AGARICA

The Norwegian Association for Mycology and Foraging

Special issue on Myxomycetes

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AGARICA

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Mycological journal published by The Norwegian Association for Mycology and Foraging

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Cribraria mirabilis
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Back cover photos:
From left to right from top to bottom:
Arcyria globosa and *Cribraria tenella*
Diderma ochraceum and *Hemitrichia serpula*
Licea pygmaea and *Physarum mutabile*
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From the editors

This special issue has been compiled through a two-step peer review, where the concept was first evaluated, and subsequently normal peer review of the manuscript as a whole was conducted.

The authors, Edvin Johannesen and Per Vetlesen, have brought our knowledge of Myxomycetes of Norway to a significantly higher level, and we are impressed with their expertise and tidiness. This work will also arouse interest far beyond Norway's borders. The images is an important part of this special issue, and we will take this opportunity to thank Helge Gundersen for his contribution of great pictures. (http://myxomycetes.net/).

The editorial board has gone through changes since vol. 39. Our Nestor and initiator of Agarica 2.0, Gro Gulden, is resigning from the editorial board, but will continue as a resource for Agarica. Gry Alfredsen, editor of Agarica for the last 7 years, is stepping down as editor, but will – luckily – continue on the editorial board. The editorial board is grateful for great efforts over many years! Ella Thoen is now stepping in as an editor after Gry. The editorial board welcomes her, and looks forward to the collaboration.

The new editorial team wishes you a Happy reading! Enjoy!

Oslo, 14. mars 2020

Ella Thoen & Anders K. Wollan

Fra redaktørene

Dette spesialvolumet er blitt utarbeidet gjennom en totrinns fagfellevurdering hvor vi først fikk tilbakemeldinger på konseptet, før en vanlig fagfellevurdering ble gjennomført på manuskriptet i sin helhet.

Forfatterne, Edvin Johannesen og Per Vetlesen, har bragt kunnskapen vår om slimsopp i Norge til et vesentlig høyere nivå, og vi er imponert over deres fagkunnskap og ryddighet. Dette arbeidet vil også vekke interesse langt utover Norges grenser. Bildematerialet er en viktig del av dette spesialvolumet. Vi benytter også anledningen til å takke Helge Gundersen for hans bidrag av flotte bilder. (http://myxomycetes.net/).

Redaksjonen i Agarica er endret siden vol. 39 . Vår nestor og initiativtaker til Agarica 2.0, Gro Gulden, går ut av redaksjonen, men vil heldigvis være der i randsonen som en ressurs. Gry Alfredsen takker av som redaktør etter 7 år med redaktøransvar, men fortsetter - også heldigvis - i redaksjonen.

Redaksjonen takker dem begge for stor innsats over mange år! Ella Thoen trer inn som redaktør etter Gry. Redaksjonen ønsker henne velkommen om bord, og ser frem til samarbeidet!

Det nye redaktørteamet ønsker dere God lesing!

Forfatterne / The Authors

Foto: Ida Bielke

Edvin Johannesen has a formal education in biology, specialising in mycology. He wrote his thesis on the myxomycetes of Norway in 1982 and has later written scientific papers and given lectures about myxomycetes.

Edvin Johannesen er utdannet biolog med spesialisering i mykologi. Han skrev sin hovedoppgave om Norges slimsopp i 1982 og har siden publisert vitenskapelige artikler og holdt en rekke foredrag om slimsopp.

Foto: Wenche Vetlesen

Per Vetlesen has a formal education in forestry engineering and pedagogy. For 35 years he was teaching forestry and open air life at agriculture colleges. The last 10 years have been dedicated to the mapping and study of myxomycetes.

Per Vetlesen er utdannet skogingeniør og pedagog. Han har gjennom 35 år undervist ved landbruksskoler i fagene skogbruk og friluftsliv. De siste 10 årene har han kartlagt og studert slimsopp.

From the authors

The interest in myxomycetes (slime moulds) has increased dramatically in recent years. This has been stimulated by improved and more up-to-date literature, access to good photos on the internet, improved species identification support through various fora, including social media, and in Norway particularly the launch of the Species Observations System (Artsobservasjoner) - a place where collections and observations can be reported in a format accessible to all. However, more recent species information from Norway, or other countries, has not always been properly validated. For example, a large proportion of photos available on the internet are obviously misidentified, or doubtful. Furthermore, numerous myxomycete species collected in Norway have never been published in a peer reviewed journal. The objectives of the paper in the present special issue of Agarica is to 1) make the scientific community aware of which species have been collected in Norway, 2) contribute to further studies of myxomycetes through knowledge about specimens preserved in the Norwegian public collections, and 3) stimulate further collection and mapping of myxomycetes in Norway and elsewhere. In particular, increased understanding of geographical distribution, altered occurrence over time, and ecological requirements, could prove useful in the assessment of a potential association of particular species with threatened habitats or substrates.

Edvin Johannesen & Per Vetlesen

Fra forfatterene

Interessen for myxomyceter (slimsopp) har økt dramatisk de senere årene. Dette har blant annet sammenheng med bedre og mer oppdatert litteratur, tilgang til gode bilder på nett, bedre muligheter for hjelp til artsbestemmelser gjennom spørrefora og sosiale medier, og i Norge ikke minst gjennom lanseringen av Artsobservasjoner - en mulighet for å få rapportert sine artsfunn i et format som er tilgjengelig for alle. Imidlertid er ikke all nyere informasjon om funn fra Norge, eller andre land, alltid tilstrekkelig kvalitetssikret. For eksempel er en stor andel av bildene som er tilgjengelig på internett åpenbart feilbestemt eller tvilsomme. Videre har et betydelig antall myxomycet-arter funnet i Norge ennå ikke blitt publisert i et fagfellevurdert tidsskrift. Hensikten med artikkelen i denne spesialutgaven av Agarica er derfor å 1) gjøre det internasjonale fagmiljøet kjent med hvilke arter som er funnet i Norge, 2) tilrettelegge for videre studier av myxomyceter gjennom kjennskap til materiale tilgjengelig ved norske offentlige vitenskapelige samlinger og 3) stimulere til videre innsamling og kartlegging av myxomyceter i Norge og andre steder. Spesielt er det ønskelig med økt kunnskap om de enkelte arters utbredelse, endret forekomst over tid, og økologiske krav, f.eks. om de kan være knyttet til truede naturtyper eller substrat

New and rare myxomycetes (Mycetozoa, Myxogastria) in Norway, including a complete checklist of Norwegian myxomycete species

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Norsk tittel: Nye og sjeldne slimsopp (Mycetozoa, Myxogastria) i Norge, med en fullstendig sjekkliste over norske slimsopp-arter.

Johannesen EW, Vetlesen P, 2020. New and rare myxomycetes (Mycetozoa, Myxogastria) in Norway, including a complete checklist of Norwegian myxomycete species. Agarica 2020 vol. 40: 3-138).

KEY WORDS
Amoebozoa, Baltic, checklist, distribution, Mycetozoa, Myxogastria, Myxomycetes, Myxomycota, Nordic, Norway, Scandinavia, slime mould.

NØKKELORD
Amoebozoa, Baltikum, sjekkliste, utbredelse, Mycetozoa, Myxogastria, Myxomycetes, Myxomycota, Norden, Norge, Skandinavia, slimsopp.

SAMMENDRAG
I dette arbeidet presenteres 130 myxomycet-arter og 8 varieteter som nye for Norge. Mange av disse er ikke tidligere rapportert fra Norden og/eller Baltikum, eller i Nord-Europa. Videre presenteres nye funn av 43 arter som tidligere er rapportert fra Norge, men som ansees sjeldne i regionen. En fullstendig sjekkliste over Norges myxomyceter (363 arter og 30 varieteter) gis som appendiks.

ABSTRACT
In this paper, we report 130 myxomycete species and 8 varieties as new to Norway. Several of these have not previously been reported from the Nordic and/or Baltic region, or even in Northern Europe. Furthermore, new records of an additional 43 species are reported. These have been reported from Norway before, but are considered rare in the region. A complete checklist of Norwegian myxomycete species (363) and varieties (30) is provided as an appendix.

INTRODUCTION

The first botanists to take an interest in myxomycetes in Norway were Søren Christian Sommerfelt and Axel Blytt in the 19th century, but reports were only sporadic until Astrid Karlsen revised the myxomycete collections at the Herbarium of The University of Oslo and also collected and reported a number of myxomycete species from Western Norway (Karlsen 1934, 1943). In 1980-1982, one of the authors (EWJ) of this paper studied all myxomycete collections in the Norwegian public herbaria and collected myxomycetes at various localities in Southern Norway. In total more than 4000 specimens were studied, and their taxonomic status determined according to available literature at the time. The number of species known from Norway increased from 125 to 190 during this study (Johannesen 1982). Subsequent papers by Johannesen (1984a, 1984b), Marstad (1994), Kalstø (1985), and a few more recent reports (Mathiassen and Granmo 1995; Elvebakk et al. 1996; Moreno and Johannesen 2009; Kuhnt 2011, 2017) increased the number of species known from Norway to approximately 230 by 2010.

Over the past two decades, the interest in myxomycetes has gradually increased in Norway, triggered initially by a few dedicated persons, later by the emergence of improved, well-illustrated literature, internet sources, a revolution in digital photography, and dedicated groups in social media, where people can post their findings and get opinions, sometimes from experts. The launch of The Norwegian Species Observation Service – Artsobservasjoner (Artsdatabanken 2020) in 2008 certainly played a significant role; this is a place where the public can report observations and collections of plants, fungi (incl. myxomycetes), and animals. Since the launch, more than 8000 collections (or observations) of myxomycetes have been reported in the system.

Many myxomycete species have adapted their life cycle to highly specialised habitats, such as the nivicolous (snowbank) and corticolous (bark of living trees) species. Indeed, recent collection of nivicolous species and placing bark, wood, and mosses from living and dead trees in moist chambers, by the authors and others, has gained many new species to the Norwegian myxomycete inventory. Andreas Kuhnt (Kuhnt pers. comm., Kuhnt 2017) has been collecting nivicolous myxomycetes in Norway in recent years, but only a few of these have been reported so far. Kuhnt (pers. comm.) has a work in progress on nivicolous myxomycetes from Norway.

With the current paper, the number of species known from Norway has reached a total of 363 (which constitutes about one third of the total number of species described worldwide), with an additional 30 varieties. A complete list of species and varieties known and reported from Norway is provided in Appendix I.

MATERIALS AND METHODS

The vast majority of the reported specimens have been identified or verified by the authors. With few exceptions, specimens have been studied under a stereo microscope (Olympus SZ-ET or Optika ST-40-2L) and in transmitted light microscopes (Zeiss Axioscope, Optika B-353PH, Olympus SZX16, Olympus MVX10). Spores have been measured using a calibrated eyepiece scale or by calibrated freeware from Piximètre (piximetre.fr). Spore and capillitium measures are given excluding ornamentation. Unless otherwise stated, the mounting medium has been 3-5% KOH. Cotton Blue (diluted) and Congo Red have occasionally been used to stain capillitium and/or spore ornamentation in certain groups, such as *Arcyria* spp. and certain species in Reticulariaceae and Trichiaceae. In a few critical species, or where specimens were sparse, a microscopic slide was made for later studies, using Hantsch' medium and nail varnish sealing.

All photos used in this paper are with permission from and copyright of the photographers. Various photographic techniques have been used over the years, all with digital cameras. Macroscopic photos have been acquired using various types of equipment; a microscope mounted Olympus UC90 camera, single-lens reflection (SLR) cameras and selected compact cameras. When necessary, focus stacking has been employed in order to improve depth of field, either by using camera built-in automatic focus stacking software or add-on software (Olympus Stream Motion). In order to avoid image artefacts, microscopic photos are generally not focus stacked. Scanning electron microscope (SEM) images are only provided for a few species, kindly provided by Dr. Gabriel Moreno in Madrid.

Unless otherwise stated, we have chosen to follow the taxonomic and nomenclatorial view of nomen.eumycetozoa.com (Lado

2005-2020). Where in doubt, we have consulted experts in various species groups in order to arrive at a reliable identification. Many of the nivicolous species have been studied by comparison with duplicate specimens kindly provided by Mrs. Marianne Meyer. All identifications are nevertheless our responsibility. Synonyms are generally only provided if used in cited reports.

We generally do not give detailed descriptions of species or specimens, but in many cases, we provide comments in order to document our taxonomic assessment. Since the focus of this paper is not primarily taxonomic, and certainly not phylogenetic, we have not embarked on DNA sequencing.

In the following treatment, species not previously reported from Norway are presented, as well as new records of species rarely reported in the Nordic/Baltic region or elsewhere. We have mostly used Danish Myxomycetes (2019) and Artskart (Artsdatabanken 2020) as our main sources of species distribution, in certain cases with an additional search in the Global Biodiversity Information Facility, GBIF (www.gbif.org). Literature references are provided for reports of the treated species from the Nordic/Baltic region, but not for reports outside this region.

It should be noted that the substantial myxomycete collection in the Herbarium of the University of Bergen (Herb BG), where Karlsens and Kalstøs collections are deposited, has not yet been digitised and specimens in this collection will therefore not appear in Artskart or GBIF. We would also like to emphasise that we have not revisited "old" Norwegian herbarium collections. This would be an immense task and beyond the scope of this work.

For most species, we present collection data for all specimens examined by us. Rare and taxonomically interesting specimens will be deposited in the Herbarium of the University of Oslo (Herb O), unless the material is considered too sparse. We have marked deposited specimens with the official abbreviation of the respective public collections; Oslo (O), Bergen (BG), and Trondheim (TRH). Specimens developed in moist chambers are marked with (MC). Collectors' names are abbreviated in the listing of collections. Their full names are given in Appendix II. Private collection numbers are provided for each collection, where such exist. Norwegian common names are listed in Appendix III.

The majority of the collections can be searched in the Artskart database (Artsdatabanken 2020), being a GBIF node (gbif.org) and thus searchable there as well.

Effective January 1st, 2020, several counties in Norway merged, reducing the number of counties from 21 (Svalbard and Jan Mayen not included) to 11. In this work, we are referring to the "old" counties. The new counties are (merged previous counties in parentheses):

- Viken (Østfold, Akershus, Buskerud)
- Oslo (no change)
- Innlandet (Hedmark, Oppland)
- Vestfold og Telemark (Vestfold, Telemark)
- Agder (Aust-Agder, Vest-Agder)
- Rogaland (no change)
- Vestland (Hordaland, Sogn og Fjordane)
- Møre og Romsdal (no change)
- Trøndelag (Nord-Trøndelag and Sør-Trøndelag merged in 2018)
- Nordland (no change)
- Troms og Finnmark (Troms, Finnmark)

Several municipalities have also merged recently. The cited municipalities in this paper may not reflect these mergers.

RESULTS

***Arcyria affinis* Rostaf.**

The species is not previously reported from Norway. Johannesen (1982) discusses 12 specimens as *Arcyria* sp., two of which erroneously appear in Artskart (Artsdatabanken 2020) as *A. affinis*. We have not re-examined these specimens. *A. affinis* is known from Denmark, Sweden, Finland and the Baltic countries (altogether 13 papers) and is quite common throughout Europe.

Material examined:

BUSKERUD: Ringerike, Gomserudtangen, IK, TSN, SH, SM, EWJ, HLJ, GMJ, THH, 30 Sep 2017, *Alnus-Prunus* forest, on *Alnus* wood.
FINNMARK: Sør-Varanger, Fjellheim, EB, HR, PF, HE, 19 Aug 2011, mixed forest with *Pinus* and *Betula* (O).
HEDMARK: Hamar, Furuberget, PV, 19 Sep 2017, calciphilous mixed forest, on *Picea abies* stump, PV-S649. Hamar, Åker, PV, 14 Oct 2013, moist mixed forest, PV-S260 (O). Ringsaker, Nydal, PV, 16 Oct 2017, moist *Alnus* forest, on *Alnus* log. Ringsaker, Nydal, PV, 14 Sep 2016, moist, rich spruce forest, on log of *Picea abies*, in woodpecker hole. Stange, Arnebeghagan, PV, 19 Oct 2015, *Vaccinium myrtillus* forest, on *Pinus sylvestris* log, PV-S467. Stange, Enghagan, PV, 2 Oct 2017, mixed forest, on *Betula* stump. Stange, Jønsbergvegen 305, PV, 19 Nov 2014, processed coniferous wood in garden, PV-S402. Stange, Jønsbergvegen 305, PV, 27 Sep 2017, in garden, on stump of plum tree, PV-S659. Stange, Rotlia, PV, AMDB, 30 Aug 2017, rich deciduous forest, on rotten *Sorbus* log. Stange, Rotlia, PV, 13 Aug 2017, rich deciduous forest, on rotten *Sorbus* log. Stange, Rotlia, PV, 17 Aug 2015, rich deciduous forest, on *Corylus* log, PV-R042. Stange, Rotlia, PV, 17 Aug 2015, rich deciduous forest, on *Acer* log. Stange, Rotlia, PV, 7 Nov 2016, rich deciduous forest, on *Corylus* log. Stange, Rotlia, PV, 9 Oct 2015, rich deciduous forest, on *Populus tremula* log. Stange, Rotlia, PV, 19 Sep 2016, lakeside forest, on *Populus tremula* log. Stange, Rotlia, PV, 6 Sep 2016, rich deciduous forest, on *Alnus* log. Stange, Vestad, PV, 7 Dec 2015, Spruce forest, on *Picea abies* log. Stange, Gjøvika, PV, 02 Jul 2019, spruce forest on *Picea abies* stump.
MØRE OG ROMSDAL: Ørskog, Sjøholt, TCM, OO, 31 Oct 2018, on log, probably *Ulmus glabra*, (MC). Nesset, Fagerhjellen, WEJ, 3 Oct 2013, Moist *Alnus incana* thicket, on bark of *Alnus incana* (O).
OPPLAND: Lom, Måfå, TH, SHLL, JGB, PGL, HW, OO, MaO, KrH, 29 Aug 2017 (O). Sel, Emberslettura, TSN, EE, NES, JS, 6 Oct 2018, *Alnus-Prunus* forest.
SOGN OG FJORDANE: Sogndal, Mundalsdalen, OO, TAR, 17 Oct 2016, *Alnus incana* forest, on old *Ulmus*, (O).
TELEMARK: Kviteseid, Klangheim, PV, 5 Jul 2012, on *Betula* log in mixed forest (O).
TRØNDELAG: Leksvik, Fera, OO, 23 Sep 2017, on rotten log, probably *Alnus incana*.
ØSTFOLD: Aremark, Budalsvika, IK, TSN, MaO, EW, 11 Aug 2017, *Vaccinium myrtillus* dominated spruce forest, on *Picea abies* log. Aremark, Jordneset, BEA, 24 Sep 2017, small herb spruce forest, on *Picea abies* log.

***Arcyria globosa* Schwein.**

Fig. 1 A, B.

These are the first published records of *A. globosa* from Norway. The species has been reported from Sweden (Eliasson and Gilert 2007), Finland (Härkönen et al. 1999; Härkönen and Varis 2012), and Lithuania (Adamonyte 2001).

This rather uncommon species is quite easily recognised by the globe-shaped greyish sporocarps, the conspicuous calyculus, and the warted-spiny capillitium.

Material examined:

MØRE OG ROMSDAL: Volda, Trongedalen, OO, 12 Feb 2018, (MC), on rotten branch of *Alnus* or *Sorbus*.
TELEMARK: Drangedal, Mørkvassjuvet, Sep 2010, HGG, on dead wood in nature reserve, HG 10.303.
VESTFOLD: Stokke, Bogen, IK, 26 Jul 2011, beech forest, on *Fagus sylvatica* log (O).

***Arcyria helvetica* (Meyl.) H. Neubert, Nowotny & K. Baumann**

(Syn.: *Arcyria incarnata* var. *helvetica* Meyl.)
Fig. 1 C, D.

