina* (Ach.) Schrad.**

Red-listed as Near Threatened (NT). Previously reported from Padjelanta by Westberg et al. (2005).

Specimen examined: Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, Stálluokta, c. 100 m N of the cabins, on schistose boulder, 67.318887°N, 16.696955°E, elev. 575 m, 2004-07-31, M. Westberg 3109 (LD).

***Peltigera elisabethae* Gyeln.**

New to Lule lappmark. Previously reported from Dalsland, Närke, Dalarna, Gästrikland, Jämtland, Åsele lappmark, Lycksele lappmark and Torne lappmark.

Specimens examined: Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, 11 km WNW of Stálluokta, N of the river Duvgejåhkå (Tukijåkkå, Tokijokk), E slope of Mount Stuorra Duvge (Stuor Tokivare, Stuorra Tuki), bare mountain region, 190 m SW of small cabin, on bryophytes/plant debris on the ground in alpine *Dryas* heath, 67.344043°N, 16.443321°E, elev. 698 m, 2020-08-01, M. Westberg PAD040 (UPS L-1009749) & U. Arup L20185 (LD); *ibid.*, 11 km WNW of Stálluokta, N of the river Duvgejåhkå (Tukijåkkå, Tokijokk), between Mount Stuorra Duvge (Stuor Tokivare, Stuorra Tuki) and Mount Unna Duvge (Unna Toki, Unna Tuki), bare mountain region, 110 m E of small cabin, on bryophytes on the ground, 67.34509°N, 16.44987°E, elev. 680 m, 2020-07-31, M. Westberg PAD022 (UPS L-1009723).

***Pertusaria coriacea* (Th.Fr.) Th.Fr.**

New to Lule lappmark. Previously reported from one locality in Torne lappmark (Svensson et al. 2020).

Specimens examined: Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, 11 km WNW of Stálluokta, N of the river Duvgejåhkå (Tukijåkkå, Tokijokk), S slope of Mount Unna Duvge (Unna Toki, Unna Tuki), bare mountain region, 670 m ESE of small cabin, just above the river, alpine heath, on soil, 67.343826°N, 16.462739°E, elev. 664 m, 2020-08-03, M. Westberg PAD216 (UPS L-1009806); *ibid.*, Unna Duvge, 680 m E of small cabin, N side of the river Duvgejåhkå, on mossy soil over schistose rock, 67.34395°N, 16.46305°E, 2020-08-03, R. Vicente (UPS L-988910).

***Pertusaria trochiscea* Norman**

New to Lule lappmark. Previously reported from Torne lappmark.

Specimen examined: Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, along the trail between Duottar (Tuottar) and Darreluoppal (Tarraluoppal) mountain lodges, 7 km SE of Duottar, 20 m W of the trail, small exposed hills with at least partly calcareous bedrock in bare mountain region, on the ground, 67.21389°N, 17.10726°E, elev. 932 m, 2021-08-01, G. Thor 43034 (UPS, HPTLC: 3 fatty acids, rf. c. 43, 32, 24 in solvent C).

****Phacographa protoparmeliae* Hafellner**

New to Lule lappmark. Previously reported only from Torne lappmark. The species was described by Hafellner (2009) and reported as new to Sweden by Westberg et al. (2016). *Phacographa protoparmeliae* is distinguished from *P. glaucomaria* by its more sessile ascomata and shorter ascospores ($18\text{--}21\text{--}(23) \times 6\text{--}7\text{ }\mu\text{m}$ compared to $20\text{--}24\text{--}(26) \times 6\text{--}7\text{ }\mu\text{m}$), and by a different host (*Protoparmelia badia* compared to *Lecanora* spp.).

Specimens examined: Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, along the trail between Duottar (Tuottar) and Darreluoppal (Tarraluoppal) mountain lodges, 3 km SE of Duottar, 5 m N of the

trail, leaning siliceous cliff exposed to SW in bare mountain region, on *Protoparmelia badia*, 67.24510°N, 17.06640°E, elev. 941 m, 2021-08-01, G. Thor 43024 (UPS); *ibid.*, 11 km WNW of Ståluokta, N of the river Duvgejåhkå (Tukijåhkå, Tokijokk), E slope of Mount Unna Duvge (Unna Toki, Unna Tuki), 980 m NE of small cabin, talus slope directed towards E in bare mountain region, on *Protoparmelia badia* on boulder, 67.35223°N, 16.45914°E, elev. 784 m, 2020-08-04, G. Thor 41469 (UPS).

****Phaeospora parasitica* (Lönnr.) Arnold**

New to Lule lappmark. Previously reported from Öland, Gotland, Uppland, Härjedalen, Jämtland and Torne lappmark.

Specimen examined: Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, along the trail between Duottar (Tuottar) and Darreluoppal (Tarraluoppal) mountain lodges, 7 km SE of Duottar, 20 m W of the trail, small exposed hills with at least partly calcareous bedrock in bare mountain region, on *Rhizocarpon umbilicatum* on rock, 67.21389°N, 17.10726°E, elev. 932 m, 2021-08-01, G. Thor 43030 (UPS, HPTLC on *Rhizocarpon umbilicatum*: stictic acid); *ibid.*, 4.8 km SE of Ståluokta, northernmost slope of Mount Gierggevárre (Kierkevarre), N of the steep slope, calcareous boulder in ±flat solifluction soil in bare mountain region, on *Rhizocarpon umbilicatum*, 67.28505°N, 16.75793°E, elev. 1190 m, 2021-07-29, M. Grube 21-321 (GZU).

***Placidiosis pseudocinerea* Breuss**

New to Lule lappmark. Previously reported from Härjedalen and Torne lappmark.

Specimens examined: Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, 11 km WNW of Ståluokta, N of the river Duvgejåhkå (Tukijåhkå, Tokijokk), S slope of Mount Unna Duvge (Unna Toki, Unna Tuki), bare mountain region, 660 m ESE of small cabin, just above the river, on soil in the slope above the river, 67.343646°N, 16.462248°E, elev. 667 m, 2020-08-03, M. Westberg PAD213 (UPS L-1009637); *ibid.*, 670 m SE of the peak of Unna Duvge, on calcareous soil on slope, 67.35225°N, 16.46270°E, elev. c. 760 m, 2020-08-04, U. Arup L20465 (LD); *ibid.*, 630 m SE of the peak of Unna Duvge, on soil over calcareous rock on ridge, 67.35258°N, 16.46225°E, elev. c. 775 m, 2020-08-04, U. Arup L20453 (LD).

***Placidium rufescens* (Ach.) A.Massal.**

New to Lule lappmark. Previously reported from Bohuslän, Södermanland, Uppland and Torne lappmark.

Specimen examined. Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, 11 km WNW of Ståluokta, N of the river Duvgejåhkå, 670 m SE of the peak of Unna Duvge, on calcareous soil on slope, 67.35225°N, 16.46270°E, elev. c. 760 m, 2020-08-04, U. Arup L20467 (LD).

****Plectocarpon linitae* (R.Sant.) Wedin & Hafellner**

New to Lule lappmark. Previously reported from Åsele lappmark, Lycksele lappmark and Torne lappmark.

Specimens examined: Sweden. Lule lappmark: Jokkmokk parish, Padjelanta National Park, along the trail between Darreluoppal (Tarraluoppal) and Sámmarlappastugan mountain lodges, 4.2 km S of Darreluoppal, 30 m W of the trail, at S shore of small stream, exposed heath on siliceous bedrock in bare mountain region, on *Lobaria linita*, 67.15536°N, 17.12642°E, elev. 710 m, 2021-08-02, M. Grube 21-290 (GZU); *ibid.*, along the trail between Darreluoppal (Tarraluoppal) and Sámmarlappastugan mountain lodges, 4.2 km S of Darreluoppal, 70 m W of the trail, at S shore of small stream, exposed heath on siliceous bedrock in bare mountain region, on *Lobaria linita*, 67.15542°N, 17.12621°E, elev. 711 m, 2021-08-03, G. Thor 43190 (UPS).

***Polyblastia albida* Arnold**

New to Lule lappmark. Previously reported from Öland, Gotland, Dalsland, Västergötland, Värmland, Uppland, Jämtland and Lycksele lappmark.