These are the first published records from Norway and, surprisingly, there are only three previous published records from the Nordic/Baltic region, i.e. from Iceland (Gøtzsche 1990), Lithuania (Adamonyte 2005), and very recently a somewhat atypical

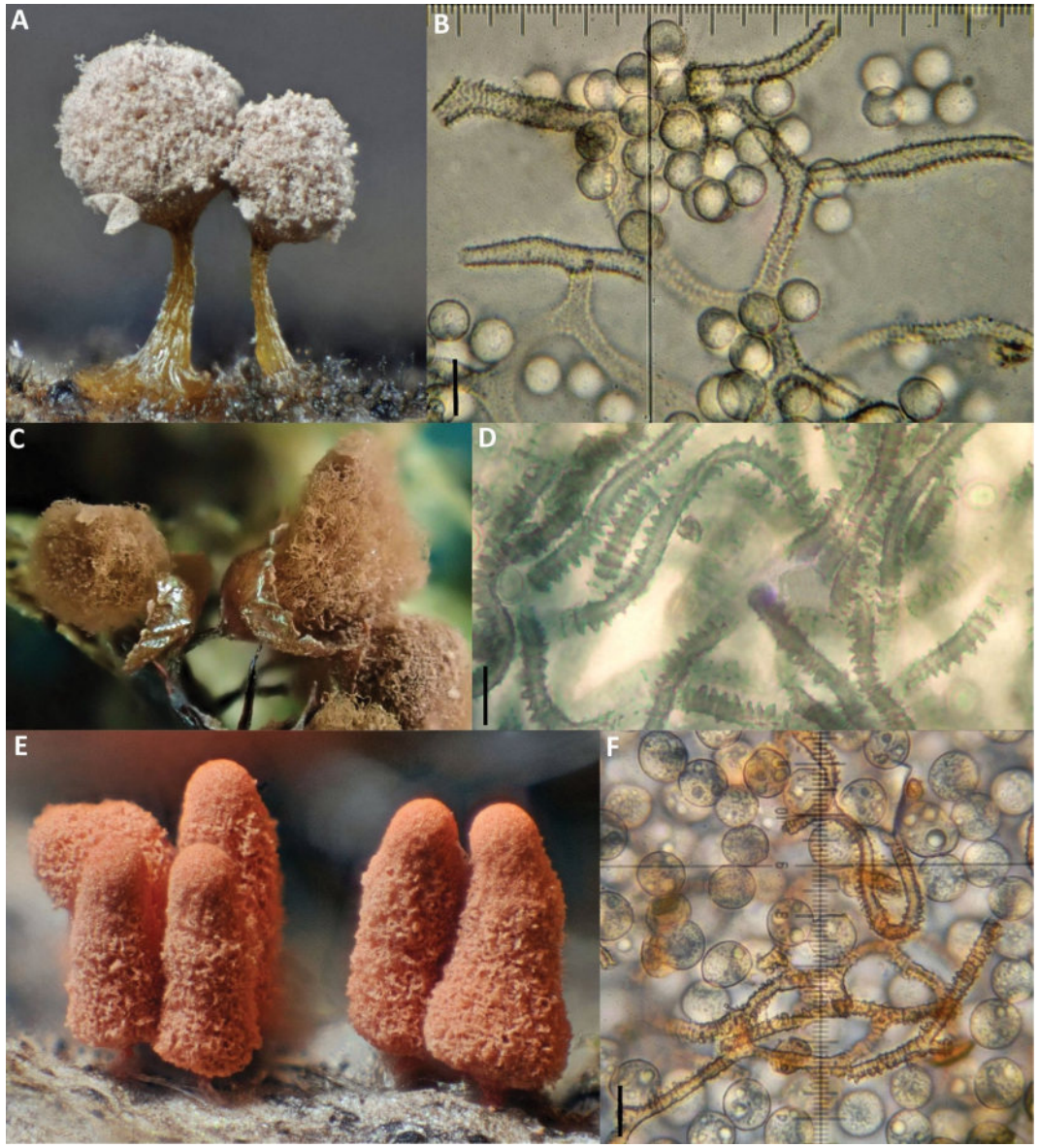


Figure 1. A, B; *Arcyria globosa* (HG 10.303). A; sporocarps. B; spores and capillitium. C, D; *Arcyria helvetica* (OOL 18-78). C; sporocarps. D; capillitium (cotton blue). E, F; *Arcyria insignis* (HG 10.235). E; sporocarps. F; spores and capillitium. Photo: A, B, E, F – Helge Gundersen; C, D – Edvin Johannesen. Scale bars 10 µm.

collection from Sweden (Eliasson and Svensson 2019).

A. helvetica is nowhere common, but may have been misinterpreted by some, or have been recorded as *A. incarnata* (var. *helvetica*). The deep, somewhat irregular cup with a more or less torn rim, the loosely attached capillitium (to the centre only), and the deep wine-red colour makes the species rather easy to recognise macroscopically. Typically, it forms small groups of sporocarps, as opposed to *A. stipata*, which forms extensive, crowded colonies.

Material examined:
HEDMARK: Stange, Rotlia, PV, 17 Aug 2015, rich deciduous wood, on log of deciduous tree, PV-R043.
MØRE OG ROMSDAL: Stranda, Hellesylt, JBJ, OO, 16 Oct 2018, on *Populus tremula* log, OOL-18.78 (O). Skodje, Ørnakken, OO, 17 Oct 2018, on *Taxus baccata* branches on the ground, OOL-19.1.
Ålesund, Ellingsøya, PGL, TCM, OO, TAR, 3 Jan 2016, on *Populus tremula* log (O).
TRØNDELAG: Leksvik, Rosvoll, OO, 23 Sep 2017, *Alnus incana* dominated forest, on log of *Alnus incana*?, OOL-18.78 (O).
VESTFOLD: Stokke, Kile, PM, 25 Nov 2012, *Vaccinium myrtillus* dominated beech forest, on *Fagus sylvatica* wood, PM 310-12 (O).

Arcyria insignis Kalchbr. & Cooke

Fig. 1 E, F.

This species has not previously been reported from Norway. From the Nordic/Baltic region there are reports from Finland (Härkönen 1981; Härkönen and Varis 2012), Sweden (Eliasson 2018), and Lithuania (Adamonyte 2005). It is relatively common elsewhere in Europe.

The small, pinkish sporocarps (0.1 – 0.3 mm diam.) with an inelastic capillitium attached to the entire calyculus, and the rather thin (2-3 µm) capillitial threads, characterise the species.

Material examined:
HEDMARK: Hamar, Furuberget, PV, 19 Oct 2017, mixed forest, on inner bark of *Sorbus aucuparia*, PV-S674 (O).
OSLO: Ekeberg, Lyngveien, GNG, 10 Aug 2014, on branch of garden bush, HG 10.235.
TRØNDELAG: Trondheim, Storlien, MGW, 5 Jul 1950 (not examined by the authors).
http://www.gbif.org/occurrence/78558543
(BPI 833039).

Arcyria major (G. Lister) Ing

There is one previous collection reported from Norway (Johannesen 1982, 1984a). In the Nordic/Baltic region, *A. major* has been reported from Finland (Härkönen and Varis 2012; Kunttu 2014), Lithuania (Adamonyte 2005; Iršėnaitė et al. 2013), and Denmark (Albertsen and Gøtzsche 1993).

The species is distinguished from *A. insignis* (above) primarily by the elastic, and thus greatly expanding capillitium and the brighter, reddish colour. Originally, *A. major* was described as a variety of *A. insignis.*

Material examined:
AKERSHUS: Frogn, Aspon, TB, 17 Oct 2015, on rotting wood of *Betula*.

Arcyria minuta Buchet

Fig. 2 A, B.

There is one previously reported collection from Norway (Johannesen 1982, 1984a). Additional published reports from the Nordic/Baltic region are from Denmark (Mårbjerg 1998), Latvia (Adamonyte 2006), and Lithuania (Kutorga 2012; Adamonyte 2013). There are several reports from elsewhere in Europe.

A. minuta resembles *A. insignis*, but the sporocarps of *A. minuta* are slightly larger, and and the capillitial threads broader (3-5 µm), with a more conspicuous and varied ornamentation, including fragmented reticulations.

Material examined:
HEDMARK: Hamar, Hedmarktoppen, PV, 14 Jun 2018, deciduous forest, on deciduous wood, PV-S834 (O).
VESTFOLD: Re, Hem, PV, 31 Oct 2017, mixed forest, on fallen branch of *Quercus*, PV-S688 (O).

Badhamia affinis Rostaf.

Fig. 2 C, D.

There is one previously reported collection from Norway (Johannesen 1982, 1984a). In

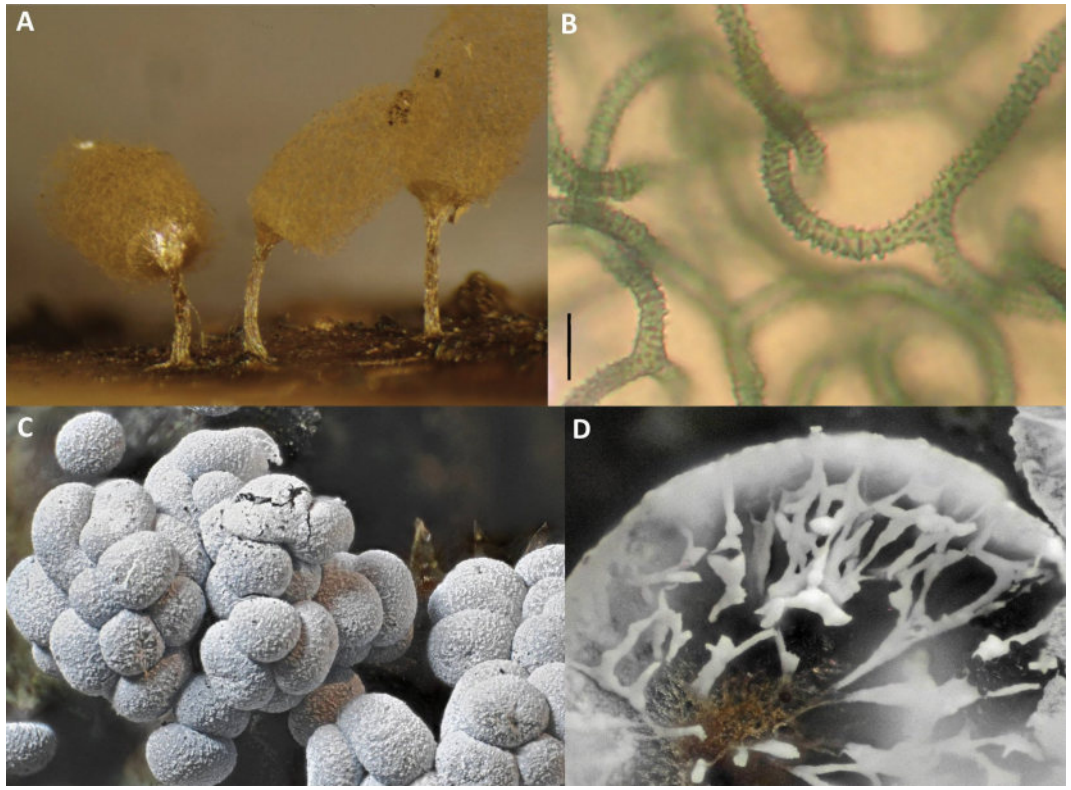


Figure 2. A, B; *Arcyria minuta* (PV-S834). A; sporocarps. B; capillitium (cotton blue). C, D; *Badhamia affinis* (PV-S224). C; sporocarps. D; capillitium. Photo: A – Per Vetlesen; B – Edvin Johannesen; C, D – Helge Gundersen. Scale bar 10 µm.

the Nordic/Baltic region, *B. affinis* is reported from Greenland (Gøtzsche 1989), Lithuania (Adamonyte 2013), and Sweden (Kylin 1997; Eliasson and Gilert 2007). This is apparently a rather common species elsewhere in Europe.

B. affinis is characterised primarily by the white/greyish, predominantly sessile sporocarps with an abundant lime cover, the rather bulky, radiating lime tubules (often forming a pseudocolumella), and the densely warted spores. It grows on the bark of living as well as dead trees.

Material examined:
HEDMARK: Stange, Jønsbergrøsa, PV, 17 Aug 2013, on bark of *Populus tremula* log on the ground, PV-S224 (O). Stange, Jønsberg, PV, 7 Feb 2018, in parkland, on *Quercus* branches on the ground, (MC), PV-F177 (O). Stange, Stangebyen, PV, 9 Oct 2018, in city alley, on *Populus tremula* 'erecta', ca. 1 m above ground, PV-S882 (O).
TRØNDELAG: Leksvik, Hindrem, JG, 20 Oct 1979, bark of *Fraxinus exelsior* (O) (not examined by the authors).

***Badhamia flavoglauca* Kuhnt**
Fig. 3 A, B.

This species was recently described (Kuhnt 2019). Two moist chamber collections from Vestfold in 1989, published as *Badhamia nitens* (Marstad 1994), have been studied by Kuhnt and according to Kuhnt (pers. comm., 2019), the Marstad collections belong to this new species. They were originally named

Physarum lakhanpalii by Nannenga-Bremekamp.

We have studied six more recent collections from Møre og Romsdal, Norway. Two of these (OOL 18.44 and OOL 19.53) have been studied by Kuhnt and all four collections probably belong to the new species, however with some minor deviations in having a rather bright yellow capillitium (typically whitish to slightly cream-colored in *B. flavoglauca*) and slightly larger spores (Kuhnt pers. comm.).

Material examined:
MØRE OG ROMSDAL: Volda, Vadstein, OO, 14 Apr 2018, on *Orthotrichum lyellii* growing on living *Populus tremula*, (MC), OOL-18.44/Dupl. Hb. Kuhnt HK 180414-Ex1 (O). Sande, Storeneset, OO, 28 Dec 2018, on *Hypnum* sp. and *Frullania* sp. growing on living *Populus tremula*, (MC), OOL-19.53/Dupl. Hb. Kuhnt HK 18122-Ex1 (O). Volda, Kalvatsvik, OO, 20 Feb 2019, west-facing slope with deciduous forest, on bark of *Ulmus glabra,* (MC). Norddal, Tafjord, 3 Nov 2019, OO, TAR, TCM, on *Isothecium alopecuroides* growing on living *Populus tremula*, (MC), OOL-20.12 (O). Skodje, Ørnakken, 27 Nov 2019, OO, on mosses growing on living *Populus tremula,* (MC), OOL-20.11 (O).
SOGN OG FJORDANE: Lærdal, Galdane, OO, 11 May 2019, in alder forest along river, on bark of *Alnus incana*, (MC).
VESTFOLD: Tønsberg, Slottsfjellet, PM, TNK, 13 Feb 2012, (MC), in garden, on bark of *Tilia* (not examined by the authors).

***Badhamia macrocarpa* (Ces.) Rostaf.**
Fig. 3 C-E.

These are the first published records of *B. macrocarpa* from Norway. The species appears to be rather common in Europe, and has been reported several times in the Nordic/Baltic region; from Denmark (Raunkiær 1888; Elliott 1926; Bjørnekær and Klinge 1964; Alstrup and Læssøe 1987), Sweden (R.E. Fries 1899, 1912; Santesson 1964; Schinner 1983), Finland (Härkönen and Varis 2012), Iceland (Gøtzsche 1984), Latvia (Vimba and Adamonyte 2003), and Lithuania (Iršėnaitė 2013).

B. macrocarpa is distinguished from the more common *B. panicea* primarily by the much more prominently ornamented (spinulose) spores.

Material examined:
HEDMARK: Ringsaker, Veldre, WV, PV, 30 Jun 2013, on trunk of dying *Sambucus racemosa*, PV-S197 (O). Ringsaker, Øvre Jesnes, PV, 20 Oct 2018, field edge, on bark of *Sambucus racemosa*, PV-S887. Stange, Hvitberg, PV, 9 Nov 2017, rich deciduous forest, on bark of fallen *Populus tremula*, PV-S691 (O). Stange, Jønsbergvegen 305, PV, 24 Feb 2019, in garden, on wood/inner bark of dead *Cotoneaster lucidus*, (MC), PV-F206 (O). Stange, Jønsbergvegen 305, PV, 3 Mar 2019, in garden, on dead branch of *Ribes nigrum*, (MC), PV-F207 (O).
MØRE OG ROMSDAL: Sande, Storeneset, OO, 28 Dec 2018, on *Populus tremula*, (MC). Volda, Bjørkedalsvatnet, OO, 13 Dec 2019, on mossy bark of living *Populus tremula*, (MC).

***Badhamia melanospora* Speg.**
(Syn.: *Badhamia gracilis* var. *melanospora* (Speg.) A. Castillo, G. Moreno & Illana)
Fig. 3 F, G.

These are the first published records from Norway, and surprisingly also from the Nordic/Baltic region. *B. melanospora* appears to quite common throughout Central and Southern Europe.

The species is characterised by the usually wrinkled, limy peridium, and warted spores with groups of more conspicuous warts, and lines or ridges, making the spores appear irregular in outline. All the Norwegian collections are from Hedmark, on *Sambucus racemosa*.

Material examined:
HEDMARK: Ringsaker, Halset, PV, 12 Oct 2018, on bark of *Sambucus racemosa*, PV-S875 (O). Stange, Sjelvehagan, PV, 19 Oct 2018, on bark of *Sambucus racemosa*, PV-S885. Ringsaker, Deglum, PV, 12 Oct 2018, glade in spruce forest, on bark of *Sambucus racemosa*, PV-S877, PV-S878, PV-S880. Ringsaker, Lykset, PV, 3 Oct 2018, glade in spruce forest, on bark of *Sambucus racemosa*, PV-S866. Ringsaker, Solberg, PV, 12 Oct 2018, glade in spruce forest, on

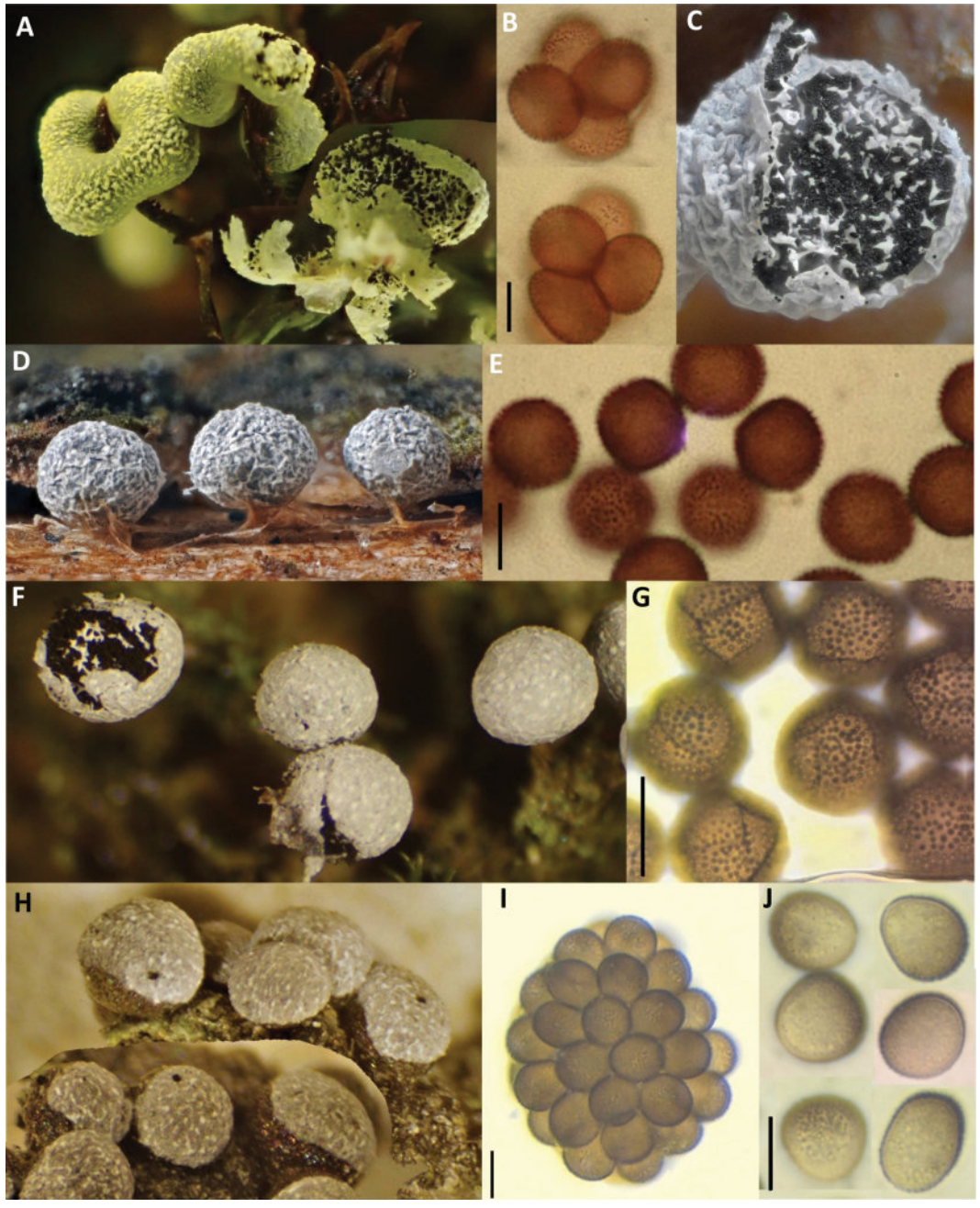


Figure 3. A, B; *Badhamia* cf. *flavoglauca* (OOL-18.44). A; sporocarps. B; spore clusters. C-E; *Badhamia macrocarpa* (PV- S197). C; sporocarp with capillitium. D; stalked sporocarps. E; spores. F, G; *Badhamia melanospora* (PV-S871). F; sporocarps. G; spores. H-J; *Badhamia versicolor* (PV-S633). H; sporocarps. I; spore cluster. J; spores. Photo: A, B, E – Edvin Johannesen. C, D – Helge Gundersen. F-J – Per Vetlesen. Scale bars 10 µm.

bark of *Sambucus racemosa*, PV-S876 (O). Stange, Ilemarka, PV, 11 Nov 2018, young spruce forest, on bark of *Sambucus racemosa*, PV-S899, PV-S900, PV-S903, PV-S904B, PV-S903, PV-S906. Stange, Sjelvehagan, PV, 19 Oct 2018, glade in spruce forest, on bark of *Sambucus racemosa*, PV-S883 (O). Stange, Skattumshagan, PV, 16 Nov 2018, mixed forest, glade in spruce forest, on bark (and mosses) of *Sambucus racemosa*, PV-S909, PV-S910. Stange, Skattumshagan, PV, 16 Nov 2018, field edge, on bark of *Sambucus racemosa*, PV-S908. Stange, Stenberghagan, PV, 3 Nov 2018, birch forest, on bark of *Sambucus racemosa*, PV-S892. Stange, Stenberghagan, PV, 11 Oct 2018, glade in spruce forest, on bark of *Sambucus racemosa*, PV-S871.

***Badhamia versicolor* Lister**

Fig. 3 H-J.

These are the first published records of *B. versicolor* from Norway and from the Nordic/Baltic region. The species appears to be quite common elsewhere in Europe.

The species is primarily characterised by the large spore clusters, with up to 60, frequently egg-shaped, spores with warts only on the exposed surface. All Norwegian collections are collected on bark of *Populus tremula* 'erecta'. Collection PV-S633 is somewhat atypical in that the sporocarps are in the 0.5 – 0.7 mm diam. range, which is larger than normal.

Material examined:

HEDMARK: Stange, Stangebyen, PV, 23 Mar 2018, street, on mosses growing on *Populus tremula* 'erecta', ca. 1 m above ground, PV-S714. Stange, Stangebyen, PV, 12 Sep 2017, street, on mosses growing on *Populus tremula* 'erecta', ca. 1 m above ground, PV-S633 (O). Stange, Stangebyen, PV, 9 Oct 2018, street, on mosses growing on *Populus tremula* 'erecta', ca. 1 m above ground, PV-S870 (O), PV-S872, PV-S873, PV-S874. Hamar, Høgskolen i Innlandet, PV, 19 Oct 2019, street, on mosses growing on *Populus tremula* 'erecta', ca. 1 m above ground, PV2232, PV2233.

***Badhamiopsis ainoae* (Yamash.) T.E. Brooks & H.W. Keller**

Fig. 4 A, B.

The species has not previously been reported from Norway, nor from the Nordic/Baltic region. There are several reports from further south in Europe, but it seems to be nowhere common.

B. ainoae is characterised by the lime-filled invaginations from the peridium (a feature which led Brooks and Keller to establish the genus *Badhamiopsis*), forming tubules or spikes, sometimes branched, sometimes connecting the peridium with the sporocarps base. A few specimens are nearly limeless, but we still regard them as *B. ainoae*, since the lack of lime sometimes occurs within Physaraceae. Collection OOL-19.60 has larger, spinulose spores and is assigned to var. *macrospora* Y. Yamam.

Material examined:

HEDMARK: Hamar, Furuberget, PV, 21 Mar 2017, calciphilous *Pinus* forest, on *Juniperus communis* bark, (MC), PV-F130A (O). Stange, Stangebyen, PV, 9 Oct 2018, street, on mosses growing on *Populus tremula* 'erecta', ca. 1 m above ground, PV-S868, PV-S873B (O).

MØRE OG ROMSDAL: Volda, Osdalen, OO, 06 Feb 2019, calciphilous deciduous forest, on *Antitrichia curtipendula* growing on living *Ulmus glabra*, (MC), OOL-19.60 (O). Volda, Bjørkedalsvatnet, OO, 29 Oct 2019, on *Frullania dilatata* growing on living *Populus tremula*, (MC). Skodje, Ørnakken, OO, 27 Nov 2019, on mossy bark of living *Populus tremula*, (MC).

SOGN OG FJORDANE: Jølster, Skei, OO, 26 Sep 2019, on bark of living *Populus tremula,* (MC), OOL-19.126.

***Barbeyella minutissima* Meyl.**

Fig. 4 C, D.

The only previous collection from Norway is one from Hordaland by Kalstø (1985). From our region, there are published reports of *B. minutissima* from Finland (Härkönen 1989; Schnittler 2000; Härkönen and Varis

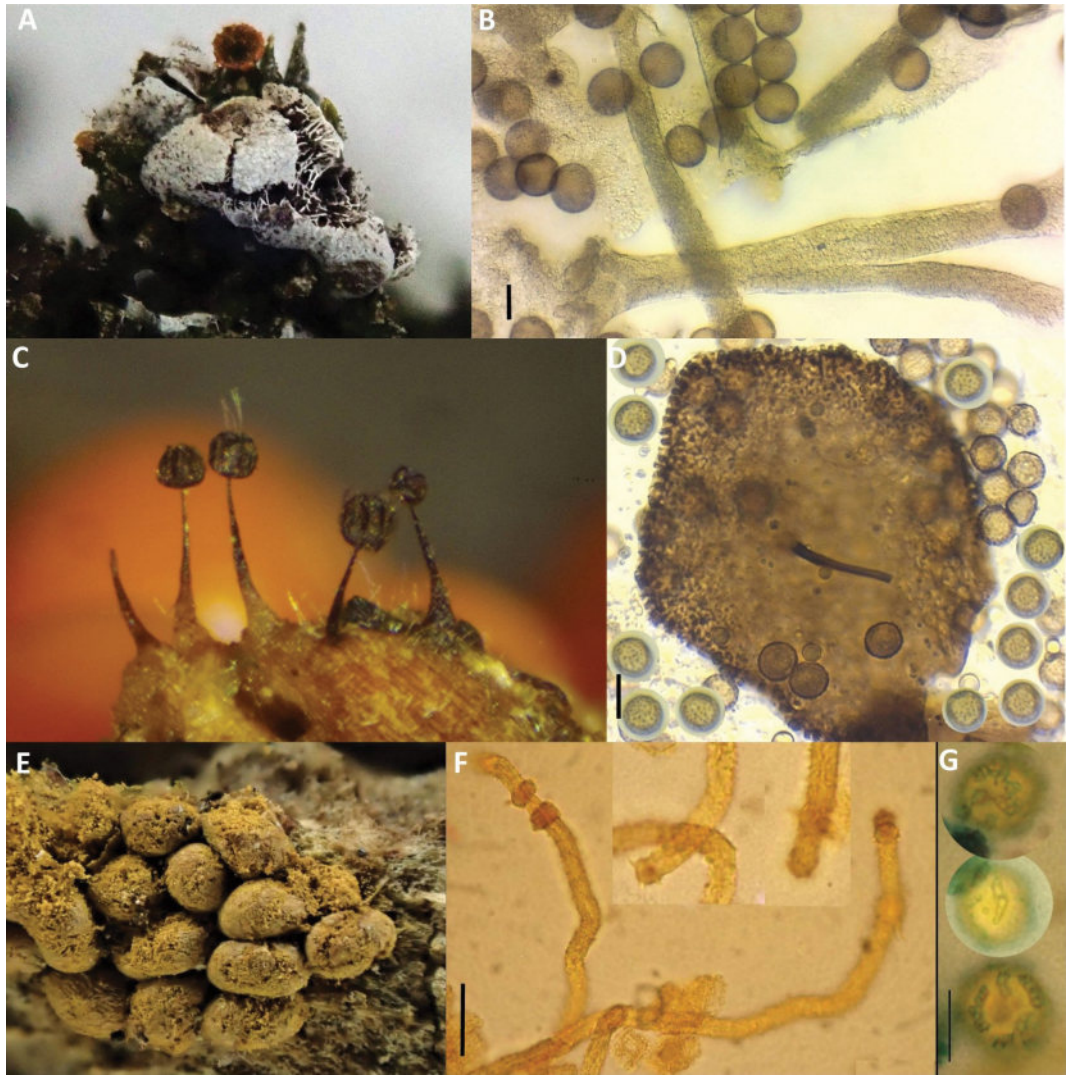


Figure 4. A, B; *Badhamiopsis ainoae* (PV-S868). A; sporocarp. B; spores and capillitium. C, D; *Barbeyella minutissima* (GH-003). C; sporocarps. D; peridial fragment and spores. E-G; *Calonema cornuvioides* (PV-S218). E; sporocarps. F; capillitium. G; spores (cotton blue). Photo: A-D – Per Vetlesen. E-G – Edvin Johannesen. Scale bars 10 µm.

2012), Sweden (Santesson 1964), Latvia (Adamonyte 2006), and Lithuania (Adamonyte 2005).

The species is probably more common than the reports reflect, but it is very difficult to detect due to its inconspicuous sporocarps. The capillitial branches ending in peridial fragments clearly identifies this species in the monotypic genus *Barbeyella*.

Material examined:
HEDMARK: Ringsaker, Nydal, PV, 17 Aug 2017, old timber heap, on mosses growing on rotten *Picea abies* log, PV-S601 (O). Ringsaker, Nydal, PV, 24 Oct

2019, old timber heap, on mosses growing on rotten *Picea abies* log. Stange, Sanderud, PV, 18 Aug 2018, rich spruce forest, on *Picea abies* log, PV-S849. OPPLAND: Gran, Sølvsberget, GH, 21 Sep 2016, GH 003 (O).

***Calonema cornuvioides* Chassain & Nann.-Bremek.**
Fig. 4 E-G.

This is the first published record of this species from Norway and from the Nordic/Baltic region. There are only few published records from Europe.

We believe the Norwegian specimen is typical, emphasising the spore size and ornamentation (small reticulations arranged in groups or lines, 3-4 to a hemisphere), and the capillitium ornamentation, consisting of distinct rings interspersed by indistinct spirals or ridges, making the capillitium appear "rough".

Material examined:
HEDMARK: Ringsaker, Kongsvegen, PV, 17 Jul 2013, on *Sambucus racemosa*, PV-S218 (O).

***Clastoderma microcarpum* (Meyl.) Kowalski**
(Syn.: *Clastoderma 'microcarpa'* (Meyl.) Kowalski. *Comatricha elegans* var. *microcarpa* Meyl.)
Fig. 5 A-C.

These are the first published records from Norway and the Nordic/Baltic region. Worldwide, *C. microcarpum* is only reported from Germany, Austria, USA, Japan, and China.

The Norwegian material is in excellent condition and in full agreement with the detailed description given by Kowalski (1975), who raised this taxon to the species level. In the stereo microscope, the sporocarps resemble a miniature *Cribraria*, with the brown spore mass visible as a 'ball' inside a cage formed by the capillitium. The spores are thick-walled, ornamented with irregularly distributed warts or spinules, and measure from 12 to 15 µm, but mostly ca. 13 µm. We have observed a few thin lines or ridges on the spore wall, giving the spores a somewhat irregular outline.

We suspect that the specimen (MM 30604) illustrated as *Clastoderma pachypus* Nann.-Bremek. in Poulain et al. (2011), plate 80, is actually *C. microcarpum*. Our view is supported by the text in the same publication, where the capillitium is described (in the key, p. 345) as "… looped at the periphery/extremity …". In the original description of *C. pachypus* (Nannenga-Bremekamp 1968), the capillitium is described as dichotomously branched, non-anastomosing, and bearing peridial flakes on the capillitial tips. The illustration and description of *C. microcarpum* (Now. 2141) by Neubert et al. (1993, p. 50) is in good agreement with our specimens.

Material examined:
MØRE OG ROMSDAL: Skodje, Apalviksætra, TAR, OO, 24 Aug 2019, mixed forest with *Taxus baccata*, on *Taxus baccata* branches on the ground, on *Hypnum* sp., (MC), OOL-19.116A-C (O). Skodje, Ørnakken, OO, 27 Nov 2019, on *Hypnum* sp. and *Frullania tamarisci* growing on living *Taxus baccata*, (MC), OOL-19.138 (O).

***Collaria rubens* (Lister) Nann.-Bremek.**
(Syn.: *Comatricha rubens* Lister)

The only previous reports of *Collaria rubens* from the Nordic/Baltic region are from Norway (Marstad 1994, as *Comatricha rubens*) and Lithuania (Adamonyte 2007b). There are many reports from elsewhere in Europe. Several workers treat this species as *Comatricha rubens* Lister. We have chosen to follow Lado (2005-2020) and place the species in *Collaria*. The species is probably overlooked due to its rather minute size and pale reddish-brown colour. It is however, easily recognised by the typical collar (thus *Collaria*), to which the capillitium is attached.

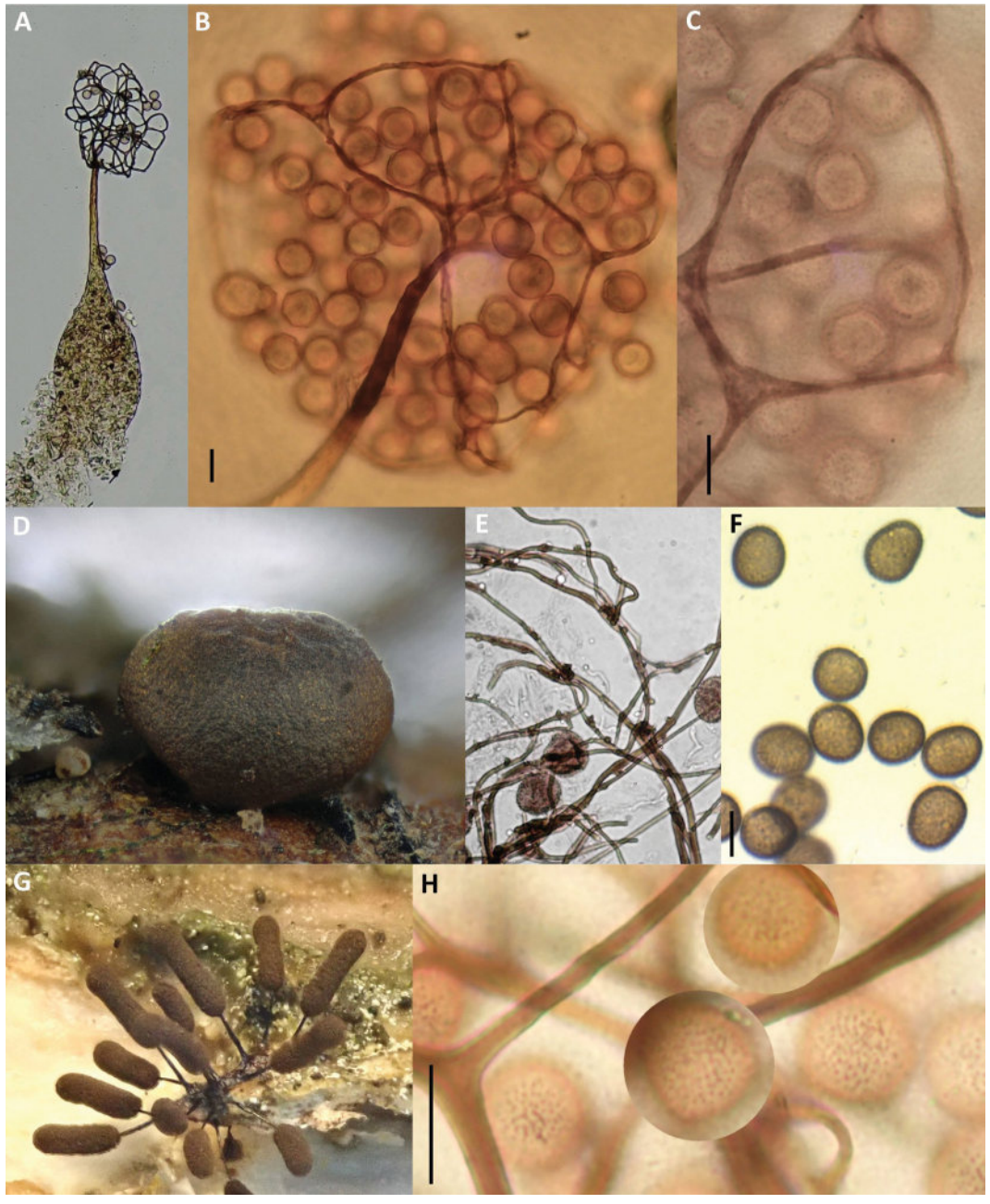


Figure 5. A-C; *Clastoderma microcarpum* (OOL-19.116). A; sporocarp. B; sporocyst. C; detail of capillitium and spores. D-F; *Colloderma robustum* (PV-S384). D; sporocyst. E; capillitium. F; spores. G, H; *Comatricha anomala* (PV-R192). G; sporocarps. H; spores and detail of capillitium. Photo: A – Oddvar Olsen. D, E – Helge Gundersen. F, G – Per Vetlesen. B, C, H – Edvin Johannesen. Scale bars 10 µm.

The two other *Collaria* species (*C. elegans* and *C. lurida*) have a capillitium free from the collar.

Material examined:
HEDMARK: Stange, Rotlia, PV, 12 Jan 2016, rich deciduous forest, on *Populus tremula* branch, (MC), PV-R118.

***Colloderma robustum* Meyl.**
Fig. 5 D-F.

These are the first published records of *C. robustum* from Norway and the Nordic/Baltic region. In other parts of Europe, it has been reported from France, Germany, Switzerland, and Spain, but it is indeed a rather uncommon species.

In identifying the Norwegian specimens, we have emphasised the dark, relatively large spores and the dark, nodulose capillitium with few anastomoses. The dull brownish colour of the sporocarps we also consider as being typical. Collection PV-S384 (Fig. 5) is atypical for the species in growing on bark of *Picea abies*. The spores in this specimen measure 11-13 µm (ovoid spores ca. 10 x 14 µm), which is in agreement with Poulain et al. (2011).

Material examined:
HEDMARK: Stange, Sanderud, PV, 1 Nov 2014, small herb spruce forest, on bark of *Picea abies*, PV-S384 (O).
SOGN OG FJORDANE: Luster, Raudaberg, TH, SHLL, GG, KW, PGL, OO, 11 May 2017, on mosses, OOL-17.22 (O). Selje, Svartehorn, PGL, DH, OO, 21 Feb 2017, on mosses, OOL-17.14 (O).

***Comatricha anomala* Rammeloo**
Fig. 5 G, H.

Johannesen (1982, 1984a) and Kalstø (1985) each reported one collection from Norway (Hordaland), which at the time were the only known collections apart from Rammeloos type specimen. There are no additional reports from the Nordic/Baltic region. Elsewhere in Europe, there are several reports.