Specimens examined: Sweden. Lule lappmark: Jokkmokk parish, Padjelanta National Park, along the trail between Duottar (Tuottar) and Darreluoppal (Tarraluoppal) mountain lodges, 1.9 km SE of Duottar, 120 m SW of the trail, at lake Unna Duottarjávrr, meadow-like vegetation on calcareous bedrock in bare mountain region, on calcareous boulder, 67.25356°N, 17.04654°E, elev. 909 m, 2021-08-01, G. Thor 43019 (UPS); *ibid.*, 4.9 km SE of Stálluokta, northernmost slope of Mount Gierggevárre (Kierkevare), bare mountain region, on 1.5 m high calcareous boulder, 67.28297°N, 16.75491°E, elev. 1254 m, 2021-07-29, G. Thor 42761b (UPS).

***Polyblastia integrascens* (Nyl.) Vain.**

New to Lule lappmark. Previously reported from Dalarna, Härjedalen, Jämtland, Lycksele lappmark and Torne lappmark.

Specimen examined: Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, 11 km WNW of Stálluokta, N of the river Duvggejáhká, 580 m SE of the peak of Unna Duvge, on calciferous schistose rock, 67.35285°N, 16.46126°E, elev. c. 775 m, 2020-08-04, U. Arup L20436 (LD, identity confirmed by molecular data (ITS, Genbank acc.nr. OR214979)).

****Polycoccum clauzadei* Nav.-Ros. & Cl.Roux**

New to Lule lappmark. In Fennoscandia previously reported from single localities in Torne lappmark in Sweden and Oppland and Troms in Norway.

Specimen examined: Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, 11 km WNW of Stálluokta, N of the river Duvggejáhká (Tukijákká, Tokijokk), S slope of Mount Unna Duvge (Unna Toki, Unna Tuki), bare mountain region, 1030 m NNE of small cabin, steep partly slightly calcareous rock exposed to S, on *Rusavskia elegans*, 67.354°N, 16.45164°E, elev. 815 m, 2020-08-02, M. Westberg PAD154 (UPS L-1009716).

****Polycoccum pulvinatum* (Eitner) R.Sant.**

New to Lule lappmark. Previously reported from Bohuslän, Öland, Östergötland, Närke, Uppland, Härjedalen and Torne lappmark.

Specimen examined: Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, 11 km WNW of Stálluokta, N of the river Duvggejáhká (Tukijákká, Tokijokk), SE slope of Mount Unna Duvge (Unna Toki, Unna Tuki), bare mountain region, 870 m NE of small cabin, on *Physcia* sp. on bryophytes, 67.35117°N, 16.459543°E, elev. 742 m, 2020-08-04, M. Westberg PAD304 (UPS L-1009712).

****Polycoccum tryptelioides* (Th.Fr.) R.Sant.**

New to Lule lappmark. Previously reported from Närke, Värmland, Dalarna, Härjedalen, Jämtland and Torne lappmark.

Specimens examined. Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, along the trail between Stálluokta and Duottar (Tuottar) mountain lodges, 13.4 km SE of Stálluokta, 40 m NE of the trail, exposed partly calcareous hill in bare mountain region, on *Stereocaulon* sp. on the ground, 67.27402°N, 16.98134°E, elev. 842 m, 2021-07-31, G. Thor 42959 (UPS); *ibid.*, along the trail between Stálluokta and Duottar (Tuottar) mountain lodges, 9.6 km SE of Stálluokta, 5 m N of the trail, almost flat and slightly calcareous rock in heath in bare mountain region, on *Stereocaulon* sp. on the ground, 67.28365°N, 16.89683°E,

elev. 821 m, 2021-07-31, G. Thor 42911 (UPS); 1.5 km S of Ståloluokta, along the trail between Ståloluokta and Stáddajáhká (Staddajákk) mountain lodges, E shore of small lake 130 m W of the trail, on small soil mound in heath, on *Stereocaulon* sp. on the ground, 67.30733°N, 16.69831°E, elev. 653 m, 2021-07-30, G. Thor 42844 (UPS).

****Polycoccum vermicularium* (Linds.) D.Hawksw.**

New to Lule lappmark. Previously reported from Öland, Gotland, Härjedalen, Jämtland, Pite lappmark and Torne lappmark.

Specimen examined: Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, W of Lake Virihavre, south slope of Unna Duvge (Unna Toki), c. 840 m E of small cabin, alpine calcareous heath, on *Thamnolia vermicularis* on the ground among bryophytes and other lichens, 67.345494°N, 16.466695°E, elev. 645 m, 2020-08-03, M. Westberg PAD266 (UPS L-1010008, filed under *Thamnolia vermicularis*).

****Pronectria robergei* (Mont. & Desm.) Lowen**

New to Lule lappmark. Previously reported from Västergötland, Uppland, Dalarna, Härjedalen, Jämtland, Lycksele lappmark and Torne lappmark.

Specimen examined: Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, 4.9 km SE of Ståloluokta, northernmost slope of Mount Giergevárre (Kierkevarre), wet vertical calcareous rockface exposed to N in bare mountain region, on *Peltigera* sp., 67.28347°N, 16.75811°E, elev. 1241 m, 2021-07-29, M. Grube 21-3870 (GZU).

***Protomicarea alpestris* (Sommerf.) McCune**

Syn. *Lecidea alpestris* Sommerf.

New to Lule lappmark. Previously reported from Småland, Västergötland, Värmland, Dalarna, Härjedalen, Jämtland and Lycksele lappmark.

Specimens examined. Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, along the trail between Duottar (Tuottar) and Darreluoppal (Tarraluoppal) mountain lodges, 1.9 km SE of Duottar, 120 m SW of the trail, at lake Unna Duottarjávrre, meadow-like vegetation on calcareous bedrock in bare mountain region, on the ground, 67.25333°N, 17.04675°E, elev. 905 m, 2021-08-01, G. Thor 43010 (UPS); *ibid.*, 11 km WNW of Ståloluokta, N of the river Duvgejåhká (Tukijåkká, Tokijokk), E slope of Mount Unna Duvge (Unna Toki, Unna Tuki), 660 m ESE of small cabin, bare mountain region just above the river, under overhang, 67.34383°N, 16.46236°E, elev. 642 m, 2020-08-03, G. Thor 41346 (UPS); *ibid.*, 11 km WNW of Ståloluokta, N of the river Duvgejåhká (Tukijåkká, Tokijokk), E slope of Mount Unna Duvge (Unna Toki, Unna Tuki), 1060 m NE of small cabin, heath with scattered stones and small boulders in bare mountain region, on bryophytes on calcareous stone, 67.35244°N, 16.46191°E, elev. 762 m, 2020-08-04, G. Thor 41509 (UPS).

***Protothelenella petri* H.Mayrhofer & Poelt**

New to Lule lappmark. Previously only reported once from Torne lappmark.

Specimen examined: Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, 11 km WNW of Ståloluokta, N of the river Duvgejåhká (Tukijåkká, Tokijokk), S slope of Mount Unna Duvge (Unna Toki, Unna Tuki), bare mountain region, 580 m ESE of small cabin, just above the river, on soil/bryophytes on the ground, 67.344004°N, 16.46063°E, elev. 672 m, 2020-08-03, M. Westberg PAD672 (UPS L-1009620).