It should be mentioned that the characteristic tiny meshes on the spore wall can be very hard to see in some specimens, and that the application of (preferably diluted) Cotton Blue dye may aid in the identification. We consider collection PV-R192 to be typical, whereas PV-F065 has a rather variable spore ornamentation, ranging from uniformly warted, to warted-reticulate or even vaguely banded-reticulate.

Material examined:
HEDMARK: Stange, Rotlia, PV, 27 Aug 2017, mixed forest, on *Populus tremula* log, (MC), PV-R192 (O).
Stange, Lille Skjelve, PV, 8 Mar 2015, pasture, on bark, (MC), PV-F065 (O).

***Comatricha brachypus* (Meyl.) Meyl.**
(Syn.: *Stemonitopsis brachypus* (Meyl.) Y. Yamam.)
Fig. 6 A-C.

These are the first published records of *C. brachypus* from Norway and from the Nordic/Baltic region. Further south in Europe, there are a few records from France, Spain, Switzerland, and Ukraine. Outside Europe, there is only one report, from Japan (as *Stemonitopsis brachypus*).

C. brachypus closely resembles *C. pulchella*, and the two may well have been confused. In examining the Norwegian specimen, we have emphasised the looping capillitium with frequent free ends, and the very minutely warted, somewhat larger spores of *C. brachypus*.

Material examined:
OSLO: Kolås, BN, 20 Jul 2012, mixed small herb coniferous forest, on decorticated log of *Pinus sylvestris* (O).
ØSTFOLD: Aremark, Metartjern, Tjøstøl Nature Reserve, BEA, 27 Jul 2019, *Vaccinium myrtillus*-dominated forest, on *Pinus sylvestris* branch on the ground (O).

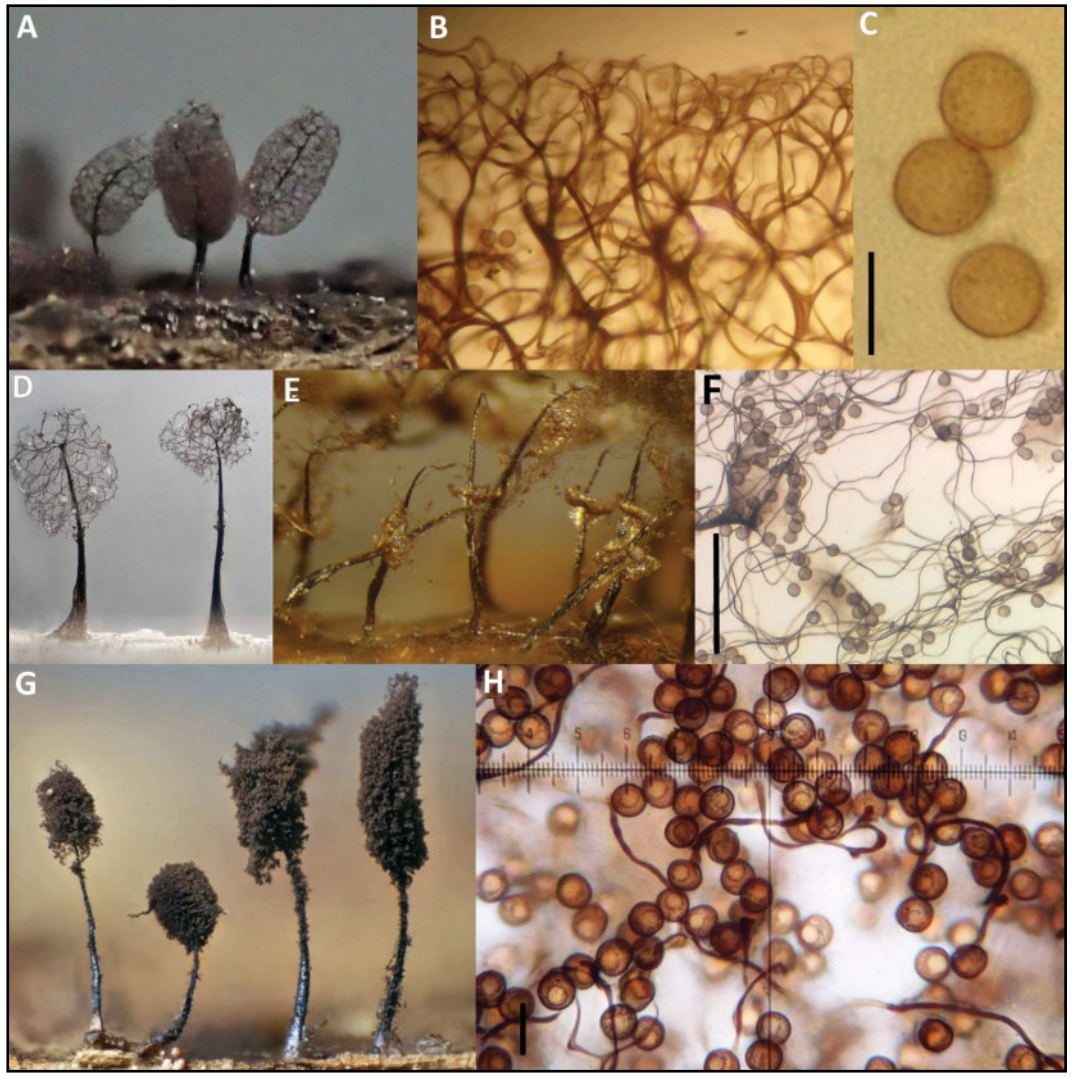


Figure 6. A-C; *Comatricha brachypus* (Kolås). A; sporocarps. B; capillitium. C; spores. D; *Comatricha ellae* (PV-S341), sporocarps. E, F; *Comatricha filamentosa* (BA-231). E; sporocarp remnants. F; capillitium and spores. G, H; *Comatricha fragilis* (HG 11.256). G; sporocarps. H; spores and capillitium. Photo: A-C – Edvin Johannesen. D-F – Per Vetlesen. G, H – Helge Gundersen. Scale bars 10 µm (C, H) and 100 µm (F).

***Comatricha ellae* Härk.**
(Syn.: *Comatricha nannengae* Härk.)
Fig 6 D.

The species was reported from Norway by Härkönen (1977, as *Comatricha nannengae*), and Härkönen (1978). There is only one published report from Sweden (Eliasson and Gilert 2007) and none from Denmark, so apparently a rare species in Scandinavia. There are a few reports from Finland (Härkönen 1977, 1979, 1983; Härkönen and Varis 2012), Estonia (Adamonyte and Veiko 2011), Lithuania (Kutorga 2012), and Iceland (Gøtzsche 1990).

The species may have been confused with small sporocarps of *C. nigra*. *C. ellae* is much smaller (< 1 mm in total height) than *C. nigra* is in its typical form. Furthermore, the columella in *C. ellae* typically ends, and may branch, long before the sporocyst apex. Finally, the capillitium is laxer within the sporocarps, ending in a nearly complete net near the surface.

Material examined:
HEDMARK: Hamar, Hedmarksmuseet, WV, PV, 11 Sep 2014, on decorticated twig of *Quercus* on the ground in park, PV-S341 (O). Stange, Jønsbergrøsa, PV, 1 May 2014, on corticiaceous fungus on *Pinus sylvestris* log, PV-S317 (O). Elverum, Nistilen, PV, 17 Dec 2017, on log of *Pinus sylvestris* in mixed forest near rivulet, (MC), PV-F168 (O). Elverum, Nistilen, PV, 11 Dec 2017, on log of *Pinus sylvestris* in mixed forest near rivulet, PV-S704 (O). Stange, Arnebeghagan, PV, 14 Aug 2018, on log of *Pinus sylvestris* in *Vaccinium myrtillus*-dominated spruce forest, PV-S844. Hamar, Furuberget, PV, 27 Apr 2018, on twig of *Pinus sylvestris* on the ground in calciphilous coniferous forest, (MC), PV-F196. Stange, Røne, PV, 14 Sep 2018, on branch of *Pinus sylvestris* on the ground in mixed forest, PV-S860.
SOGN OG FJORDANE: Flora, Blåmannsåsen, OO, TAR, 19 Oct 2017, on *Quercus* log, OOL-17.99 (O).
ØSTFOLD: Aremark, Ufredsraua, PV, BEA, 3 Feb 2017, on bark of *Juniperus communis* in mixed coniferous forest, (MC), BA-023 (O).

***Comatricha filamentosa* Meyl.**
Fig. 6 E, F.

The species has not previously been reported from Norway. The only previously published record from the Nordic/Baltic region is by Eliasson (2012). There are European reports from Austria, Switzerland, The Netherlands, Ukraine, and Germany. The only reports outside Europe are from USA and Japan.

The Norwegian specimen is in agreement with Meylans original description. Key features include relatively short stalks (compared to *C. alta*), a capillitium consisting of long, slender, unbranched threads, loosely attached to the columella and falling away as a whole, and the relatively large spores (compared to e.g. *C. fragilis*). An oval germination pore on the spores has been mentioned in the literature, and this is also observed in our specimen. Furthermore, our material shows a cup-like remnant of the peridium at the base of the sporocarps.

Material examined:
ØSTFOLD: Aremark, Sørliåsane, BEA, 1 Feb 2019, mixed small herb coniferous forest, on decorticated log of *Pinus sylvestris*, BA-231 (O).

***Comatricha fragilis* Meyl.**
Fig. 6 G, H.

These are the first published records of *C. fragilis* from Norway and the Nordic region. There is one uncertain record (cf.) from Lithuania (Adamonyte and Eliasson 2001). In rest of Europe *C. fragilis* is known from France, Germany, Portugal, Scotland, Spain, Switzerland, and The Netherlands, but outside Europe only from Japan and the Phillipines.

The species is partly characterised by having small spores with scattered warts and a flexuous, looped capillitium, which readily falls away at maturity. In daylight, the sporocarps appear sooty brown.

Material examined:
AKERSHUS: Bærum, Kjaglidalen, HGG, 25 Aug 2012, on decayed log of deciduous tree, HG 12.256 (O).
OSLO: Oslo, Kolås, BN, 5 Oct 2012, on decayed log of *Picea abies* in spruce forest (O).

***Comatricha longipila* Nann.-Bremek.**
Fig. 7 A-C.

These are the first published records of *C. longipila* from Norway. In our region, it has been reported from Finland (Varis et al. 2016), Sweden (Eliasson and Gilert 2007), Lithuania (Adamonyte 2001), and Greenland (Gøtzsche 1989). Elsewhere in Europe, it is reported

Figure 7. A-C; *Comatricha longipila* (Lesja). A; sporocarps. B; details of sporocarp. C; capillitium and spores. D-F; *Comatricha meandrispora* (PV-S708). D, E; sporocarps. F; spores. G-J; *Comatricha nigricapillitia* (PV-S786). G; sporocarps. H; capillitium and spores. I; capillitium, spores and peridial flakes. J; spores. Photo: A-C – Helge Gundersen. D-H – Per Vetlesen. I, J – Edvin Johannesen. Scale bars 10 µm (F, I, J) and 50 µm (C).

from Ukraine, The Netherlands, Scotland, Germany, France, and Belarus.

C. longipila is distinguished from *C. laxa* by smaller spores with more distant warts, usually more elongate sporocarps, and by long, free ends on the capillitium, occasionally with small swellings (short and pointed in *C. laxa*).

Material examined:
HEDMARK: Stange, Sørum, PV, 3 Mar 2015, on dead twig of *Juniperus communis*, PV-S448 (O). OPPLAND: Lesja, Tangøye, IK, EWJ, 24 Aug 2013, subalpine birch forest with tall herbs, on white rot *Betula* wood (O).
TRØNDELAG: Leksvik, Rosvollia, OO, 23 Sep 2017, mixed forest dominated by *Picea abies* and *Alnus*, on *Alnus incana,* OOL-17.44 (O).

***Comatricha meandrispora* A. Castillo, G. Moreno & Illana**
Fig. 7 D-F.

These are the first published records of *C. meandrispora* from Norway. There is one report from Sweden (Eliasson et al. 2010). Outside our region, there are eight reports from Spain and one from France. In rest of the world, *C. meandrispora* is only known from Brazil and Mexico.

The species is easily recognised by its spore ornamentation, consisting of sinuous, narrow bands, partly forming an incomplete reticulum.

Material examined:
HEDMARK: Elverum, Nistilen, PV, 20 Nov 2017, on decorticated twig of *Pinus sylvestris* near rivulet in mixed forest, PV-S697. Elverum, Nistilen, PV, 11 Dec 2017, on decorticated twig of *Pinus sylvestris* near rivulet in mixed forest, PV-S708 (O). Hamar, Furuberget, PV, 1 Sep 2018, on decorticated twig of *Pinus sylvestris* near rivulet in mixed forest, PV-S855 (O), PV-S856. Hamar, Furuberget, PV, 2 Sep 2019, mixed coniferous forest, on decorticated log of *Pinus sylvestris*, PV2196.

***Comatricha nigricapillitia* (Nann.-Bremek. & Bozonnet) A. Castillo, G. Moreno & Illana**
Fig. 7 G-J.

This nivicolous species is not previously reported from Norway or elsewhere in the Nordic/Baltic region. There are several reports from France, Italy, Spain, and Germany. Outside Europe, it has only been reported from USA and Argentina.

The most striking feature of *C. nigricapillitia* is the very dark, distinctly nodulose to spiny capillitium. The presence of tiny white «flakes» near the periphery in some of our sporocarps, appearing as white, amorphous flakes in the light microscope, may represent peridial fragments. The species was originally described as *Lamproderma nigricapillitium* Nann.-Bremek. & Bozonnet, and due to the resemblance to *Lamproderma*, we tentatively named our specimen *L. disseminatum* Kowalski, which has a very similar, dark and spiny capillitium. Marianne Meyer (pers. comm.) has ruled out *L. disseminatum* (from photos) and provisionally confirmed the identity as *C. nigricapillitia*.

We have not observed a peridial collar (which led Lado to assign this species to *Collaria*) in our specimen, nor in a specimen or photos kindly provided by Marianne Meyer, so we have chosen to follow the common view that this taxon belongs in *Comatricha*, and not in *Collaria*.

Material examined:
AUST-AGDER: Bykle, Lundane, IK, PV, SM, EWJ, 22 May 2018, subalpine birch forest, on dead twig of *Betula*, PV-S786 (O).

***Comatricha tenerrima* (M.A. Curtis) G. Lister**
Fig. 8 A.

The species was reported from Norway (Trøndelag, Oppdal) by Hjortstam and

Figure 8. A; *Comatricha tenerrima* (PV-F014), sporocarps. B, C; *Craterium aureonucleatum* (PM 28-19). B; empty sporocarps. C; sporocarps with pseudocolumellae and capillitium. D-F; *Craterium dictyosporum* (HG 11.252). D; sporocarps. E; open sporocarp showing capillitium and spores. F; spores. Photo: A – Per Vetlesen. B, C – Edvin Johannesen. D-F – Helge Gundersen. Scale bar 10 µm.

Johannesen (1980) and by Johannesen (1982). In the Nordic region it is reported from Finland (Härkönen and Varis 2012), Sweden (Eliasson and Gilert 2007), Lithuania (Adamonyte 2005; Adamonyte et al. 2013), and the Faroe Islands (Vesterholt, 1998). There are numerous reports from Europe and from throughout the world.

The long-stalked sporocarps, the ovoid to subfusiform sporocysts, the pale pinkish brown colour, and the small, spinulose spores with groups of larger spinules, make this species easily recognisable.

Material examined:
HEDMARK: Stange, Jønsbergv. 305, PV, 6 Feb 2014, on dead branch of *Clematis* from garden, (MC), PV-F014 (O). Stange, Rotlia, PV, 5 Feb 2016, rich deciduous wood, on dead *Populus tremula* log, (MC), PV-R125 (O).
SOGN OG FJORDANE: Sogndal, Heimastølen, TAR, OO, 23 Aug 2019, Deciduous forest with hollow elm trees, on *Ulmus glabra*, (MC), OOL-19.130.

***Craterium aureonucleatum* Nann.-Bremek.**
Fig 8 B, C.

This is the first published record from Norway. In the Nordic/Baltic region, it is only reported from Finland (Härkönen and

Varis 2012). The known worldwide distribution is restricted to Western Europe.

This species is related to *C. leucocephalum,* but the small, brownish, sessile or very short-stalked sporocarps, the small lime nodes, and most importantly, the conspicuous, yellow pseudocolumella present in most sporocarps, strongly suggest *C. aureonucleatum*.

Material examined:
VESTFOLD: Færder, Brøtsø, TNK, PM, 6 Mar 2019, in calciphilous deciduous forest, on bark of dead deciduous tree, PM 28-19 (O).

***Craterium dictyosporum* (Rostaf.) H. Neubert, Nowotny & K. Baumann**
(Syn.: *Badhamia rubiginosa* var. *dictyospora* (Rostaf.) Lister. *Badhamia obovata* var. *dictyospora* (Rostaf.) Lister ex Nann.-Bremek.)
Fig. 8 D-F.

Karlsen (1943) reported one collection (Hordaland, Granvin) of this species (as *Badhamia rubiginosa* var. *dictyospora*). Her finding was listed as *Badhamia obovata* (Peck) S. J. Smith by Johannesen (1982).

The more recent collection presented here is typical in having a true columella and a spore ornamentation consisting of distinct ridges formed by fused spines.

C. dictyosporum is reported from several European countries, but not from the Nordic/Baltic region.

Material examined:
TELEMARK: Drangedal, HGG, on lichen thallus (*Cladonia* sp.), 24 Sep 2009, HG 11.252.

***Cribraria atrofusca* G.W. Martin & Lovejoy**
Fig. 9 A, B.

Johannesen (1982, 1984) reported two collections from Norway (Akershus and Oslo). The only additional reports from the Nordic/Baltic region are from Finland (Varis et al. 2016) and Lithuania (Adamonyte and Eliasson 2001; Adamonyte 2005). There are only around 20 additional reports from around the world.

C. atrofusca can easily be recognised by the dark concentric, sometimes sinuous, bands ("wrinkles") on the cup, consisting of aggregated, very dark, dictydine granules.

Material examined:
HEDMARK: Hamar, Åker, PV, 14 Oct 2013, on deciduous wood in moist mixed forest, PV-S250 (O). Hamar, Hjellum, PV, 7 Nov 2015, on *Picea abies* log in spruce forest. Ringsaker, Nydal, PV, 13 Oct 2014, on *Picea abies* log in old timber heap, PV-S356. Ringsaker, Nydal, PV, 16 Oct 2017, on *Picea abies* log in old timber heap, PV-S670 (O). Stange, Hammerstadmarka, PV, 11 Mar 2014, on *Picea abies* log in old timber heap, PV-S312 (O). Stange, Hvitbergåa, PV, 26 Sep 2017, mixed forest, on *Picea abies* log, PV-S660 (O).

***Cribraria ferruginea* Meyl.**
Fig. 9 C, D.

This is the first published report from Norway and the Nordic/Baltic region. There are scattered reports from Central Europe, USA, Mexico, China, and Japan.

Apart from the brick red to rust brown colour, *A. ferruginea* is characterised by an indistinct cup consisting of radial ribs connected by a membranous translucent peridium, which gradually turns into the nodeless network of the upper part of the sporocysts.

Material examined:
OSLO: Svartdalen, HGG, 20 Oct 2011, on decayed log of *Picea abies*, HG 11.315.

***Cribraria languescens* Rex**
Fig 9 E-G.

There are no previous published reports of this species from Norway or elsewhere in the Nordic/Baltic region.

C. languescens is characterised by the very long stalks (6-10 times the sporocyst

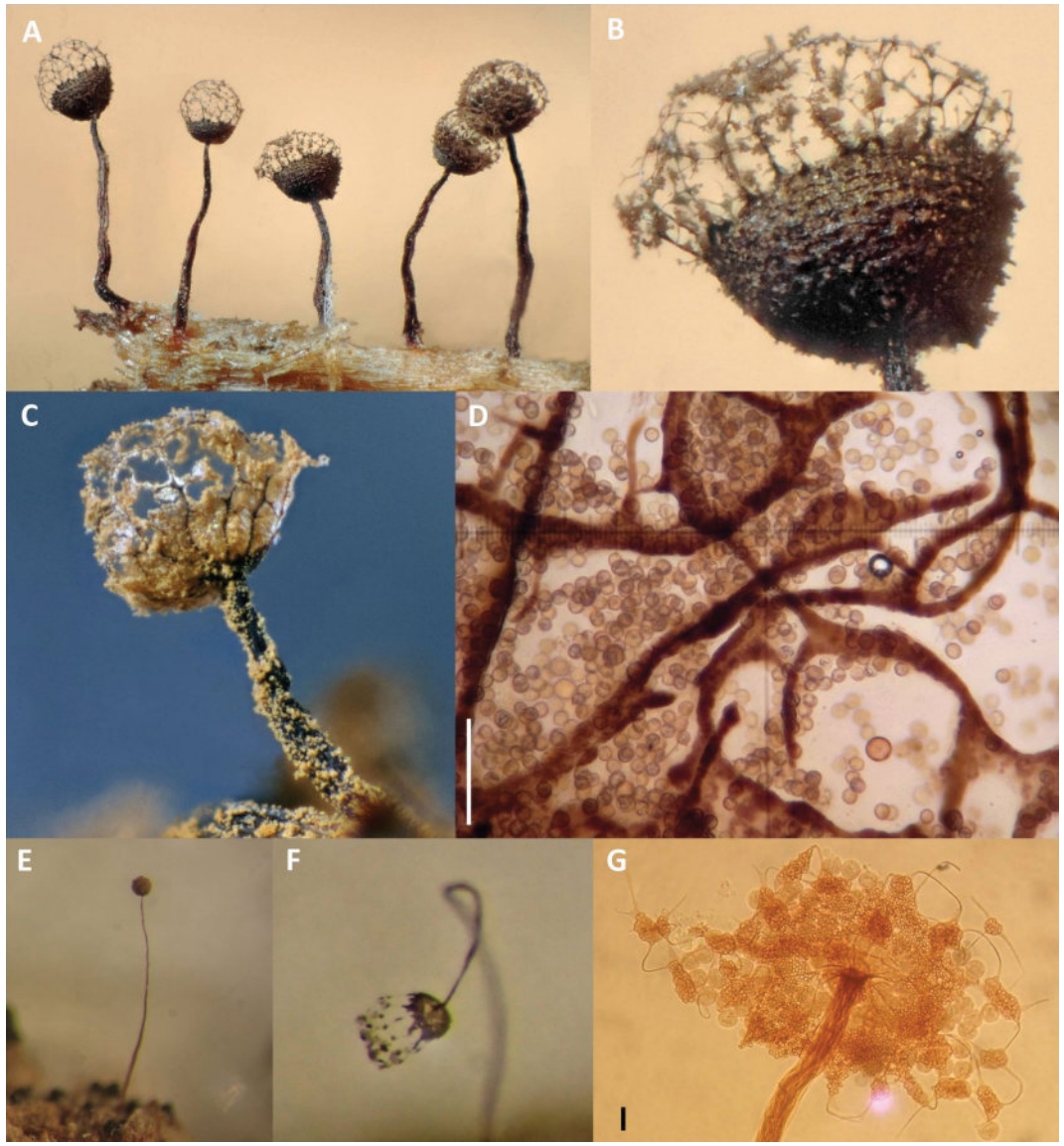


Figure 9. A, B; *Cribraria atrofusca* (PV-S250), sporocarps. C, D; *Cribraria ferruginea* (HG 11.315). C; sporocarp. D; peridial net and spores. E-G; *Cribraria languescens* (PV-S636). E, F; sporocarps. G; cup, peridial net and spores. Photo: A-D: Helge Gundersen. E-G – Edvin Johannesen. Scale bars 50 µm (D) and 10 µm (G).

diameter), in combination with a well-developed brownish cup and numerous thickened peridial nodes. (The identity of collection PV-R164 is somewhat uncertain due to hyphomycete infection.)

Material examined:
HEDMARK: Ringsaker, Nydal, PV, 17 Aug 2017, on *Picea abies* log in old timber heap, PV-S603 (O). Ringsaker, Nydal, PV, 4 Sep 2017, on log of *Picea abies* in old timber heap, matured in moist chamber, PV-S636 (O). Stange, Arneberghagen, PV, 16 Aug 2018, on *Picea abies* log in rich, moist spruce forest, (MC), PV-S846. Stange, Rotlia, PV, 25 Oct 2016, coniferous wood, on bark of *Pinus sylvestris*, (MC), PV-R164 (O).

***Cribraria lepida* Meyl.**
Fig. 10 A-C.

These are the first published records of *C. lepida* from Norway and the Nordic/Baltic region. It has been reported from France, Italy, Germany, Russia, Switzerland, and the Netherlands, and there are rather few reports from the rest of the world.

C. lepida can be distinguished from *C. violacea* by its longer stalks, smaller dictydine granules, and by having thick, pulvinate peridial nodes and more numerous peridial meshes.

Material examined:
HEDMARK: Stange, Enghagan, PV, 7 Oct 2014, on bark of *Juniperus communis*, (MC), PV-F033 (O). Stange, Ottestad, PV, AMDB, 9 Aug 2014, on deciduous wood (cf. *Salix*), PV-S335 (O). Stange, Jønsbergvegen 305, PV, 10 May 2015, on litter under *Cotoneaster lucidus* in garden, (MC), PV-F103. Stange, Rotlia, PV, 12 Jun 2016, on leaf of *Corylus avellana*, (MC), PV-R152.
MØRE OG ROMSDAL: Ålesund, Kverve, OO, KJG, 29 Aug 2014, on decayed processed wood. OOL-S14.15 (O).
OSLO: Dronningberget, MG, 22 Dec 2015, on decorticated wood, (MC).

***Cribraria minutissima* Schwein.**
Fig. 10 D, E.

The species has not prevsiously been reported from Norway. In our region, the only additional reports are from Finland (Ohenoja and Saari 1988; Härkönen 1989; Härkönen and Varis 2012) and Sweden (Santesson 1964).

C. minutissima is distinguished from *C. rufa* primarily by its much smaller size and from *C. confusa* by the presence of a well-developed cup.

Material examined:
MØRE OG ROMSDAL: Volda, Høgedalen, OO, 27 Oct 2017, on *Pinus sylvestris*, OOL-17.97 (O).
OPPLAND: Nordre Land, Røste, EWJ, 12 Sep 1984, on processed coniferous wood, EWJ 1555, EWJ 1556 (O).

***Cribraria mirabilis* (Rostaf.) Massee**
(Syn.: *Heterodictyon mirabile* Rostaf. *Dictydium mirabile* (Rostaf.) Meyl.)
Fig. 11 A-D.

This species is previous reported from Norway by Blytt (1892, as *Heterodictyon mirabile*), Hjortstam and Johannesen (1980, as *Dictydium mirabile*), and Johannesen (1982, as *D. mirabile*). Additional regional reports are from Finland (Varis 2016) and Sweden (R. E. Fries 1897, 1899, 1912; Santesson 1964).

C. mirabilis is easily recognised by the prominent peridial ribs in the lower part of the sporocysts, gradually merging into a nodeless peridial net. The dark granules frequently adhering to the spores, is another feature characteristic of this species (and *C. cancellata*).

Material examined:
HEDMARK: Elverum, Fjeldsetlia, PV, 18 Aug 2015, on *Picea abies* stump in poor, moist spruce forest, PV-S458 (O). Stange, Gjøvika, PV, 15 Sep 2019, on *Pinus sylvestris* log in spruce forest, PV2204.
OPPLAND: Gran, Jøvika, 23 Sep 2019, KAM, in steep slope, on coniferous wood, probably *Pinus sylvestris* (O). Ringebu, Imsdalen, Samtjørnsbekken, HGG, 12 Sept 2002, on large log of *Picea abies*, alt. 750 m, HG 12.274.
ØSTFOLD: Aremark, Runde Kolle, BEA, 2 Mar 2019, on *Pinus sylvestris* log in *Vaccinium* dominated coniferous forest.

***Cribraria persoonii* Nann.-Bremek.**
Fig. 12 A, B.

Johannesen (1984a) reported *C. persoonii* from Norway (Akershus), as new to

Figure 10. A-C; *Cribraria lepida* (PV-S335). A, B; sporocarps. C; peridial node. D, E; *Cribraria minutissima* (OOL-17.97), sporocarps. Photo: A-C – Helge Gundersen. D, E – Oddvar Olsen.

Scandinavia. The species appears to be rather common throughout Europe, and has repeatedly been reported from Finland, Sweden, Lithuania, and Estonia in our region.

C. persoonii is taxonomically close to *C. aurantiaca*, but it differs from the latter by a more brownish spore mass and cup and by elongate, more or less branched peridial nodes. *C. intricata* has a less developed (or absent) cup, generally longer stalks, and peridial nodes with many free, granule-free ends, giving them a stellate appearance.

Material examined:

HEDMARK: Stange, Fokholhagan, PV, 16 Aug 2012, on *Picea abies*, PV-S080 (O). Hamar, Åkersvika, PV, 2 Nov 2013, on stump of *Picea abies* in rich lakeside forest, PV-S274. Stange, Fokholhagan, PV, 2 Aug 2012, on *Picea abies* log (O).

NORDLAND: Rana, Fallheia, HH, 15 Aug 2012, on stump of *Picea abies* in rich, moist forest dominated by *Alnus incana* (TRH).

OSLO: Ekebergparken, HGG, 5 Sep 2007 (exact date uncertain), heap of dead deciduous tree trunks, on dead deciduous wood, HG 07.212 (O).

SOGN OG FJORDANE: Sogndal, Heimastølen, TAR, OO, 21 Aug 2019, deciduous forest with

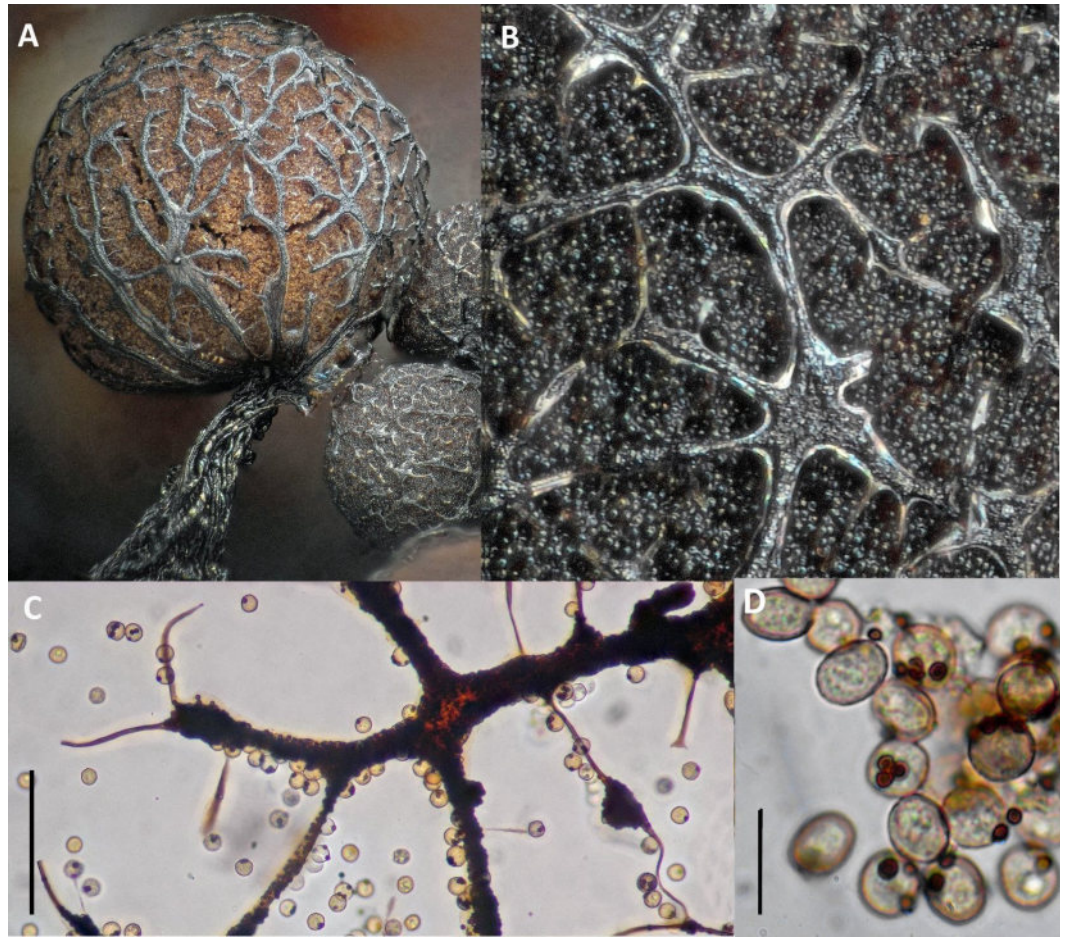


Figure 11. *Cribraria mirabilis* (HG 12.274). A; sporocarp. B; peridial net detail. C; peridial net detail and spores (TL). D; spores and associated granules. Photos: Helge Gundersen. Scale bars 50 µm (C) and 10 µm (D).

hollow elm trees, on mossy *Ulmus glabra*, OOL-19.106 (O).

TELEMARK: Drangedal, Lappedalen, HGG, 5 Sep 2013, on dead wood (HG 07.212).

***Cribraria stellifera* Nowotny & H. Neubert**

Fig. 12 C-E.

This is the first published record of *C. stellifera* from Norway. In the Nordic/Baltic region there is one previous report, from Finland (Varis et al. 2016). Apart from the Finnish report and the present, the only known published reports worldwide are from Austria, Germany, and Australia.

The hallmarks of this species are the small, very long-stalked sporocarps without a distinct cup and the rather dark, rounded peridial nodes with 1-5 free, hyaline ends radiating from them. The spore size (9-10 µm) is relatively large for the genus, as is the granule size. Our specimen has granules somewhat smaller than described in the original description (see Neubert et al. (1993) for a full description and a discussion of *C.*

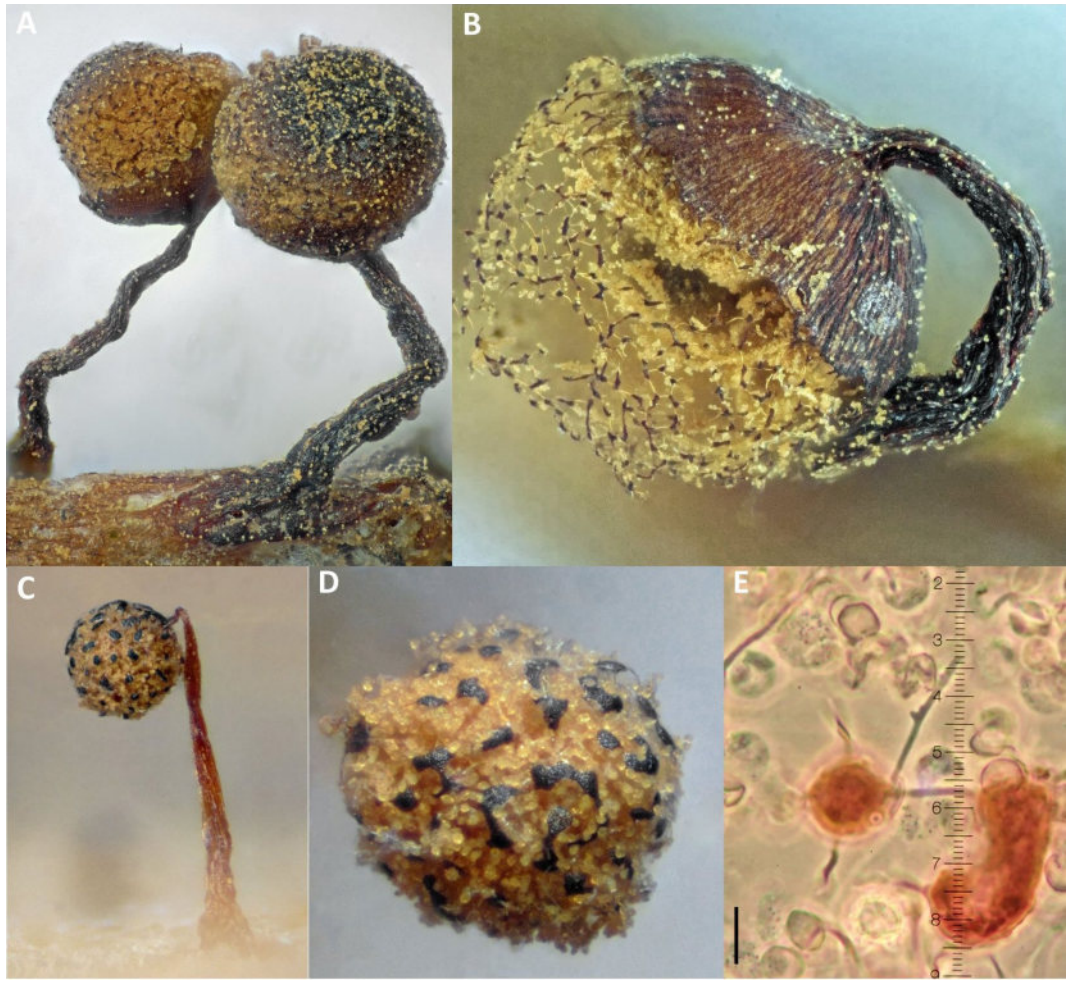


Figure 12. A, B; *Cribraria persoonii* (HG 07.212), sporocarps. C-E; *Cribraria stellifera* (HG 13.111). C, D; sporocarps. E; detail of peridial net. Photo: A-D – Helge Gundersen. E – Edvin Johannesen. Scale bar 10 µm.

stellifera versus *C. intricata* and *C. microcarpa*).

Material examined:
TELEMARK: Drangedal, Lappedalen, Ø. Straume, HGG, 5 Sep 2013, on log of *Picea abies*, HG 13.111 (O).

***Cribraria tenella* Schrad.**
Fig. 13 A-C.

This is the first published record of *C. tenella* from Norway. In the Nordic/Baltic region, it has been reported from Finland (Hintikka 1920; Härkönen 1979; Härkönen and Varis 2012) and Sweden (Santesson 1964; R. E. Fries 1912).

C. tenella may superficially resemble *C. stellifera* (above), but has a distinct cup, smaller spores, and peridial nodes mostly lacking free ends.

Material examined:
HEDMARK: Stange, Gjøvika, PV, 2 Jul 2019, on stump of *Picea abies*, PV2147B, (O).

OSLO: Skullerud, Småmyr, HGG, 22 Jul 2012, on decayed log of *Picea abies*, HG 12.181 (O).

***Diacheopsis* cf. *effusa* Kowalski**
Fig. 13 D-F.

This is the first report of *D. effusa* from the Nordic/Baltic region. We are only aware of previous reports from USA and Russia.

Our specimen is in good condition and in agreement with Kowalskis original description and the illustrations in Poulain et al. (2011). The collection date (April) also indicates that this specimen is a nivicolous species. The specimen, however, consists of one ring-shaped plasmodiocarp only, and we have thus chosen to indicate some uncertainty to the identity.

Material examined:
HEDMARK: Stange, Jønsbergrøsa, PV, 6 Apr 2015, on stems of dead *Chenopodium album* in disturbed vegetation, (MC), PV-F077 (O).

***Diacheopsis insessa* (G. Lister) Ing**
Fig. 14 A, B.

The first collections from Norway (Oslo) were reported by Johannesen (1982) and Kalstø (1985). At that time, *D. insessa* was only known from Great Britain. The somewhat deviating Oslo specimen was described in detail by Johannesen (1984a). The species is nowhere common, and it appears to be rare outside Europe.

Apart from being non-nivicolous, the relatively large (18-19 µm), spiny spores and the lax, dark grey capillitial net, bearing dark bead-like nodules, are the prime characteristics of *D. insessa.* Collection HG 00.1581 is somewhat atypical in growing on a moss (*Polytrichum*) which normally is not associated with bark or wood. Collection PV-S637 consists of a few very small, subglobose, sporocarps (0.3-0.4 mm in diam.) with rather scanty capillitium (which may occur according to the original description of *Lamproderma insessum* G. Lister), but it is otherwise typical.