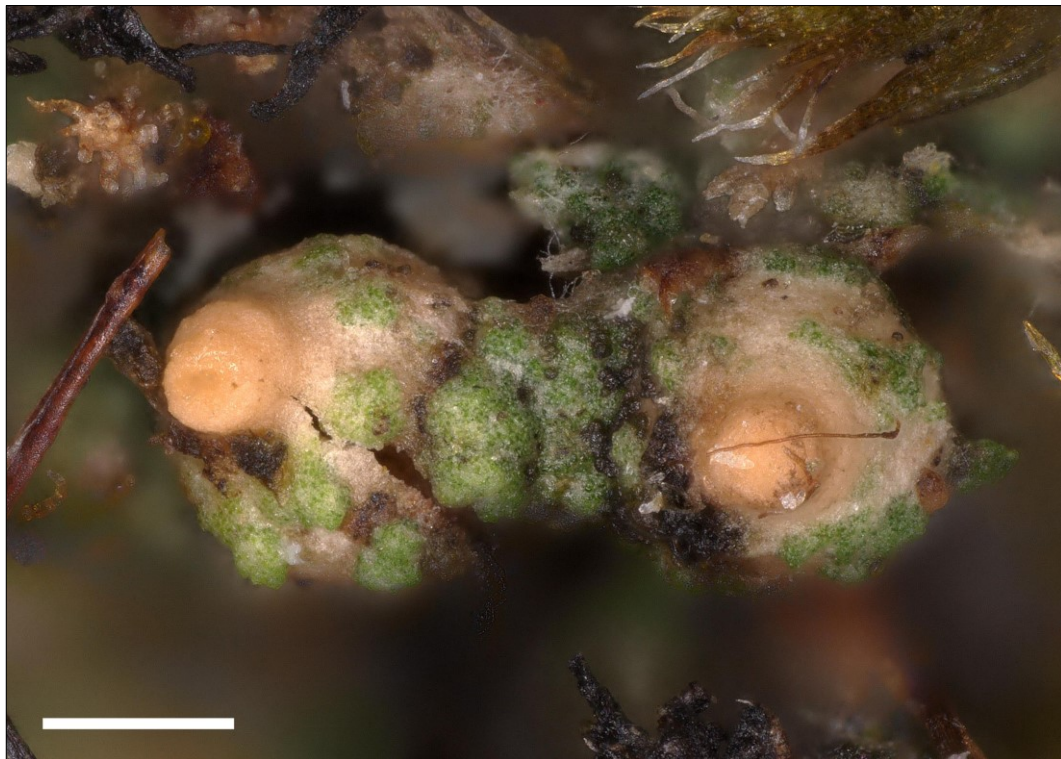


Figure 13. *Psoroglaena biatorella*. M. Grube 21-344 (GZU). Scale bar: 250 μ m. Photo M. Grube.

***Psoroglaena biatorella* (Arnold) Lücking**

Fig. 13

New to Lule lappmark. Previously reported once from Åsele lappmark. Characteristic for the species are the greenish ground-dwelling thallus, large, pale perithecia 0.5–0.8 mm in diameter, and large ascospores measuring $25\text{--}45 \times 10\text{--}14 \mu\text{m}$.

Specimen examined: **Sweden.** *Lule lappmark:* Jokkmokk par., Padjelanta National Park, 4.9 km SE of Ståloluokta, northernmost slope of Mount Gierggevårre (Kierkevare), wet vertical calcareous rockface exposed to N in bare mountain region, on the ground, 67.28366°N, 16.75672°E, elev. 1244 m, 2021-07-29, M. Grube 21-344 (GZU).

+*Pyrenula coryli* A.Massal.

New to Lule lappmark. Previously reported from Skåne to Södermanland and from Jämtland. Red-listed as Critically Endangered (CR). The species was collected only a few hundred metres away from *Pectenium plumbeum*, and was affected by mist from splashing water from the rapid as well. Even though the locality is far north of the other known localities in Sweden, this occurrence is maybe not surprising as *P. coryli* is reported from Nordland in Norway (Westberg et al. 2021). Earlier reported from forests, this is the first finding in a bare mountain region. It was growing together with *Naetrocymbe rhyponota* (G. Thor 41378a, UPS).

Specimen examined: Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, 11 km WNW of Ståloluokta, N of the river Duvggejåhkå (Tukijåkkå, Tokijokk), E slope of Mount Unna Duvgge (Unna Toki, Unna Tuki), 690 m ESE of small cabin, bare mountain region, just above the river, with mist from splashing water from the rapid, on *Sorbus aucuparia*, 67.34385°N, 16.46313°E, elev. 678 m, 2020-08-03, G. Thor 41378b (UPS).

****Rhizocarpon* sp. 42835**

Lichenicolous on *Ochrolechia upsaliensis* on the ground. Similar to *R. ochrolechia* (Poelt & Nimis) Hafellner (not reported from Fennoscandia), but that species grows on *O. parella* at seashores and morphological differences are observed. A second collection of the same species from Norway was found in herbarium UPS (see below).

Specimen examined: Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, 1.5 km SSE of Ståloluokta, along the trail between Ståloluokta and Stáddájåhkå (Staddajåkk) mountain lodges, 15 m W of the trail, on small hill with meadow-like vegetation on ultramafic bedrock in bare mountain region, on *Ochrolechia upsaliensis*, 67.30705°N, 16.70136°E, elev. 664 m, 2021-07-30, G. Thor 42835 (UPS). **Norway.** Sør-Trøndelag: Oppdal, Dovre, Kongsvold, on *Ochrolechia upsaliensis*, 1863-08-07, Th.M. Fries (UPS).

***Rinodina bischoffii* (Hepp) A.Massal.**

New to Lule lappmark. Previously reported from Skåne to Gästrikland, Jämtland, Lycksele lappmark and Torne lappmark.

Specimen examined: Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, 11 km WNW of Ståloluokta, N of the river Duvggejåhkå (Tukijåkkå, Tokijokk), E slope of Mount Unna Duvgge (Unna Toki, Unna Tuki), bare mountain region, 1.05 km NE of small cabin, on schistose, calcareous rock, 67.352168°N, 16.46305°E, elev. 742 m, 2020-08-04, M. Westberg PAD357 (UPS L-1009653).

***Rinodina endophragma* I.M.Lamb**

New to Lule lappmark. Red-listed as Critically Endangered (CR). Previously only reported from Jämtland.

Specimen examined: Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, 11 km WNW of Ståloluokta, N of the river Duvggejåhkå (Tukijåkkå, Tokijokk), S slope of Mount Unna Duvgge (Unna Toki, Unna Tuki), bare mountain region, 660 m ESE of small cabin, just above the river, on calcareous, schistose rock by the river, 67.343646°N, 16.462248°E, elev. 667 m, 2020-08-03, M. Westberg PAD206 (UPS L-1009719).

***Rinodina roscida* (Sommerf.) Arnold**

New to Lule lappmark. Previously reported from Värmland, Dalarna, Härjedalen, Jämtland, Lycksele lappmark and Torne lappmark.

Specimens examined: Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, 4.8 km SE of Ståloluokta, northernmost slope of Mount Gierggevårre (Kierkevare), boulder exposed to N in bare mountain region, 67.28311°N, 16.75472°E, elev. 1265 m, 2021-07-29, M. Grube 21-303 (GZU); *ibid.*, 11 km WNW of Ståloluokta, N of the river Duvggejåhkå (Tukijåkkå, Tokijokk) below its exit from Lake Gásakluoppal, 815 m SSW of small cabin, on bryophytes on schistose boulder, 67.33801°N, 16.44054°E, elev. 738 m, 2020-08-01, M. Westberg PAD112 (UPS L-1009656); *ibid.*, S slope of Unna Duvgge 285 m SSE of the peak, on plants debris on limestone rocks, 67.35378°N, 16.45232°E, elev. c. 860 m, 2020-08-02, U. Arup L20254 (LD); *ibid.*, SE slope of Mount Unna Duvgge (Unna Toki, Unna Tuki), bare mountain region, 870 m NE of small cabin, on

bryophytes/plant debris on the ground, 67.35117°N, 16.459543°E, elev. 742 m, 2020-08-04, M. Westberg PAD299 (UPS L-1009655).

***Sarcogyne cyclocarpa* (Anzi) J.Steiner**

Fig. 14

New to Sweden. In Fennoscandia earlier known from Buskerud and Hedmark in Norway (Westberg et al. 2021). *S. cyclocarpa* is an infrequent but overlooked species on calcareous schistose rocks in the mountain regions of Fennoscandia. It is rather easily recognized by the strongly gyrose and often angular, sometimes almost stellate apothecia. It is further characterized by lacking a visible thallus, a low hymenium c. 60–100 µm tall, ellipsoid ascospores $3\text{--}5 \times 1.5\text{--}2$ µm large, and by being confined to calcareous rocks. In appearance, it is most similar to *Acarospora privigna* (syn. *Polysporina simplex*, see Knudsen et al. 2021) although the two species are not closely related. *Acarospora privigna* grows on siliceous rocks and has bacilliform to narrowly ellipsoid ascospores $3\text{--}5 \times 1\text{--}1.5$ µm large, and apothecia that are not distinctly gyrose but rather have rounded carbonized epithelial accretions, forming irregular apothecia with ridges, furrows and umbos (e.g. photographs in Westberg et al. 2015a). Here we also report *S. cyclocarpa* from a few further localities from Härjedalen, Lycksele lappmark and Torne lappmark in Sweden and from Oppland and Sør-Trøndelag in Norway.

Specimens examined: **Norway.** *Oppland:* Lom, Runningsgrende, Kleive, on calcareous, almost vertical rock surface, 61.71583°N, 8.23417°E, elev. 720–850 m, 2013-06-28, M. Westberg (S F313593); *Sør-Trøndelag:* Oppdal, Kongsvoll, east side of road E6, by the visitor center, on calcareous schist, 2008-06-14, elev. 944 m, M. Westberg 08-265 (S F123674). **Sweden.** *Härjedalen:* Tännäs par., Hamrafjället, close to the top, NW of p. 1138,7, on a boulder on a NW slope in the alpine region, 62.5661°N, 12.2734°E, elev. 1050 m, 1968-08-10, R. Moberg 1022b (UPS L-018669); *Lycksele lappmark:* Tärna par., Ume älv, Över-Umans sydvästligaste vik, "1:a Sedum-ön", strandhällar nära "Båtviken", övre övergeolitoral, 66.108°N, 14.542°E, elev. 530 m, 1960-08-18, G. Einar Du Rietz 924e (UPS L-115651); *Lule lappmark:* Jokkmokk par., Padjelanta National Park, 11 km WNW of Ståloluokta, W of Lake Virihavvre, south slope of Unna Duvgge (Unna Toki), c. 590 m NE of small cabin, on calcareous, schistose rock, 67.349099°N, 16.455751°E, elev. 721 m, 2020-08-05, M. Westberg PAD388 (UPS L-1009607); *ibid.*, 11 km WNW of Ståloluokta, N of the river Duvggejähkå (Tukijähkå, Tokijokk), E slope of Mount Unna Duvgge (Unna Toki, Unna Tuki), bare mountain region, 1.05 km NE of small cabin, on calcareous boulder, 67.352769°N, 16.461286°E, elev. 749 m, 2020-08-05, M. Westberg PAD329 (UPS L-1009607); *Torne lappmark:* Jukkasjärvi par., Abisko district, on calcareous slate, elev. 700 m, 1919-07-16, A.H. Magnusson 3293 (UPS L-516002); Karesuando par., Pältsan (Bealccan), c. 2 km NNE of the middle peak (1444 m), S side of Njearrejohka, on schistose rock, 69.022580°N, 20.254480°E, elev. c. 700 m, 2011-08-07, M. Westberg P117 (S F313403).

***Sarcogyne urceolata* H.Magn.**

Fig. 15

New to Sweden. In Fennoscandia, *S. urceolata* has been reported from northernmost Norway and Jämtland in Sweden. However, the Swedish sample investigated by MW (specimen in S, F103714), originally identified as *Biatorella simplex* var. *herpes*, is a misidentified *S. lapponica*. Here we report specimens not only from Padjelanta but also from Torne lappmark in Sweden, and from Hedmark and Sør-Trøndelag in Norway. The material we here recognize as *S. urceolata* is a small, lichenicolous species that is easily overlooked. All finds are made on calcareous rocks and identified hosts include *Protoblastenia* cf. *rupestris* and *Candelariella aurella*. Sometimes, however, it is difficult to assess whether the species is lichenicolous or not. Its habitus is distinct with small, 0.15–0.3(–0.5) mm wide, sessile apothecia, often on cushions derived from the host. The apothecia at first have a slit-like disc that is later expanding and often become umbonate when older. The margin is

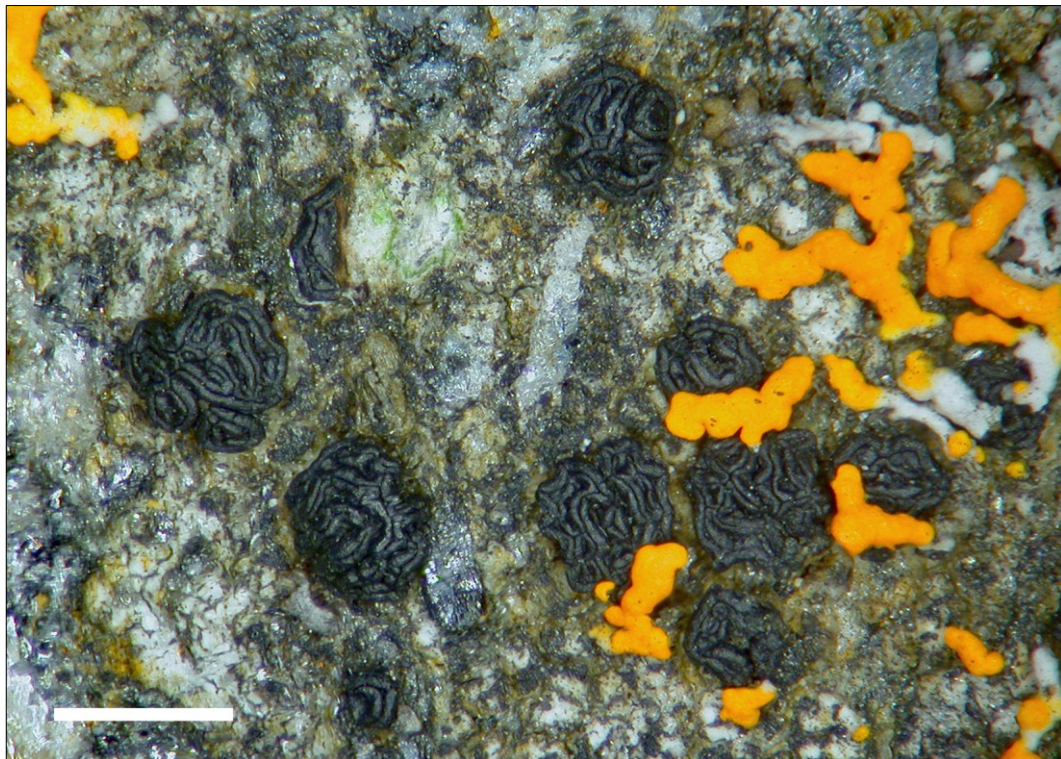


Figure 14. *Sarcogyne cyclocarpa*. Distinctly gyrose apothecia on calcareous rock. R. Haugan H3360 (O L116594). Scale bar: 1 mm. Photo M. Westberg.

deeply dissected into three to five sections. The low hymenium, 60–80 μm tall, and ellipsoid to broadly ellipsoid ascospores, $3.5\text{--}5 \times 2\text{--}2.5 \mu\text{m}$, are important characteristics of the species. It should be noted that *S. urceolata* is not considered to be a lichenicolous species (Kantvilas 1998, Nimis 2022) and the name *S. urceolata* is used provisionally here. From our studies of syntypes of *S. urceolata* in S and UPS (Anzi, Lich. rar. Langob. Exs. No. 185), we find the Fennoscandian material to be anatomically very similar.

The differences towards the likewise lichenicolous and calciphilous *S. pusilla* Anzi are also not entirely clear. From our observations of syntypes of that species in S and UPS (Anzi, Lich. rar. Langob. Exs. No. 190), the apothecia of *S. pusilla* have a different appearance with a thin margin that is often pale on the outer side (but see also Knudsen & Kocourková 2008). They are usually immersed in the substrate and *S. pusilla* is regarded as a parasite on *Protoblastenia incrustans* developing on the apothecia of that species (Kantvilas 1998, Nimis 2022). The shape and size of the ascospores as well as the hymenium height are similar to *S. urceolata*. *S. lapponica* (see Knudsen & Kocourková 2008) has a tall hymenium (120–150 μm in Fennoscandian samples) and narrowly ellipsoid ascospores and should not be easily confused with this species.