Material examined:
HEDMARK: Hamar, Furuberget, PV, 19 Sep 2017, calciphilous mixed forest, on bark/resin of *Pinus sylvestris* attacked by pathogenic rust, PV-S637 (O).
TELEMARK: Drangedal, HGG, 24 Sep 2000, on *Polytrichum* sp. HG 00.1581.

***Diacheopsis metallica* Meyl.**
Fig. 14 C-E.

This nivicolous species has not previously been reported from Norway. In the Nordic/Baltic region, it is only known from Sweden (Eliasson 2012). There are numerous reports from further south in Europe, but only a few additional reports worldwide.

Among the nivicolous species of *Diacheopsis*, *D. metallica* is easily identified by the crowded, hemispheric to pulvinate sporocarps, the dark brown, branched capillitium, and the widely dispersed and somewhat irregularly distributed spines on the spores.

Material examined:
AKERSHUS: Nittedal, Bjønndalen, SM, 24 Apr 2018, *Vaccinium myrtillus* dominated coniferous forest with snow patches, on *Pinus sylvestris* bark, SM-18.13 (O).
HEDMARK: Hamar, Ormsætertajet, PV, 29 Apr 2018, spruce forest near melting snow, on various plant litter, PV-S733B.

***Diacheopsis mitchellii* Nann.-Bremek. & Y. Yamam.**
Fig. 14 F, G.

These are the first published records of *D. mitchellii* from Norway and the Nordic/Baltic region. It is apparently a very rare species, only reported from Belgium, Spain, China, and Japan.

This is a non-nivicolous, presumably corticolous, species. The small groups of dark, pulvinate sporocarps are not easy to detect, so it may easily be overlooked. The large spores (>20 µm) with spines up to 1µm,

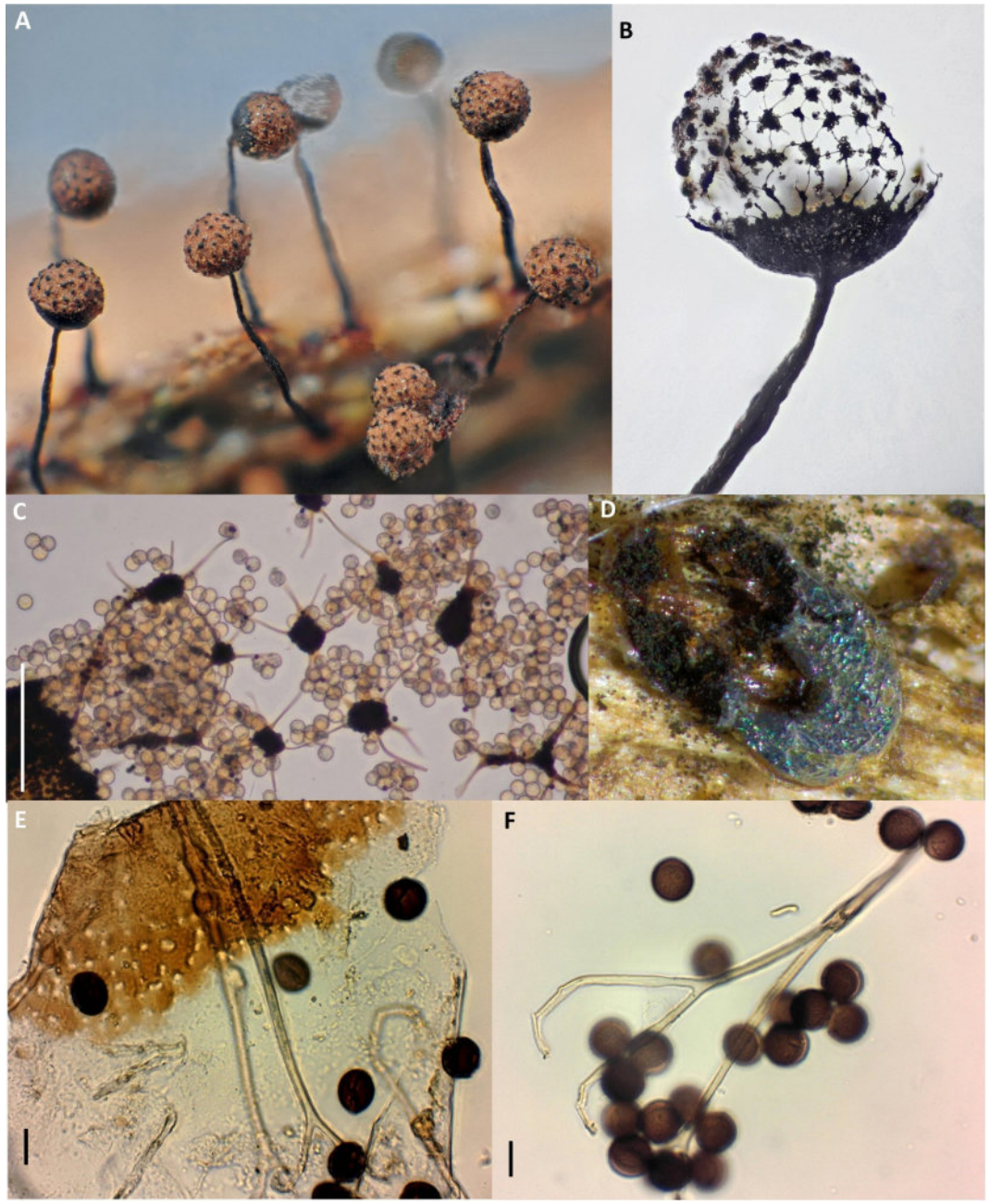


Figure 13. A-C; *Cribraria tenella* (HG 12.181). A, B; sporocarps. C; peridial net and spores. D-F; *Diacheopsis* cf. *effusa* (PV-F077). D; plasmodiocarp. E; peridium, capillitium, and spores. F; capillitium and spores. Photo: A-C – Helge Gundersen. D – Edvin Johannesen. E, F – Per Vetlesen. Scale bars 10 µm (E, F) and 50 µm (C).

and the scanty capillitium consisting of sparsely branched threads, are diagnostic features.

Material examined:
MØRE OG ROMSDAL: Aure, Todalen, ØF, SHLL, OO, SS, ÅH, 11 Oct 2018, on *Isothecium alopecuroides* growing on *Alnus incana* (O). Sula, Solavågsfjellet, OO, 28 Mar 2019, in old pine forest, on dead branches of living *Taxus baccata*, (MC), OOL-19.96 A (O). Skodje, Apalviksætra, TAR, OO, 24 Aug 2019, mixed forest with scattered *Taxus baccata*, on *Taxus baccata* branches on the ground, (MC), OOL-19.114 (O).
ROGALAND: Stavanger, Stavanger cannery museum, TMS, 3 Sep 2016, in parkland, on 80-year old cherry tree (*Prunus* cf. *cerasus*) along with *Cladonia* sp. and *Zygodon* sp. (O).

Diacheopsis nannengae G. Moreno, Illana & Heykoop

Fig. 15 A-C.

Moreno and Johannesen (2009) reported the species from Norway (Oslo) and described the specimen in detail. We report here one additional collection. Apart from Norway, *D. nannengae* is only known from France and Spain, worldwide. The present specimen deviates from the normal spore size range (9-12 µm) in having larger spores ((14.4) 14.7 - 16.6 (17.2) µm; n = 34; mean = 15.5 µm), but it is otherwise considered typical in all aspects.

Material examined:
HEDMARK: Stange, Nebbvika, PV, 7 Apr 2018, lakeside forest, on *Pinus sylvestris* branch on the ground, PV-S715 (O).

Cf. *Diacheopsis vermicularis* Nann.-Bremek. & Y. Yamam.

Fig. 15 D-F.

This is the first report of *D. vermicularis* from Norway and it has previously only been reported from Portugal and Japan. We have become aware of one recent (unpublished) collection from Greece, at 2 500 m alt. (Thomas Giannakis pers. comm.).

Our specimen is not in very good condition, partly infected with a hyphomycete. However, the spores appear normally developed. They are warted, but not "densely … warted" as in the original description of the holotype from Japan. In the holotype, the spores are described as having groups of larger, more conspicuous warts (like in our specimen). We have also observed a "halo" around the spores, which may represent a hyaline sheath. This is also a feature of the holotype. It appears that in our specimen, this sheath is being stained, and partly detached, when mounted in Cotton Blue.

The Norwegian specimen has a very scanty capillitium which consists of hyaline threads, similar to what is described and depicted for the holotype.

Gabriel Moreno (Madrid) has kindly studied a small portion of our material and has provided us with a SEM micrograph of two spores. In SEM the rather scattered warts and groups of denser warts can also be observed. Something which may be remnants of a sheath, can also be seen in SEM, but this may well be an artefact.

Material examined:
ØSTFOLD: Aremark, Budalsvika, IK, TSN, MaO, EW, 12 Aug 2017, rocky deciduous forest, on thin twig (O).

Dianema depressum (Lister) Lister

Fig. 16 A, B.

These are the first published records from Norway. In the Nordic/Baltic region, *D. depressum* has been reported from Sweden (R. E. Fries 1897, 1899, 1912; Hedbom 1911; Santesson 1964), Denmark (Albertsen and Gøtzsche 1993; Mårbjerg 1998), and Finland (Härkönen and Varis 2012). It appears to be quite common in Europe.

This non-nivicolous *Dianema* species is easily recognised by the flattened sporocarps (or plasmodiocarps), the warted capillitium, and the fine-meshed, banded-reticulate

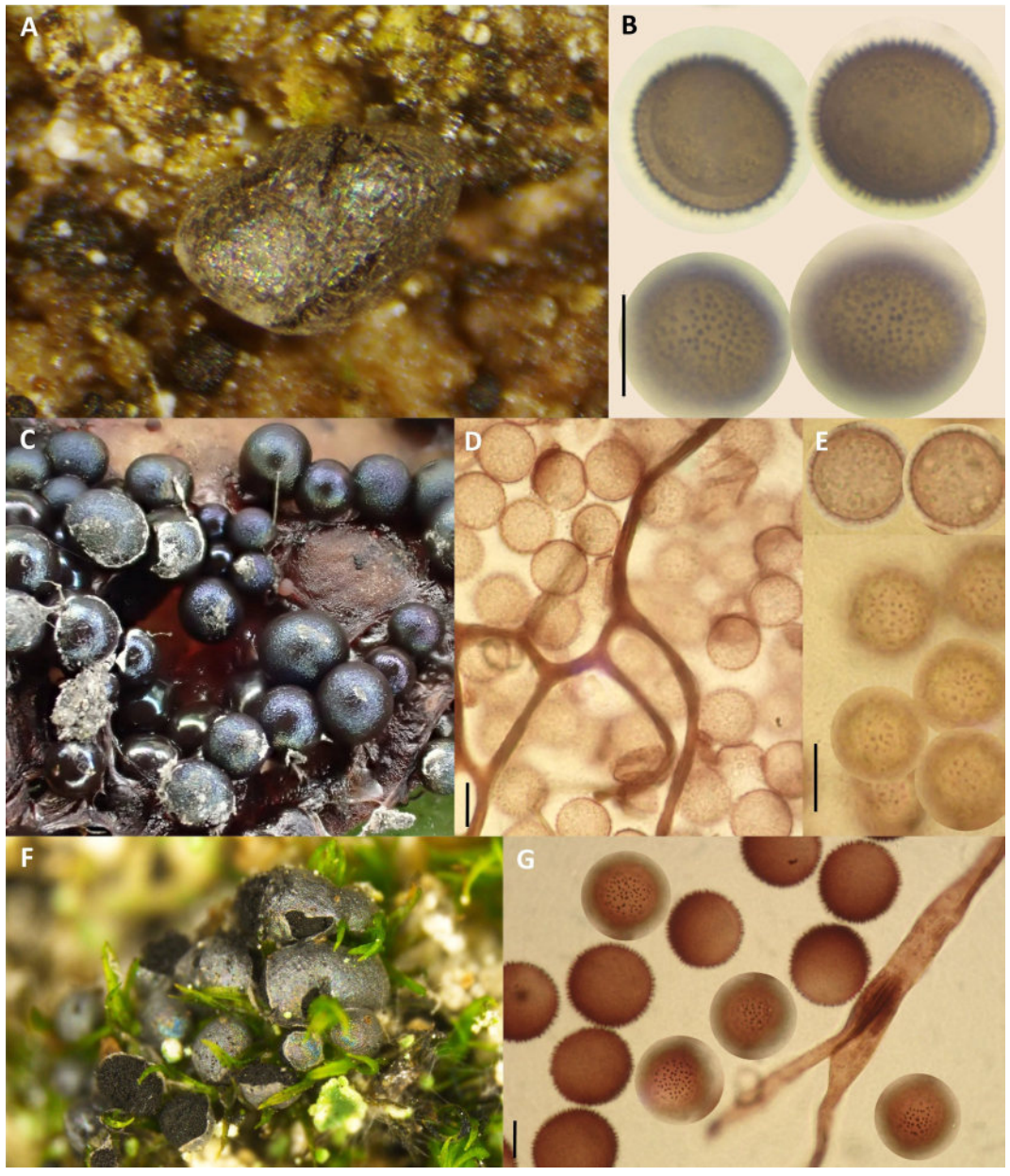


Figure 14. A, B; *Diacheopsis insessa* (PV-S637). A; sporocarp. B; spores. C-E; *Diacheopsis metallica* (SM-18.13). C; sporocarps. D; capillitium and spores. E; spores. F, G; *Diacheopsis mitchellii* (Stavanger). F; sporocarps. G; spores and detail of capillitium. Photo: A, B – Per Vetlesen. C – Siv Moen. D, E, G – Edvin Johannesen. F – Trond Magne Storstad. Scale bars 10 µm.

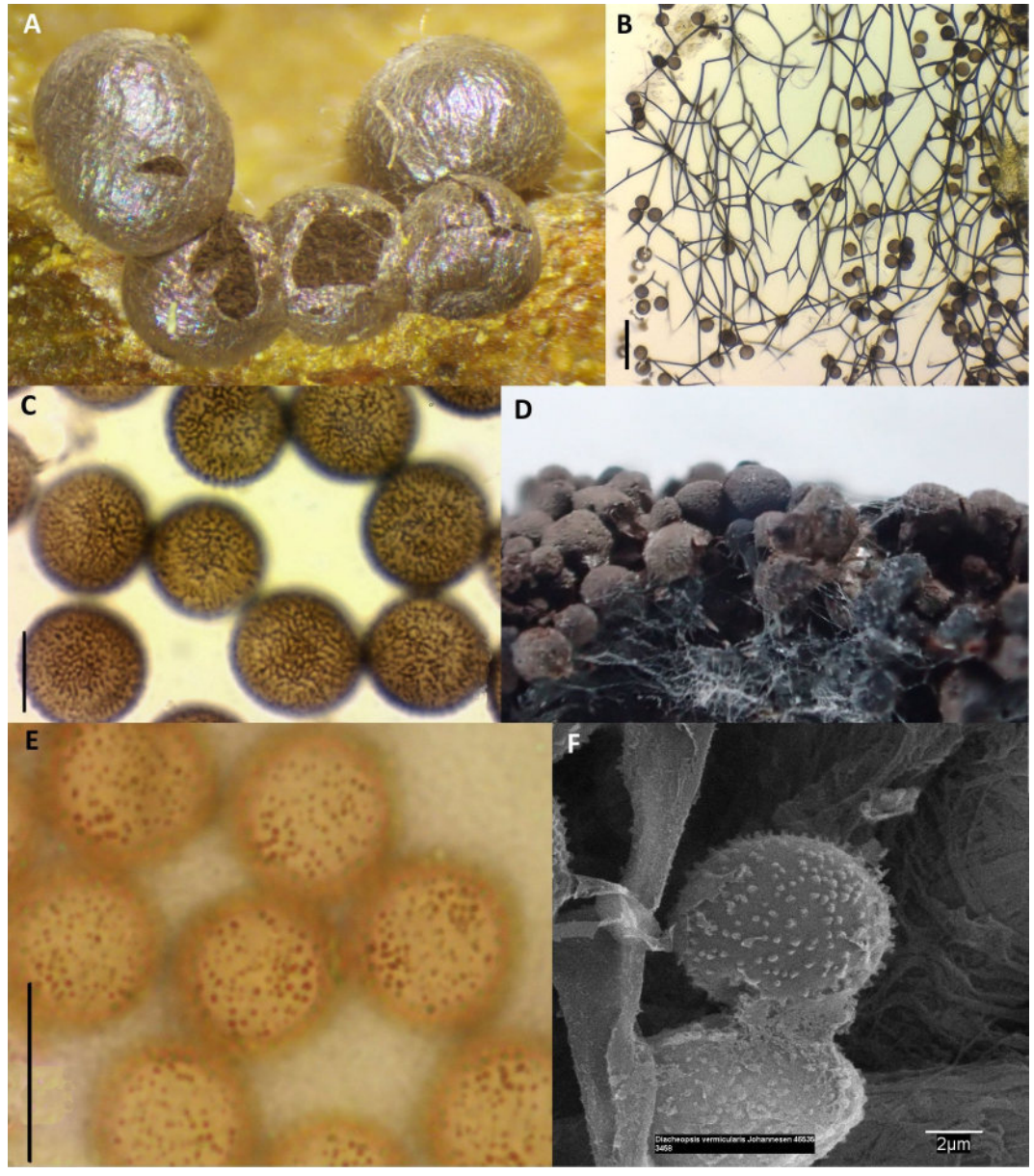


Figure 15. A-C; *Diacheopsis nannengae* (PV-S715). A; sporocarps. B; capillitium and spores. C; spores. D-F; Cf. *Diacheopsis vermicularis* (Aremark). D; sporocarps. E; spores. F; spores (SEM). Photo: A-C – Per Vetlesen. D, E – Edvin Johannesen. F – Gabriel Moreno. Scale bars 2 µm (F), 10 µm (C, E), 50 µm (B).

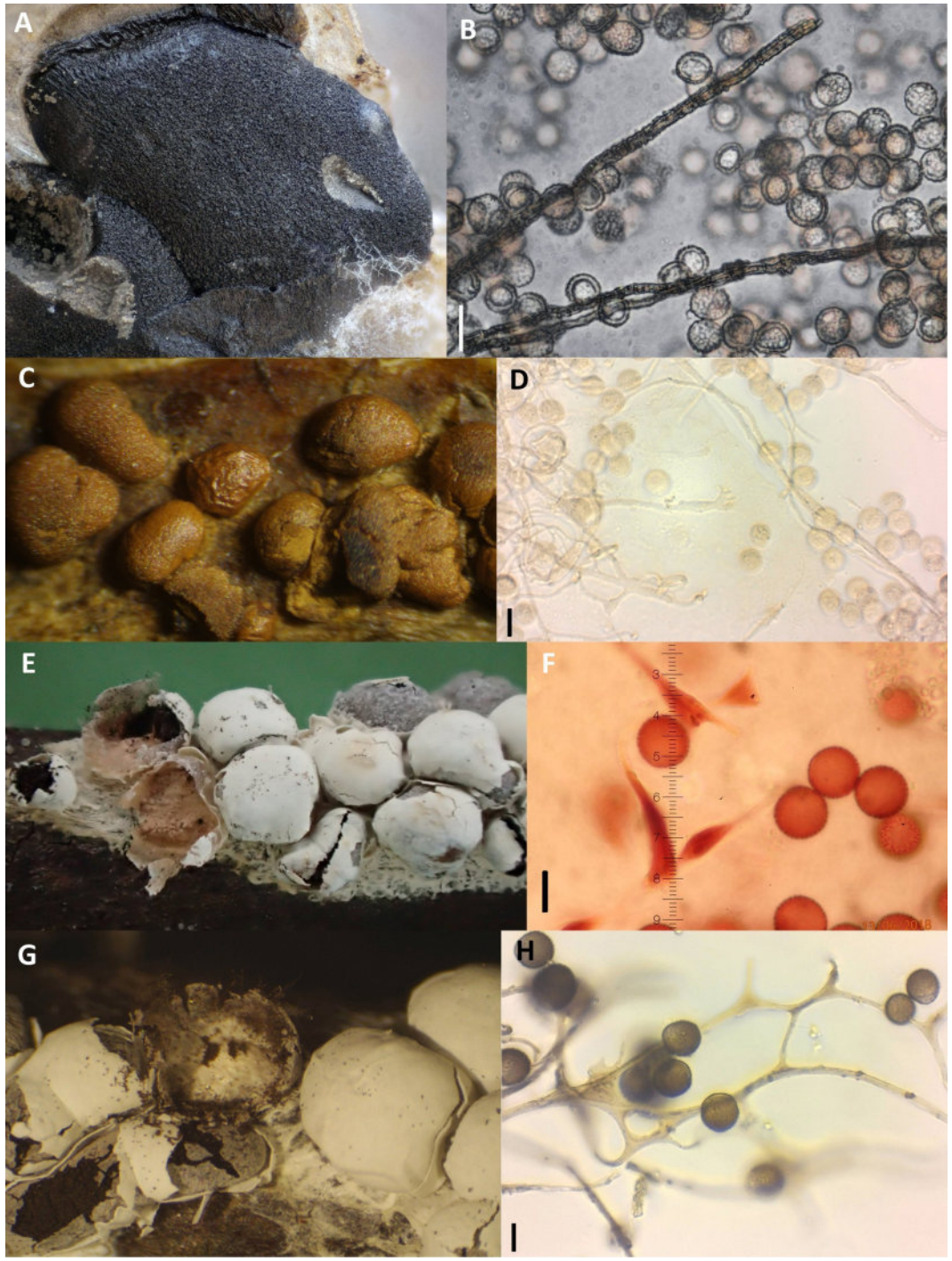


Figure 16. A, B; *Dianema depressum* (HG 12.262). A; plasmodiocarp. B; capillitium and spores. C, D; *Dianema harveyi* (PV-R202). C; sporocarps. D; capillitium and spores. E, F; *Diderma alpinum* (EJ 120-18). E; sporocarps. F; capillitium and spores. G, H; *Diderma europaeum* (PV-S774). G; sporocarps. H; capillitium and spores. Photo: A, B – Helge Gundersen. C, D, G, H – Per Vetlesen. E, F – Edvin Johannesen. Scale bars 10 µm.

spores. Spores are sometimes united in pairs or triplets.

Material examined:
MØRE OG ROMSDAL: Sande, Larsnes, OO, 2 Mar 2016, on *Corylus avellana* (O).
OPPLAND: Ringebu, Imsenda, HGG, 31 Aug 2012, on decayed *Picea abies*, HG 12.262.

***Dianema harveyi* Rex**
Fig. 16 C, D.

These are first published records from Norway. In the Nordic/Baltic region, the only reports are from Finland (Härkönen et al. 1999; Härkönen and Varis 2012). There are several reports from elsewhere in Europe.

The brownish orange to coppery brown, usually aggregated sporocarps (or short plasmodiocarps), warted (free) spores, and rather straight, usually smooth capillitium makes this species rather easy to recognise.

Material examined:
HEDMARK: Stange, Rotlia, PV, Nov 30 Nov 2015, rich deciduous wood, on log of *Populus tremula*, PV-R202 (O).
MØRE OG ROMSDAL: Ålesund, Verpingsvika, TCM, OO, 20 Jan 2018, (MC), on *Acer pseudoplatanus* in graveyard, OOL-18.53 (O).

***Dianema nivale* (Meyl.) G. Lister**

This nivicolous species has not previously been reported from Norway, and the only previous report from our region is, surprisingly, from Denmark (Onsberg 1970). There are several reports from mountainous regions in Europe, but only four reports from the rest of the world.

Unfortunately, the specimen from Hovden is lost, but we were certain as to the identity at the time we studied the collection. Andreas Kuhnt (pers. comm.), having collected nivicolous myxomycetes in Norway over several years, has found *D. nivale* only once in Norway (Oppland, Dombås in 2007).

D. nivale has certain features in common with *D. harveyi* (free, warted or spinulose spores, straight capillitial threads), but contrary to *D. harveyi*, *D. nivale* is a nivicolous species. *D. nivale* also has a more solitary growth habit.

Material examined:
AUST-AGDER: Bykle, Hovden, EWJ, PV, IK, SM, 22 May 2018, on *Betula* twig in subalpine birch forest, near melting snow.

***Diderma alpinum* (Meyl.) Meyl.**
Fig. 16 E, F.

Karlsen (1943) reported *D. alpinum* from Norway. Johannesen (1982) studied these specimens and tentatively identified three specimens as *D. alpinum*, however included them in *D. niveum*, noting that the differences seemed too arbitrary to justify separation. Recent studies have clarified the distinctions between the two species, and against other species in the *D. niveum*-group and consequently, *D. alpinum* is frequently reported from mountainous regions throughout Europe. There are, however, no published reports from the Nordic/Baltic region, other than the above-mentioned report.

We have emphasised the thinner, paler, and less roughened capillitium in separating *D. alpinum* from *D. niveum*. From *D. microcarpum* it is distinguished by the larger sporocarps and the somewhat thicker capillitium with occasional nodular or fusiform thickenings.

Figure 17. A, B; *Diderma meyerae* (PV-S816). A; sporocarps. B; spores. C-F; *Diderma microcarpum* (C: EJ-51-18, D: PV2044, E: EJ 91-18, F: Østre Toten), sporocarps. Photo: A, B – Per Vetlesen. C-F – Edvin Johannesen. Scale bar 10 µm.

Material examined:
AKERSHUS: Nittedal, Varingskollen, SM, 27 May 2019, SM, ski slope with patches of snow, on dead grass.
AUST-AGDER: Bykle, Lislefjødd, IK, PV, SM, EWJ, 21 May 2018, moist subalpine birch forest with *Betula*, *Juniperus*, *Salix*, grasses and tall herbs, on branch of *Betula* and twig of *Salix*, EJ 120-18 (O), EJ 153-18 (O).
HEDMARK: Elverum, Nordhue, PV, 8 Jun 2018, spruce forest, on thin twig on the ground, PV-S828. Hamar, Ormsætertajet, PV, 29 Apr 2019, in spruce forest near melting snow, on grass and twigs of *Betula*, PV2038, PV2059, PV2064 (O).
OPPLAND: Vang, Tyin, IK, PV, RB, EWJ, 8 Jun 2017, snowbank with *Salix* species, on petiole of *Athyrium* and twig of *Salix*, EJ 10-17 (O), EJ 13-17 (O).
TRØNDELAG: Klæbu, Hallset, KIF, 16 May 1976, (TRH). Trondheim, Baklidammen, AG, 16 Apr 1974, (TRH) (not examined by the authors).

***Diderma europaeum* (Buyck) Kuhnt**
(Syn.: *Diderma globosum* var. *europaeum* Buyck)
Fig. 16 G, H.

This strictly nivicolous species was until recently considered as a variety of *D. globosum* (var. *europaeum* Buyck) or as a form of *D. alpinum* (f. *europaeum* (Buyck) H. Singer, G. Moreno, & Illana). Kuhnt (2017) argued that this is a distinct species and made the formal combination. We have chosen to accept Kuhnts species. The only previous report from Norway (Nordland) is by Kuhnt (2017). We have not made efforts to find out how many previous reports of *D. globosum* or *D. alpinum* from our region, which would fall under this species.

Apart from the white sporocarp base and columella, a rather unique feature of *D. europaeum* is an apparent loosening or swelling of the spore wall at one end, giving many of the spores an "eyeball" appearance.

Collection EJ 24-17 is somewhat atypical in having partly crystalline lime in the peridium. This is however not an uncommon phenomenon in *Diderma*, resulting from lime granules being dissolved during wet conditions, and then crystallising.

Material examined:
AUST-AGDER: Bykle, Lislefjødd, IK, PV, RB, EWJ, 21 May 2018, moist subalpine birch forest with *Betula*, *Juniperus*, *Salix*, grasses and tall herbs, on thin twigs of *Betula*, EJ 123-18 (O), PV-S774 (MM 40144).
HEDMARK: Trysil, Anderskjølen, PV, 9 May 2018, spruce forest near melting snow, on *Vaccinium myrtillus*, PV-S751 (O).
OPPLAND: Vestre Slidre, Bukonofjellet, IK, PV, RB, EWJ, 9 Jun 2017, on twig of *Salix*(?), near snowbank, EJ 21-17 (O), EJ 24-17 (O).
SOGN OG FJORDANE: Årdal, Mannsbergi, SM, 8 Jun 2018, above tree line, on *Empetrum nigrum*. Årdal, Mannsbergi, SM, 9 Jun 2018, above tree line, on *Betula nana*, SM-18.4 (O).
TELEMARK: Vinje, Mjølstøyl, IK, PV, SM, EWJ, 21 May 2018, subalpine birch forest, on *Betula nana*, PV-S805 (O).

***Diderma meyerae* H. Singer, G. Moreno, Illana & A. Sánchez**
Fig. 17 A, B.

These are the first published records of *D. meyerae* from Norway and from the Nordic/Baltic region. There are several reports from mountainous regions in Europe, but only two reports from elsewhere.

This is a strictly nivicolous species. It belongs to the *Diderma niveum-alpinum* group, comprising also *D. niveum*, *D. microcarpum, D. alpinum, and D. europaeum. D. meyerae* is characterised by its inner peridium, which is iridescent and powdered with small lime clusters, appearing punctate or subreticulate, and by the spore ornamentation with partly coalescent warts.

Collection EJ 62-18 (cf.) is atypical in lacking hypothallus and columella, and in having a partly limeless peridium. The spores measure 9-12 µm and are ornamented with irregular warts, partly coalescing into short ridges (in our specimen visible in transmitted light). Collection PV-S816 is typical in all aspects, including the subreticulate peridium.

Figure 18. A, B; *Diderma ochraceum* (HG 11.259), sporocarps. C-E; *Diderma sauteri* (OOL 19.20). C; sporocarps. D; capillitium and spores. E; spores. F-H; *Diderma sessile* (OOL-18.66). F; sporocarps. G; capillitium. H; spores. I-K; *Diderma simplex* (OOL-19.120). I; sporocarp. J; detail of peridium. K; capillitium and spores. Photo: A, B – Helge Gundersen. C-H, J, K – Edvin Johannesen. I – Oddvar Olsen. Scale bars 10 µm.

Material examined:
AUST-AGDER: Bykle, Lislefjødd, IK, PV, SM, EWJ, 21 May 2018, on *Betula nana* in subalpine birch forest, PV-S816 (O).
TELEMARK: Vinje, Arabygdvegen, Roi, IK, PV, SM, EWJ, 22 May 2018, on stem of *Chamerion angustifolium*, EJ 62-18 (O).

***Diderma microcarpum* Meyl.**
Fig. 17 C-F.

These are the first published records of this nivicolous species from Norway and the Nordic/Baltic region. Outside Europe, it is only reported from USA and Japan.

Moreno et al. (2003) studied the *Diderma niveum* complex and did not accept *D. microcarpum* as a good species. This view is followed by Lado (2005-2020). However, *D. microcarpum* has been accepted by later workers (Poulain et al. 2011; Kuhnt 2017). After studying the Norwegian specimens and one specimen kindly provided by Marianne Meyer, we have chosen to follow the view that *D. microcarpum* is a separate species. Undoubtedly, there are collections in various fungaria, which will fall under this species, if re-examined.

D. microcarpum is characterised by the coloured columella, the thin, pale or colourless capillitium, and most strikingly, the small sporocarps, less than 1 mm in diameter. We have observed quite some variation in the outer peridium, which may be pure white, mottled, or entirely limeless.

Material examined:
AKERSHUS: Nittedal, Bjønndalen, BN, TJ, RZ, SM, EWJ, NES, TD, 8 Apr 2019, heather dominated mixed coniferous forest, on *Vaccinium myrtillus*, EJ 01-19. Skedsmo, Lahaug, SM, KH, 5 Apr 2019, small herb spruce forest, on *Vaccinium myrtillus*, SM-19.006 (O).
AUST-AGDER: Bykle, Lundane, IK, PV, SM, EWJ, 22 May 2018, subalpine birch forest, near rivulet and snowbank, on thin twig of *Betula*, EJ 51-18 (O). Bykle, Hovdenuten, IK, PV, SM, EWJ, 22 May 2018, subalpine birch forest with *Juniperus*, *Empetrum*, *Vaccinium* and *Lycopodium*, on *Betula* twig, EJ 91-18 (O).
HEDMARK: Hamar, Ormsætertajet, PV, 29 Apr 2019, in spruce forest near melting snow, on *Betula*, PV2044 (O).
OPPLAND: Østre Toten, Hveemsåsen, KNT, 24 Apr 2019, young spruce forest, on *Vaccinium myrtillus* (O).

***Diderma ochraceum* Hoffm.**
Fig. 18 A, B.

Despite being rather frequently reported from various parts of Europe, the only previous report of *D. ochraceum* from the Nordic/Baltic region is one collection from Norway, Hordaland, by Kalstø (1985).

The ochraceous, subglobose sporocarps mingled with curved or ring-shaped plasmodiocarps, the double peridium, and the occurrence on mosses in wet places, makes the species easily recognisable. See also *D. simplex* below.

Material examined:
AKERSHUS: Bærum, Eineåsen, RZ, EWJ, 24 Sep 2017, mature spruce forest with tall ferns, on mosses (O).
OPPLAND: Nordre Land, Aavella, OO, TAR, 13 Sep 2017 (O).
ROGALAND: Hjelmeland, Hiafossen, OO, 6 Sep 2011, on mosses, OOL-17.15 (O).
TELEMARK: Drangedal, Vefallsneset, HGG, 6 Oct 2011, on mosses, HG 11.259.

***Diderma sauteri* (Rostaf.) E. Sheld.**
Fig. 18 C-E.

These are the first definite records from Norway and the Nordic/Baltic region. Johannesen (1984b) reported one specimen from Norway, Oppland (as *Diderma* cf. *sauteri*). The specimen reported from Trøndelag (Hjortstam and Johannesen 1980) later turned out to be a misidentification. The two specimens cited here are typical in all aspects. Some of the sporocarps are partly or completely void of peridial lime, but this is rather commonly seen in several *Diderma* species.

Figure 19. A-E; *Diderma subasteroides* (HG 13.031). A-C; sporocarps. D; spores. E; capillitium. Photos: Helge Gundersen. Scale bars 10 µm.

Material examined:
MØRE OG ROMSDAL: Aure, Todalen, SHLL, ØF, SS, ÅH, OO, 11 Oct 2018, on mosses growing on *Alnus incana*, OOL-19.21 (O). Aure, Todalen, SHLL, ØF, SS, ÅH, OO, 11 Oct 2018, on *Populus tremula,* (MC), OOL-19.20 (O).

***Diderma sessile* (Brândză) Mar. Mey. & Poulain**
(Syn.: *Diderma rugosum* (Rex) T. Macbr. var. *sessile* Brândză).
Fig. 18 F-H.

This is the first record of *D. sessile* from Norway and the Nordic/Baltic region and the only previous published reports worldwide

are from France (Meyer and Poulain 1999; Poulain et al. 2011), Germany (Kuhnt 2019), and Romania (Meyer and Poulain 1999; Brândză 1929, as *Diderma rugosum* var. *sessile*).

The Norwegian specimen is rather scanty, only partly having a limy outer peridial layer. However, the paired spores with distinct warts on a pale background, and the very pale to colourless, reticulate-physaroid capillitium consisting of band-like threads expanded at the junctions, makes us confident in the identification. The species was recently discussed in detail by Kuhnt (2019), where the Norwegian collection is cited (from GBIF).

Material examined:
NORDLAND: Lurøy, Storrøssøya, SHLL, OO, ÅH, 30 Aug 2018, on *Scytinium lichenoides, Homalothecium sericeum* and various other mosses growing on limy rock, OOL-18.66 (O).

***Diderma simplex* (J. Schröt.) E. Sheld.**
Fig. 18 I-K.

The species is not previously reported from Norway. In our region it is reported from Denmark (Bjørnekær and Klinge 1964; Elliott 1926), Sweden (Schinner 1983; Eliasson 1983), and Finland (Härkönen 1979; Härkönen and Varis 2012).

D. simplex superficially resembles *D. ochraceum*, but it is distinguished from that species by having a simple peridium and warted spores with groups of larger warts.

Material examined:
SOGN OG FJORDANE: Sogndal, Heimastølen, TAR, OO, 21 Okt 2019, deciduous forest with hollow elm trees, on mossy *Ulmus glabra*, (MC), OOL-19.120.

***Diderma subasteroides* M. L. Farr**
Fig. 19.

This is the first published record from Europe and there are few reports worldwide. We find the Norwegian specimen to be in good agreement with the original description and illustration by Farr (1971).

Material examined:
OSLO: Ekeberg, HGG, 24 Sep 2013, on decayed wood of *Picea abies* in abandoned heap of cut logs, HG 13.031 (O).

***Didymium annulisporum* H.W. Keller & Schokn.**
Fig. 20.

This is the first report from Norway. The only reports from the Nordic/Baltic region are from Greenland (Gøtzsche 1989) and very recently from Sweden (Eliasson and Svensson 2019). Elsewhere in Europe it is known from Austria and The Netherlands.

D. annulisporum resembles *D. trachysporum* G. Lister both in appearance and growth habit, but it differs in having spores partly encircled by a pale line of dehiscence. We have studied one collection of *D. trachysporum* (EWJ 1403) reported by Johannesen (1982, 1984b), suspecting that also this might be *D. annulisporum* (which was not described at the time). In both our specimens of *D. annulisporum*, low ridges can be seen on some spores. In the *D. trachysporum* specimen such ridges are very frequent, but we find no pale lines of dehiscence in it. Furthermore, the *D. annulisporum* specimens have spores which are reddish brown in transmitted light (olivaceous brown in *D. trachysporum*) and rather evenly distributed small, pointed spinules (irregularly distributed, larger, less pointed, and partly coalescing warts in *D. trachysporum*). Both species occur on dung, manure, soil, and bulb plants (e.g. *Hyacinthus*) in green houses.

Material examined:
HEDMARK: Stange, Stangebyen, PV, 12 Dec 2019, Europris warehouse, on *Hyacinthus* bulb, PV2248 (O).
VESTFOLD: Horten, Paletten Shopping Centre PV, 28 Oct 2019, on *Hyacinthus* bulb and surrounding soil, PV2235 (O).

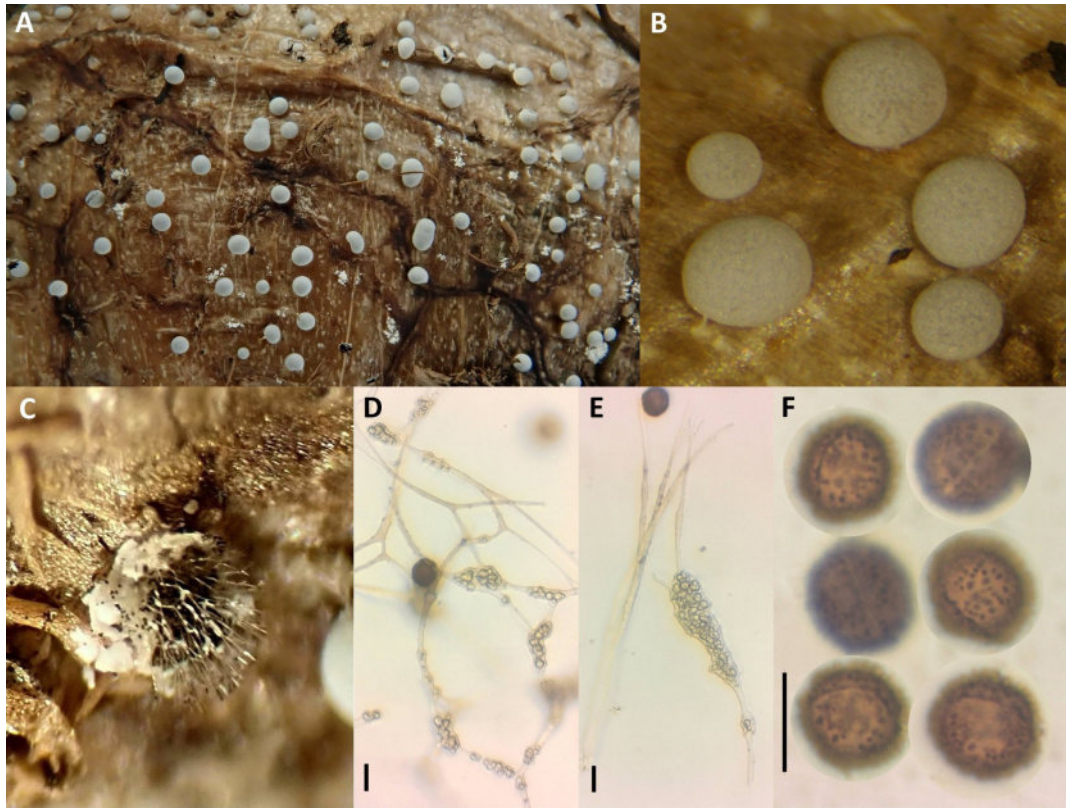


Figure 20. A-F; *Didymium annulisporum* (PV2235). A-B; sporocarps. C-E; capillitium. F; spores. Photos: Per Vetlesen. Scale bars 10 µm.