Three of the specimens here reported as *S. urceolata* (F313442, F313404, F123679, all in S) have been included in phylogenetic analyses of the Acarosporaceae (Westberg et al. 2015a, Knudsen



Figure 15. *Sarcogyne urceolata*. Apothecia growing on *Candelariella aurella*. M. Westberg 08-260 (S F123679). Scale bar: 1 mm. Photo M. Westberg.

et al. 2020) as *Acarospora subfuscescens* (syn. *Polysporina subfuscescens*). Together with *S. cyclocarpa* and *S. albothallina* K.Knudsen et al., *S. urceolata* formed a small clade within the large *Sarcogyne* clade in those studies. *S. pusilla* and *S. sinensis* H.Magn., the latter described from high altitude in China (Magnusson 1940), are likely to be close relatives to *S. urceolata* and the group is in need of further studies.

Specimens examined: **Norway.** *Hedmark:* Folldal, Einunndalen, Settdalen, along the road between Borkhussætra and the brook Sâtålibekken, on S-facing, calciferous rock in the low alpine zone, 62.4°N, 10.03°E, elev. 1000 m, 1993-08-07, R. Haugan H3360 (O L-116594); *Sør-Trøndelag:* Oppdal, Kongsvoll, east side of road E6, by the visitor center, on calcareous schist, 2008-06-14, elev. 944 m, M. Westberg 08-260 (S F123679); Røros, Mt Feragsfjället, old chromium mine, on serpentine, 62.56633°N, 11.8182°E, elev. 730 m, 2012-06-15, M. Westberg 12-018 (S F313442). **Sweden.** *Lule lappmark:* Jokkmokk par., Padjelanta National Park, 11 km WNW of Ståloluokta, N of the river Duvggejåhkå (Tukijåkkå, Tokijokk), SE slope of Mount Unna Duvgge (Unna Toki, Unna Tuki), bare mountain region, 700 m NE of small cabin, on vertical, calcareous rock, 67.350207°N, 16.456197°E, elev. 758 m, 2020-08-04, M. Westberg PAD289 (UPS L-1009714); *Torne lappmark:* Jukkasjärvi par., NW side of Njullå, E side of the valley Gohpasvåggi, on calcareous boulder, 68.38524°N, 18.66563°E, elev. 706 m, 2011-08-09, M. Westberg (S F313404); *ibid.*, in the valley Gearggevåggi (Kärkevagge) between Vässecohkka (Vassitjåkkö) and Gearggecorru (Kärketjårro), c. 2 km SE of Vassijaure, on a large schistose calcareous boulder, 68.41133°N, 18.28568°E, elev. 643 m, 2013-08-05, M. Westberg (UPS L-925865).

****Sclerococcum protothallinum* (Anzi) Ertz & Diederich**

New to Lule lappmark. Previously reported from Härjedalen, Lycksele lappmark and Torne lappmark.

Specimen examined. Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, 11 km WNW of Ståloluokta, N of the river Duvggejåhkå (Tukijåkkå, Tokijokk), E slope of Mount Stuurra Duvgge (Stuor Tokivare, Stuurra Tuki), 900 m SW of small cabin, at the outlet of Lake Gásakluoppal, heath in bare mountain region, on *Fuscopannaria praetermissa* on vertical shaded 1.5 m high rock, 67.33749°N, 16.43954°E, elev. 753 m, 2020-08-01, G. Thor 41172 (UPS).

****Sphaeropezia melaneliae* (Diederich & Zhurb.) Baloch et al.**

Syn. *Odontotrema melaneliae* Diederich & Zhurb.

New to Lule lappmark. Previously reported from Härjedalen and Torne lappmark, but still not from Finland or Norway.

Specimens examined. Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, 11 km WNW of Ståloluokta, N of the river Duvggejåhkå (Tukijåkkå, Tokijokk), S slope of Mount Unna Duvgge (Unna Toki, Unna Tuki), bare mountain region, 660 m ESE of small cabin, just above the river, on *Melanohalea olivacea* on dry birch twig, 67.343646°N, 16.462248°E, elev. 667 m, 2020-08-03, M. Westberg PAD214 (UPS L-1009731); *ibid.*, 11 km WNW of Ståloluokta, N of the river Duvggejåhkå (Tukijåkkå, Tokijokk), E slope of Mount Unna Duvgge (Unna Toki, Unna Tuki), 660 m ESE of small cabin, just above the river in bare mountain region, on *Melanohalea olivacea* on *Sorbus aucuparia*, 67.34383°N, 16.46236°E, elev. 642 m, 2020-08-03, G. Thor 41351 (UPS).

****Sphaeropezia thamnoliae* (Zhurb. et al.) Baloch & Wedin**

New to Lule lappmark. Previously only reported from Torne lappmark (Låktatjåkka, 1947, R. Santesson).

Specimen examined: Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, 4.8 km SE of Ståloluokta, northernmost slope of Mount Gierggevårre (Kierkevare), boulder exposed to N in bare mountain region, on *Thamnolia vermicularis*, 67.28311°N, 16.75472°E, elev. 1265 m, 2021-07-29, M. Grube 21-332 (GZU).

***Steinia geophana* (Nyl.) Stein**

New to Lule lappmark. Previously reported from Skåne to Jämtland and from Torne lappmark.

Specimen examined: Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, c. 600 m E-SE of the peak of Unna Duvgge, 205 m E of small cabin, on dead and dying *Sphagnum* in a small peat marsh affected by melting snow in open alpine heath, 67.35325°N, 16.46371°E, elev. c. 800 m, 2020-08-05, R. Vicente (UPS L-988912).

****Stigmidium cerinae* Cl.Roux & Triebel**

New to Lule lappmark. In Fennoscandia previously reported once from Jämtland, Sweden (Skurdalsporten, 1914, A.H. Magnusson).

Specimen examined: Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, bare mountain of Unna Dijdder, above Ståloluokta, on *Caloplaca stillicidiorum* on bryophytes, 67.326961°N, 16.713746°E, elev. c. 800 m, 2004-08-01, M. Westberg 3137 (LD).

****Stigmidium conspurcans* (Th.Fr.) Triebel & R.Sant.**

New to Lule lappmark. Previously reported from Härjedalen, Jämtland and Torne lappmark.

Specimens examined. Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, along the trail between Stáloruokta and Duottar (Tuottar) mountain lodges, 9.6 km SE of Stáloruokta, 5 m N of the trail, almost flat and slightly calcareous rock at ground level in heath in bare mountain ground, on *Psora rubiformis* on the ground, 67.28365°N, 16.89683°E, elev. 821 m, 2021-07-31, G. Thor 42719 (UPS); *ibid.*, 11 km WNW of Stáloruokta, N of the river Duvggejáhká (Tukijákká, Tokijokk), E slope of Mount Stuorra Duvgge (Stuor Tokivare, Stuorra Tuki), bare mountain region, 600 m SW of small cabin, 67.340334°N, 16.439762°E, elev. 741 m, 2020-08-01, M. Westberg (UPS L-1009638, filed under *Psora rubiformis*); *ibid.*, 11 km WNW of Stáloruokta, N of the river Duvggejáhká (Tukijákká, Tokijokk), E slope of Mount Unna Duvgge (Unna Toki, Unna Tuki), 1080 m NE of small cabin, heath on exposed hill in bare mountain region, on *Psora rubiformis* on the ground, 67.35267°N, 16.46198°E, elev. 772 m, 2020-08-04, G. Thor 41500 (UPS) & U. Arup L20439 (LD).

****Stigmidium frigidum* (Sacc.) Alstrup & D.Hawksw.**

New to Lule lappmark. Previously reported from Öland, Härjedalen and Jämtland.

Specimen examined. Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, 11 km WNW of Stáloruokta, N of the river Duvggejáhká (Tukijákká, Tokijokk), E slope of Mount Unna Duvgge (Unna Toki, Unna Tuki), 1080 m NE of small cabin, heath on exposed hill in bare mountain region, on *Thamnolia vermicularis* on the ground, 67.35267°N, 16.46198°E, elev. 772 m, 2020-08-04, G. Thor 41506 (UPS).

****Stigmidium psorae* (Anzi) Hafellner**

New to Lule lappmark. In Fennoscandia previously reported from Jämtland in Sweden and Finnmark in Norway.

Specimen examined: Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, 11 km WNW of Stáloruokta, SW slope of Unna Duvgge 365 m S of the peak, on *Psora decipiens* on soil in *Dryas* heath, 67.35299°N, 16.45170°E, elev. c. 830 m, 2020-08-02, U. Arup L20243 (LD).

****Stigmidium solorinarium* (Vain.) D.Hawksw.**

New to Lule lappmark. Previously reported from Värmland, Härjedalen, Åsele lappmark, Lycksele lappmark and Torne lappmark.

Specimens examined: Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, 4.9 km SE of Stáloruokta, northernmost slope of Mount Gierggevárre (Kierkevare), N of the steep slope, calcareous boulder in ±flat solifluction soil in bare mountain region, on *Solorina saccata*, 67.28508°N, 16.76106°E, elev. 1190 m, 2021-07-29, M. Grube 21-353 (GZU); *ibid.*, along the trail between Stáloruokta and Duottar (Tuottar) mountain lodges, 6.1 km SE Stáloruokta, 120 m W of the trail and 150 m W of the river Bállávrjáhká (Pállaurjákká), small stream on siliceous bedrock surrounded by *Salix* spp. in bare mountain region, on *Solorina saccata*, 67.29539°N, 16.82443°E, elev. 682 m, 2021-07-30, M. Grube 21-364 (GZU).

***Tetramelas papillatus* (Sommerf.) Kalb**

New to Lule lappmark. Previously reported from Lycksele lappmark and Torne lappmark.

Specimens examined. Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, 4.8 km SE of Stáloruokta, northernmost slope of Mount Gierggevárre (Kierkevare), boulder exposed to N in bare mountain region, on remnants of mosses, 67.28311°N, 16.75472°E, elev. 1265 m, 2021-07-29, M. Grube 21-338 (GZU); *ibid.*, 11 km WNW of Stáloruokta, N of the river Duvggejáhká (Tukijákká, Tokijokk), S slope of Mount Unna

Duvgge (Unna Toki, Unna Tuki), bare mountain region, 660 m ESE of small cabin, just above the river, on schistose, calcareous rock by the river, 67.343646°N, 16.462248°E, elev. 667 m, 2020-08-03, M. Westberg PAD212 (UPS L-1009807); *ibid.*, 11 km WNW of Stáloruokta, N of the river Duvggejåhkå (Tukijåkkå, Tokijokk), E slope of Mount Unna Duvgge (Unna Toki, Unna Tuki), 810 m E of small cabin, at mire in bare mountain region, on 0.5 m high boulder, 67.34566°N, 16.46589°E, elev. 653 m, 2020-08-03, G. Thor 41412 (UPS); *ibid.*, 11 km WNW of Stáloruokta, N of the river Duvggejåhkå (Tukijåkkå, Tokijokk), E slope of Mount Unna Duvgge (Unna Toki, Unna Tuki), bare mountain region, 1.05 km NE of small cabin, 67.352361°N, 16.461623°E, elev. 737 m, 2020-08-04, M. Westberg PAD332 (UPS L-1009614) & U. Arup L20447 (LD); *ibid.*, 11 km WNW of Stáloruokta, N of the river Duvggejåhkå (Tukijåkkå, Tokijokk), the summit of Mount Unna Duvgge (Unna Toki, Unna Tuki), bare mountain region, 1300 m NNE of small cabin, on bryophytes on rock, 67.356208°N, 16.450643°E, elev. 880 m, 2020-08-02, M. Westberg PAD159 (UPS L-1009613).

***Thalloidima opuntoides* (Vill.) Kistenich et al.**

New to Lule lappmark. Previously reported from Jämtland and Pite lappmark.

Specimen examined: Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, 11 km WNW of Stáloruokta, W of Lake Virihávrr, south slope of Unna Duvgge (Unna Toki), c. 590 m NE of small cabin, on soil, 67.349099°N, 16.455751°E, elev. 721 m, 2020-08-05, M. Westberg PAD393 (UPS L-1009615, HPTLC: *opuntoides* unknown).

****Thamnogalla crombiei* (Mudd) D.Hawksw.**

New to Lule lappmark. Previously reported from Öland, Gotland, Härjedalen, Jämtland, Lycksele lappmark, Pite lappmark and Torne lappmark.

Specimens examined. Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, 4.9 km SE of Stáloruokta, northernmost slope of Mount Gierggevårre (Kierkevare), bare mountain region, on *Thamnolia vermicularis* on calcareous boulder (1.5 m high), 67.28297°N, 16.75491°E, elev. 1254 m, 2021-07-29, G. Thor 42744 (UPS); *ibid.*, 11 km WNW of Stáloruokta, N of the river Duvggejåhkå (Tukijåkkå, Tokijokk), E slope of Mount Unna Duvgge (Unna Toki, Unna Tuki), 670 m ESE of small cabin, bare mountain region, just above the river which give mist from splashing water from the rapid, on *Thamnolia vermicularis* on the ground, 67.34386°N, 16.46239°E, elev. 677 m, 2020-08-03, G. Thor 41361 (UPS).

***Thelenella pertusariella* (Nyl.) Vain.**

New to Lule lappmark. Previously reported from Östergötland, Södermanland, Västmanland, Uppland, Dalarna, Hälsingland, Härjedalen, Jämtland, Åsele lappmark, Lycksele lappmark and Torne lappmark.

Specimens examined: Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, Stáloruokta at the shore of Lake Virihávrr (Virihauve), S slope of Mount Unna Diidder (Unna Titer), bare mountain region at the tree-line, on *Sorbus aucuparia*, 67°19.277'N, 16°42.751'E, elev. 750 m, 2004-08-01, G. Thor 18938b (UPS); *ibid.*, 10 km NNW of Stáloruokta, N shore of Lake Virihávrr (Virihauve), S slope of Mount Allak, mountain region near the tree-line with scattered *Betula* and *Salix* spp., along the steep shore 0–300 m E of small bay, bedrock calcareous micaceous slate, on *Salix* sp., 67°24.545'N, 16°38.937'E, elev. 580 m, 2004-07-31, G. Thor 18877a (UPS); *ibid.*, 10 km NNW of Stáloruokta, N shore of Lake Virihávrr (Virihauve), S slope of Mount Allak, mountain region near the tree-line with scattered *Betula* and *Salix* spp., at stream surrounded by steep slopes, rocks of calcareous micaceous slate, on *Salix* sp., 67°24.632'N, 16°38.836'E, elev. 590 m, 2004-07-30, G. Thor 18824 (UPS).

***Thelocarpon superellum* Nyl.**

New to Lule lappmark. Previously reported from Västergötland to Värmland. The finding in Padjelanta indicates a wider distribution in Sweden.

Specimen examined: Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, 11 km WNW of Stáloruokta, N of the river Duvggejåhkå (Tukijåkkå, Tokijokk), S slope of Mount Unna Duvge (Unna Toki, Unna Tuki), bare mountain region, 830 m NNE of small cabin, alpine meadow, on soil, 67.352332°N, 16.451243°E, elev. 780 m, 2020-08-01, M. Westberg PAD120 (UPS L-1009759).

***Toniniopsis verrucarioides* (Nyl.) Kistenich et al.**

New to Lule lappmark. Previously reported from Öland, Gotland, Västergötland, Södermanland and Jämtland.

Specimen examined: Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, 11 km WNW Stáloruokta, W of Lake Virihavre, south slope of Unna Duvge (Unna Toki), c. 590 m NE of small cabin, on calcareous, schistose rock, 67.349099°N, 16.45575°E, elev. 721 m, 2020-08-05, M. Westberg PAD387 (UPS L-1010005).

****Tremella nephromatis* Diederich**

New to Sweden. The species was described by Diederich (1996) from British Columbia, Canada, and was later reported from Europe (northern Ural, Russia, Zhurbenko 2004).

Specimen examined: Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, along the trail between Stáloruokta and Duottar (Tuottar) mountain lodges, 13.4 km SE of Stáloruokta, 40 m NE of the trail, exposed partly calcareous hill in bare mountain region, on *Nephroma* sp., 67.27388°N, 16.98191°E, elev. 837 m, 2021-07-31, M. Grube 21-314 & 21-316 (GZU).

***Verrucaria othmarbreussii* Pykälä & Myllys**

Fig. 16

New to Sweden. This species was recently described by Pykälä et al. (2017a) from Finland, where the main distribution is in southern and eastern Finland with one locality in the northeastern Koillismaa. The Finnish records are all, like the one in Padjelanta, on calcareous rocks. The thallus in our specimen is thin, dark brown and cracked areolate, or rimose and greyish brown (Jämtland), but the usual appearance in Finland is without cracks. The perithecia in our specimen are often immersed 50–75 % in the thallus and up to 0.3 mm in diameter, whereas the Finnish material is stated to have 0.12–0.23 mm wide perithecia (Pykälä et al. 2017a). The ascospores are 15–21 µm long, which is slightly longer than in the original description (Pykälä et al. 2017a). Despite these smaller differences, there should be no doubt about the identity of the material as the two ITS sequences obtained from Padjelanta collections group well within a clade of five other sequences of the species including type material. *V. othmarbreussii* is closely related to *V. tenebrica*, a very similar species that differs in the normally thicker, areolate thallus and slightly thicker involucrellum, 40–60(–70) µm versus 40–50(–70) µm (Pykälä et al. 2017b).



Figure 16. *Verrucaria othmarbreussii*. Thallus thin brown and perithecia up to 0.3 mm in diameter, often immersed 50–75 % in the thallus. U. Arup L20274 (LD). Scale bar: 1 mm. Photo U. Arup.

Specimens examined: **Sweden.** *Jämtland:* Undersåker par., Ristafallet, below the upper fall, on calcareous rock under overhang, 63.31288°N, 13.35044°E, elev. 395 m, 2020-08-09, U. Arup L20603 (LD, identity confirmed by molecular data (ITS, Genbank acc.nr. ON380914)). *Lule lappmark:* Jokkmokk par., Padjelanta National Park, 11 km WNW of Ståloluokta, S slope of Unna Duvgge 285 m SSE of the peak, on sloping calciferous rock, 67.35277°N, 16.45233°E, elev. c. 860 m, 2020-08-02, U. Arup L20274 (LD, identity confirmed by molecular data (ITS, Genbank acc.nr. ON380915)).

Verrucaria oulankaensis Pykälä & Myllys

Fig. 17

New to Sweden. This species was recently described by Pylälä & Myllys (2017b) from Koillismaa in Finland where it is known from a few localities. The thallus in this species is areolate, pale to dark brown and normally pruinose, but our material lacks pruina and is continuous and cracked areolate. The size and appearance of the perithecia and ascospores fit fairly well with the description, even if the perithecia are slightly wider, up to 0.3 mm in diameter, and the width of the ascospores slightly extends the range to 11.0 μm from 9.1–(10.3) μm . The perithecia are halfway immersed in the thallus, but may be almost completely immersed with just the ostiole visible. Our material resembles a small version of *V. nigrescens*, but the habitat is rocks close to water, probably periodically inundated.

Specimen examined: **Sweden.** *Lule lappmark:* Jokkmokk par., Padjelanta National Park, 11 km WNW of Ståloluokta, N of the river Duvggejähkä, 1.55 km ESE of the peak of Unna Duvgge, on calciferous slate



Figure 17. *Verrucaria oulankaensis*. The brown thallus of this species is normally pruinose, but in this case pruina is lacking. The perithecia are up to 0.3 mm in diameter and halfway immersed in the thallus, but may be almost completely immersed with just the ostiole visible. U. Arup L20367 (LD). Scale bar: 1 mm. Photo U. Arup.

boulders near the rapids, possibly periodically inundated, 67.34351°N, 16.46964°E, elev. c. 650 m, 2020-08-03, U. Arup L20367 (LD, identity confirmed by molecular data (ITS, Genbank acc.nr. ON380916)).

***Xylographa pallens* (Nyl.) Harm.**

New to Lule lappmark. Previously reported from Dalarna and Härjedalen in Sweden, and rarely from Finland and Norway. The species is almost certainly more widespread and common in Fennoscandia.

Specimen examined: Sweden. Lule lappmark: Padjelanta National Park, 11 km WNW of Stáلولuokta, N of the river Duvggejáhká (Tukijákká, Tokijokk), between Mount Stuurra Duvgge (Stuur Tokivare, Stuurra Tuki) and Mount Unna Duvgge (Unna Toki, Unna Tuki), at small cabin in alpine heath, on construction wood, 67.34489°N, 16.44729°E, elev. 651 m, 2020-07-31, G. Thor 40994 (UPS; HPTLC: stictic acid (major) and norstictic acid (minor)).

***Xylographa vitiligo* (Ach.) J.R.Laundon**

New to Lule lappmark. Previously reported from Skåne to Pite lappmark and from Torne lappmark.

Specimen examined: Sweden. Lule lappmark: Jokkmokk par., Padjelanta National Park, along the trail between Darreluoppal (Tarraluoppal) and Sámmarlappastugan mountain lodges, 8.7 km SSE of Darreluoppal, 5 m E of

the trail, open deciduous forest edge dominated by *Betula pubescens*, on old construction wood, 67.11558°N, 17.16168°E, elev. 650 m, 2021-08-02, G. Thor 43129 (UPS, HPTLC: stictic acid).

***Zahlbrucknerella calcarea* (Herre) Zahlbr.**

New to Lule lappmark. Previously only reported from Torne lappmark.

Specimen examined: **Sweden.** *Lule lappmark:* Jokkmokk par., Padjelanta National Park, 5.2 km SE of Stáloluokta, northernmost top plateau of Mount Gierggevárre (Kierkevarre), exposed flat heath on mainly siliceous bedrock in bare mountain area, under small overhang on schistose rock, 67.28175°N, 16.76068°E, elev. 1343 m, 2021-07-29, G. Thor 42774 (UPS).

Acknowledgements: The excursion in 2020 was funded by the foundation "Göran Gustafsson stiftelse" and SLU Swedish Species Information Centre. Permission to fly with helicopter within the area and collecting permits was given by the County administration board of Norrbotten and the Sámi administrative association Tuorpon sameby and for which we are most grateful. The phylogenetic analyses of *Arthonia protoparmeliae* and field work by AF were supported by the Norwegian Biodiversity Information Centre through the project 'Mapping Uncharted Diversity (MUD): a first comprehensive survey of lichenicolous fungi in Norway' (no. 70184243).

References

- Ahti, T., Stenroos, S. & Moberg, R. 2013. *Cladoniaceae*. Nordic Lichen Flora vol. 5. Uppsala University, Uppsala.
- Alstrup, V. & Hansen, E. S. 2001. New lichens and lichenicolous fungi from Greenland. *Graphis Scripta* **12**: 41–50.
- Arup, U., Ekman, S., Lindblom, L. & Mattsson, J.-E. 1993. High performance thin layer chromatography (HPTLC), an improved technique for screening lichen substances. *Lichenologist* **25**: 61–71. <https://doi.org/10.1006/lich.1993.1018>
- Arup, U., Klepsland, J. T. & Pykälä, J. 2014. Species of *Caloplaca* s.lat. new to Norway, Sweden or Finland. *Graphis Scripta* **26**: 46–48.
- Arup, U., Vondrák, J. & Halici, M. G. 2015. *Parvoplaca nigroblastidiata*, a new corticolous lichen (Teloschistaceae) in Europe, Turkey and Alaska. *Lichenologist* **47**: 379–385.
- Cannon, P., Ertz, D., Frisch, A., Aptroot, A., Chambers, S., Coppins, B. J., Sanderson, N. A., Simkin, J. & Wolseley, P. 2020. Arthoniales: Arthoniaceae. *Revisions of British and Irish Lichens* **1**: 1–48.
- Degelius, G. 1943. Zur Kenntnis der Flechtenflora um den See Virihaure in Lule Lappmark (Swedish-Lapland). *Botaniska Notiser* **1943**: 75–113.
- Diederich, P. 1996. The Lichenicolous Heterobasidiomycetes. *Bibliotheca Lichenologica* **61**: 1–198.
- Ekman, S., Svensson, M., Westberg, M. & Zamora, J. C. 2019. Additions to the lichen flora of Fennoscandia III. *Graphis Scripta* **31**: 34–46.
- Etayo, J. 2010. Líquenes y hongos liquenícolas de Aragón. *Guineana* **16**: 1–501.
- Frisch, A. & Holien, H. 2018. *Arthonia toensbergii*, a new lichenicolous fungus on *Mycoblastus affinis* from the boreal rainforests in Norway. *Graphis Scripta* **30**: 34–43.
- Frisch, A., Thor, G., Ertz, D. & Grube, M. 2014b. The Arthonialean challenge: Restructuring Arthoniaceae. *Taxon* **63**: 727–744.
- Grube, M. 2005. *Frigidopyrenia*—a new genus for a particular subarctic lichen, with notes on similar taxa. *Phyton (Austria)* **45**: 305–318.
- Hafellner, J. 2009. *Phacothecium* resurrected and the new genus *Phacographa* (Arthoniales) proposed. *Bibliotheca Lichenologica* **100**: 85–121.
- Hafellner, J. 2011. *Halospora* resurrected and segregated from *Merismatium*. *Bibliotheca Lichenologica* **106**: 75–93.

- Hafellner, J. & Grube, M. 2023. *Arthonia epipolytropa* and *Arthonia subclemens*, two new lichenicolous species on *Lecanora polytropa*, with a key to the microfungi known on this common species. *Lichenologist* **55**: 241–251.
- Hitch, C. B. J. 2015. New, rare and interesting lichens. *Bulletin of the British Lichen Society* **117**: 61–72.
- Kantvilas, G. 1998. Notes on *Polysporina* Vězda, with a description of a new species from Tasmania. *Lichenologist* **30**: 551–562.
- Knudsen, K., Adams, J. N., Kocourková, J., Wang, Y., Ortañez, J. & Stajich, J. E. 2020. The monophyletic *Sarcogyne canadensis–wheeleri* clade, a newly recognized group sister to the European *Acarospora glaucocarpa* group. *The Bryologist* **123**: 11–30.
- Knudsen, K. & Kocourková, J. 2008. A study of lichenicolous species of *Polysporina* (Acarosporaceae). *Mycotaxon* **105**: 149–164.
- Knudsen, K., Kocourková, J., Cannon, P., Coppins, B., Fletcher, A. & Simkin, J. 2021. Acarosporales: Acarosporaceae, including the genera *Acarospora*, *Caeruleum*, *Myriospora*, *Pleopsidium*, *Sarcogyne* and *Trimmatothelopsis*. *Revisions of British and Irish Lichens* **12**: 1–25.
- Länsstyrelsernas WebbGIS. <https://ext-geoportal.lansstyrelsen.se/standard/> [accessed 2022]
- Magnusson, A. H. 1940. Lichens from central Asia I. In: Hedin, S: *Reports Scientific Exped. Nort-west. provinces of China (the Sino-Swedish expedition)*. 13, XI. Botany, 1. Aktiebolaget Thule, Stockholm, pp. 1–168.
- Nimis, P. L. 2022. Keys to the lichens of Italy - 03) *Sarcogyne* (incl. species formerly assigned to *Polysporina*). http://italic.units.it/flora/index.php?procedure=ext_key_home&key_id=1583 [accessed 29 January 2022]
- Printzen, C., Halda, J. P., McCarthy, J. W., Palice, Z., Rodriguez-Flakus, P., Thor, G., Tønsberg, T. & Vondrák, J. 2016. Five new species of *Biatora* from four continents. *Herzogia* **29**: 566–585.
- Pykälä, J., Launis, A. & Myllys, L. 2017a. Four new species of *Verrucaria* from calcareous rocks in Finland. *Lichenologist* **49**: 27–37.
- Pykälä, J., Launis, A. & Myllys, L. 2017b. *Verrucaria ahtii*, *V. oulankaensis* and *V. vitikainenii*, three new species from the *Endocarpon* group (Verrucariaceae, lichenized Ascomycota). *Lichenologist* **49**: 107–116.
- SMHI 2021. <https://www.smhi.se/data/meteorologi/dataserier-med-normalvarden-for-perioden-1991-2020-1.167775> [accessed 11 November 2021]
- Søchting, U., Lorentsen, L. B. & Arup, U. 2008. The genus *Caloplaca* (Ascomycota, Lecanoromycetes) on Svalbard. Notes and additions. *Nova Hedwigia* **87**: 69–96.
- Stenroos, S., Velmala, S., Pykälä, J. & Ahti, T. (eds.) 2016. Lichens of Finland. *Norrlinia* **30**: 1–896.
- Svensson, M., Vicente, R. & Westberg, M. 2020. Additions to the lichen flora of Fennoscandia IV. *Graphis Scripta* **32**: 52–62.
- Svensson, M. & Westberg, M. 2021. A new lichenicolous species of *Carbonea* (Ascomycota, Lecanoraceae) from northern Sweden. *Phytotaxa* **522**: 221–230.
- Thor, G. 2004. *Siphula ceratites* återfunnen i Sverige! *Lavbulletinen* **2004(2)**: 50–52.
- Thor, G., Arup, U., Hermansson, J., Hultengren, S., Jonsson, F., Svensson, M. & Westberg, M. 2020. Rödlista över lavar. In: SLU Artdatabanken, *Rödlistade arter i Sverige 2020*. Uppsala, pp. 89–96.
- Thor, G., Arup, U., Hermansson, J., Vicente, R. & Westberg, M. 2021. Blylav återfunnen i Padjelanta nationalpark efter 79 år. *Fauna & Flora* **116**: 14–17.
- Vondrák, J., Frolov, I., Davydov, E. A., Urbanavichene, I., Chesnokov, S., Zhdanov, I., Muchnik, E., Konoreva, L., Himelbrant, D. & Tchabanenko, S. 2016. The extensive geographical range of several species of Teloschistaceae: evidence from Russia. *Lichenologist* **48**: 171–189.
- Westberg, M., Arup, U., Berglund, T., Ekman, S., Nordin, A., Prieto, M. & Svensson, M. 2016. New and interesting records of lichens from Pältsan (Mt Bealcan) in northernmost Sweden. *Graphis Scripta* **28**: 22–32.
- Westberg, M., Arup, U. & Fröberg L. 2005. SLF:s exkursion till Padjelanta 28 juli – 1 augusti 2004. *Lavbulletinen* **2005(1)**: 4–19.
- Westberg, M., Millanes, A., Knudsen, K. & Wedin, M. 2015a. Phylogeny of Acarosporaceae (Lecanoromycetes, Ascomycota, Fungi) and evolution of carbonized ascomata. *Fungal Diversity* **73**: 145–158. <https://doi.org/10.1007/s13225-015-0325-x>

- Westberg, M., Timdal, E., Asplund, J., Bendiksby, M., Haugan, R., Jonsson, F., Larsson, P., Odelvik, G., Wedin, M. & Millanes, A.M. 2015b. New records of lichens and lichenicolous fungi in Scandinavia. *Mycocokeys* **11**: 33–61. [https://doi: 10.3897/mycokeys.11.6670](https://doi.org/10.3897/mycokeys.11.6670)
- Westberg, M., Moberg, R., Myrdal, M., Nordin, A. & Ekman, S. 2021. *Santesson's Checklist of Fennoscandian Lichen-Forming and Lichenicolous Fungi*. Uppsala University, Museum of Evolution. [http://www.evolutionsmuseet.uu.se/publikation/Santesson's Checklist - Westberg et al. 2021 PDF-A1b.pdf](http://www.evolutionsmuseet.uu.se/publikation/Santesson's%20Checklist%20-%20Westberg%20et%20al.%202021%20PDF-A1b.pdf)
- Zhurbenko, M. P. 2004. Lichenicolous and some interesting lichenized fungi from the northern Ural, Komi Republic of Russia. *Herzogia* **17**: 77–86.
- Zhurbenko, M. P. 2012. Lichenicolous fungi growing on *Thamnolia*, mainly from the Holarctic, with a worldwide key to the known species. *Lichenologist* **44**: 147–177.