***Didymium tussilaginis* (Berk. & Broome) Massee**
Fig. 21 A-C.

These are the first records of *D. tussilaginis* from Norway and the Nordic/Baltic region. There are unpublished collections from Denmark (Henrik Gøtzsche pers. comm.). The only previous reports are from Austria, Germany, and England (Ing 2011; Kuhnt et al. 2014).

There has been much confusion around the taxonomic status and nomenclature of this species, which is discussed and clarified in detail by Kuhnt et al. (2014). *D. tussilaginis* and *D. vernum* (see below) are both confined to the very special microhabitat on the underside of living leaves of *Petasites hybridus*. The two species are easily distinguished by the colour of the lime crystals; white in *D. tussilaginis* and orange brown in *D. vernum*. For further details, see Kuhnt et al. (2014).

Material examined:
HEDMARK: Hamar, Finsalbekken, PV, 17 Jul 2016, in nutrient rich pasture with dense growth of *Petasites hybridus*, underside of leaf, PV-S514 (O), PV-S520, PV-S524, PV-S525 (O). Hamar, Åker, PV, 11 Jul 2017, on *Petasites hybridus*, PV-S594 (O). Hamar, Åker, PV, 11 Jul 2017, on *Petasites hybridus*, PV-S596. Hamar, Åker, PV, 06 Jun 2019, in dense thicket of *Petasites hybridus*, underside of leaf, PV2105 (O), PV2109. Stange, Kvernmo, AMDB, PV, 14 Jun 2019, on *Petasites hybridus*, underside of leaf, PV2115 (O), PV2116 (O), PV2119, PV2121, PV2122, PV2123.

Figure 21. A-C; *Didymium tussilaginis* (PV2105). A, B; sporocarps. C; spores and peridial crystal. D-F; *Didymium vernum* (PV2106). D; sporocarps. E; spores and peridial crystals. F; spores. Photos: Per Vetlesen. Scale bars 10 µm.

OSLO: Badedammen, by the parking lot, SM, 18 Jun 2019, on *Petasites hybridus*, SM-19.024.

***Didymium vernum* Kuhnt, K. Baumann & Nowotny**
Fig. 21 D-F.

These are the first records of *D. vernum* from Norway and the Nordic/Baltic region. The only previous reports are from France and Germany (Kuhnt et al. 2014). See comments under *D. tussilaginis* above.

Material examined:
HEDMARK: Hamar, Finsalbekken, PV, 17 Jul 2016, dense growth of *Petasites hybridus*, underside of leaf, PV-S521 (O). Hamar, Åker, PV, 17 Jul 2016, dense growth of *Petasites hybridus*, underside of leaf, PV-S519 (O). Hamar, Åker, PV, 11 Jul 2017, dense growth of *Petasites hybridus*, underside of leaf, PV-S595 (O), PV-S597. Hamar, Åker, PV, 06 Jun 2019, in dense thicket of

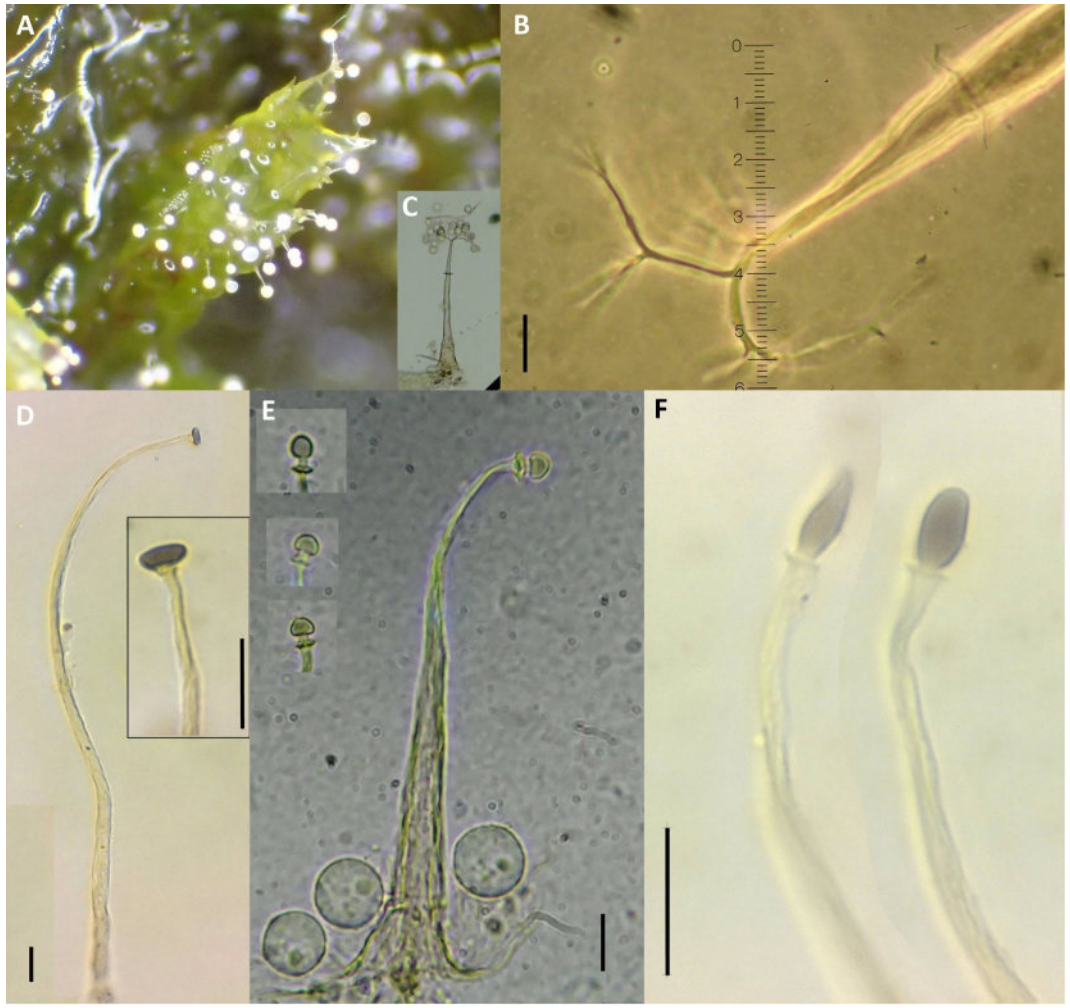


Figure 22. A-C; *Echinostelium arboreum* (OOL-18.55). A; sporocarps on moss leaves; B; detail of columella and capillitium; C; single sporocarp. D; *Echinostelium brooksii* (PV-F185), sporocarp with columella (insert). E; *Echinostelium corynophorum* (OOL-19.57), sporocarp with columellae (inserts). F; *Echinostelium fragile* (PV-F182), sporocarps with columellae. Photo: A, C, E – Oddvar Olsen. B – Edvin Johannesen. D, F – Per Vetlesen. Scale bars 10 µm.

Petasites hybridus, underside of leaf, PV2106 (O), PV2107, PV2108, PV2110. Hamar, Åker, PV, 02 Aug 2019, in dense thicket of *Petasites hybridus*, underside of leaf, PV2161, PV2162. Stange, Kvernmo, AMDB, PV, 14 Jun 2019, in dense thicket of *Petasites hybridus*, underside of leaf, PV2111 (O), PV2112, PV2113 (O), PV2114 (O) PV2117 (O), PV2118, PV2120.

***Echinostelium arboreum* H.W. Keller & T.E. Brooks**
Fig. 22 A-C.

The species is not previously known from Norway. In the Nordic/Baltic region, the only published report is from Lithuania (Adamonyte 2006). It is known from throughout Europe.

E. arboreum resembles the much more common *E. minutum*, but it lacks the characteristic thickened articular areas on the spore surface of the latter. It normally also has a shorter stalk, a longer columella, and less branched capillitium.

Material examined:
SOGN OG FJORDANE: Eid, Heggjavatnet, OO, 20 May 2018, on *Populus tremula* log, (MC), OOL-18.55 (O).

***Echinostelium brooksii* K.D. Whitney**
Fig. 22 D.

The species is not previously known from Norway. In the Nordic/Baltic region, *E. brooksii* has been reported from Finland (Härkönen and Vänskä 2004; Härkönen and Varis 2012), Sweden (Eliasson and Gilert 2007), Iceland (Gøtzsche 1990), and Estonia (Ing 1990; Adamonyte and Veiko 2011).

E. brooksii belongs to the group of extremely small *Echinostelium* species which lack a capillitium. The brownish, lenticular columella and the minutely roughened spores without surface thickenings characterise the species. The sporocysts are initially pink, turning brownish pink on maturation.

Material examined:
HEDMARK: Stange, Nebbvika, PV, 30 Mar 2018, lakeside forest, on thin twig of *Pinus sylvestris*, on the ground, (MC), PV-F185.

***Echinostelium corynophorum* K.D. Whitney**
Fig. 22 E.

This extremely small species has not previously been reported from Norway. In our region it is known from Iceland (Gøtzsche 1984, 1990) and Lithuania (Adamonyte 2006).

The combination of a pale brown, pedunculate-hemispheric columella and spores with circular wall thickenings, identifies *E. corynophorum*.

Material examined:
MØRE OG ROMSDAL: Volda, Vadstein, OO, 20 Feb 2019, on catkins of *Alnus glutinosa*, (MC), OOL-19.57 (O). Volda, Eikrem, OO, 11 Mar 2019, on catkin of *Alnus glutinosa*, (MC).

***Echinostelium fragile* Nann.-Bremek.**
Fig. 22 F.

This is the first published record of *E. fragile* from Norway. In the Nordic/Baltic region, the species has been reported from Sweden (Eliasson and Gilert 2007), Iceland (Gøtzsche 1984), Estonia (Ing 1990), and Lithuania (Adamonyte 2008; Adamonyte et al. 2013).

E. fragile is primarily distinguished from *E. brooksii* (see above) by the cylindric to ellipsoid or fusiform columella.

Material examined:
HEDMARK: Stange, Jønsberg, PV, 14 Mar 2018, on bark of living *Pinus sylvestris*, (MC), PV-F182 (O).

***Elaeomyxa cerifera* (G. Lister) Hagelst.**
Fig. 23 A, B.

Johannesen (1982) studied two specimens of *E. cerifera* (Oslo and Aurland, Sogn og Fjordane). In our region, apart from one fairly recent report from Denmark (Mårbjerg 1998), there are only two old reports from Sweden (Lister 1899, as *Lamproderma physaroides* (Alb. & Schwein.) Rostaf. var. *sessile* Lister; R. E. Fries 1912, as *Lamproderma columbinum* (Pers.) Rostaf. var. *sessile* G. Lister). It is likely that this species may have been confused by some with *Colloderma oculatum* (Lippert) G. Lister. The waxy/oily contents in the upper part of the stalks, which define the genus, are not evident in the examined collection. Marianne Meyer has kindly confirmed the identity (from photos).

Material examined:
TELEMARK: Drangedal, Mørkvassjuvet, Sep 2010, HGG, on mosses and plant debris in nature reserve, HG 10.287 (O).

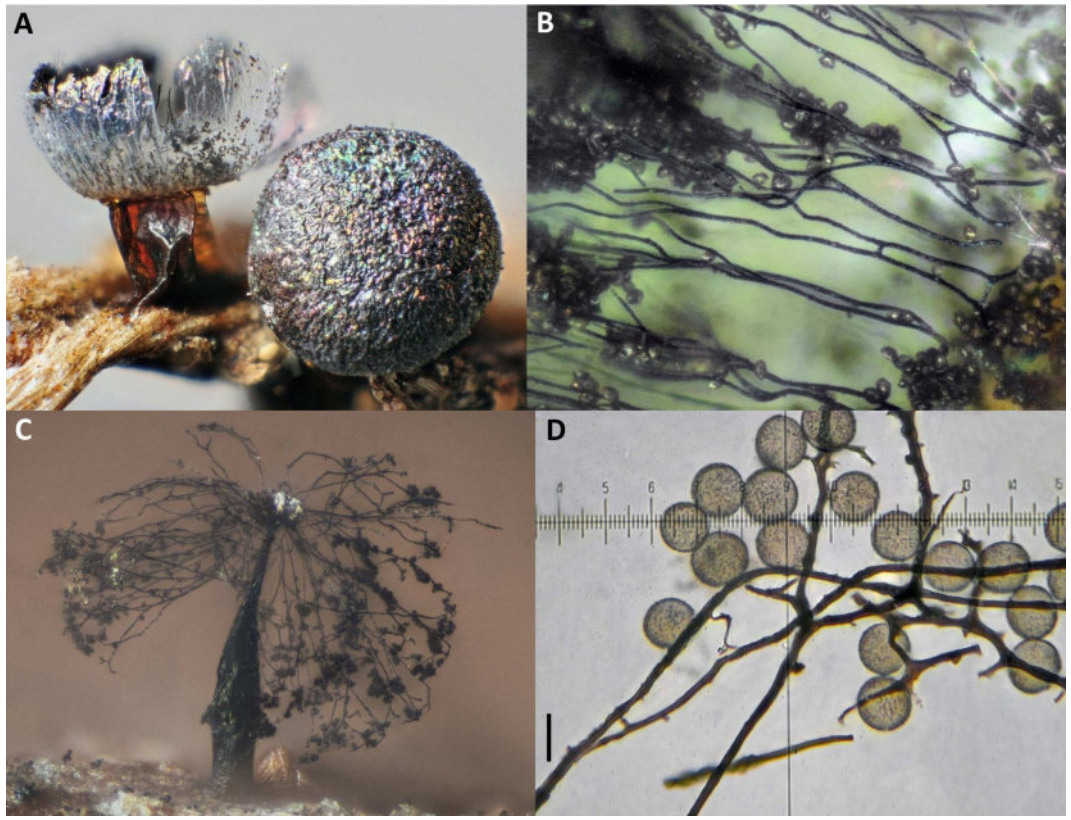


Figure 23. A, B; *Elaeomyxa cerifera* (HG 10.287). A; sporocarps. B; capillitium and spores. C, D; *Enerthenema intermedium* (HG 00.1068). C; sporocarp. D; capillitium and spores. Photos: Helge Gundersen. Scale bar 10 µm.

***Enerthenema intermedium* Nann.-Bremek. & R.L. Critchf.**
Fig. 23 C, D.

These are the first published records from Norway and the Nordic/Baltic region. There are only a few reports from Europe, USA and Taiwan.

This is one of two nivicolous species in the genus. *E. intermedium* differs from *E. melanospermum* (not strictly nivicolous, not known from Norway) by having a smaller apical disc, somewhat smaller spores, and usually a capillitium with short spines.

Material examined:
AUST-AGDER: Bykle, Lundane, IK, PV, RB, EWJ, 22 May 2018, subalpine birch forest with *Juniperus* thicket, *Calluna vulgaris* and grass, on branch of *Betula*, EJ 46-18 (O).
BUSKERUD: Nore og Uvdal, Lian/Åsen, HGG, 24 Jul 2000, rotten log of *Pinus sylvestris?*, alt. 900 m, HG 00.1068.

***Fuligo laevis* Pers.**
Fig. 24 A-C.

There is one unverified report from Norway by Sommerfelt (1826). This is the only previous report from the Nordic/Baltic region. In Europe, *F. laevis* is reported from France, Spain, and The Netherlands, and outside Europe from USA and Canada.

F. laevis macroscopically resembles the more common *F. leviderma* in having a coherent, almost smooth, orange brown to brick red cortex, but differs from the latter in having spores which are distinctly paler on one side.

Material examined:
MØRE OG ROMSDAL: Stranda, Hellesylt, JBJ, OO, 16 Oct 2018, on trunk of standing *Populus tremula*, OOL-18.73 (O).
OPPLAND: Nord-Fron, Massdøla, EWJ, 6 Oct 2018, small herb spruce forest, on massive *Populus tremula* log (O).
ØSTFOLD: Aremark, Budalsvika, IK, TSN, MaO, EW, 12 Aug 2017, *Vaccinium myrtillus* dominated deciduous wood, on deciduous tree log (O).

***Fuligo leviderma* H. Neubert, Nowotny & K. Baumann**
Fig. 24 D.

This species has not previously been reported from Norway. However, it was formally described in 1995 and it is likely that some older specimens in the Norwegian fungaria are identified as *Fuligo septica* var. *rufa*. We have verified approximately 80 more recent collections of *F. leviderma* from Norway, many of which have been collected on *Populus tremula*. The species has been collected in the following counties: Akershus, Aust-Agder, Hedmark, Oppland, Oslo, Sogn og Fjordane, Telemark, Trøndelag, Vestfold, and Østfold. The collections will not be listed here.

***Fuligo luteonitens* L.G. Krieglst. & Nowotny**
Fig. 24 E, F.

These are the first published records from Norway. There are several collections reported from Finland (Härkönen and Varis 2012; Härkönen et al. 1999) and two reports (one of them as cf.) from Sweden (Eliasson 2012; Eliasson and Svensson 2019). Given the known distribution in Europe, one might speculate that *F. luteonitens* has a predominantly Eastern distribution; most collections from Europe are from Finland, Poland, Russia, and Ukraine.

The yellow, coherent, almost smooth cortex and the broadly ellipsoid spores with very few and scattered warts, makes this rather rare species (at least in our region) easy to identify.

Material examined:
MØRE OG ROMSDAL: Stranda, Hellesylt, PGL, OO, 10 Nov 2018, on bark of living *Populus tremula*, OOL-19.40 (O).
TELEMARK: Porsgrunn, Bassebu, IK, KMS, PM, EWJ, JE, 9 Jun 2018, forest edge, on *Populus tremula* (O).
TRØNDELAG: Snåsa, Ålnestangen, SG, IM, 09 Aug 2019, on fallen trunk of *Populus tremula.*
ØSTFOLD: Aremark, Kvernfossen, BEA, 29 Mar 2018, heather dominated pine forest, on *Populus tremula* log, BA-142 (O).

***Hemitrichia calyculata* (Speg.) M.L. Farr**
(Syn.: *H. stipitata* (Massee) T. Macbr.)

Surprisingly, *H. calyculata* has not previously been reported from Norway. There are several reports from our region; Denmark (Bjørnekær 1964, as *H. stipitata*), Finland (Härkönen 1989; Härkönen and Varis 2012), Sweden (Elisasson 1975; Svensson 2010), Latvia (Adamonyte 2006), and Lithuania (Iršėnaitė 2013), and from throughout Europe.

H. calyculata is one of two species with distinctly stalked sporocarps and reticulate spores. It differs from *H. clavata* in having a more abrupt transition from stalk to sporocyst, and in having smaller spores. Also, the apparent «halo» around the spores often observed in *H. clavata* is not seen in *H. calyculata*.

Material examined:
AKERSHUS: Nittedal, Slattum, SM, 25 Aug 2018, small herb spruce forest, on wet wood.
HEDMARK: Stange, Rotlia, PV, 21 Dec 2016, rich deciduous forest, on *Populus tremula* log, PV-R374.

***Hemitrichia leiocarpa* (Cooke) Lister**
(Syn.: *Arcyria leiocarpa* (Cooke) Massee)

The reported specimen was collected in 1965 by Moravec, but it was not published. In our region, the species is only reported from

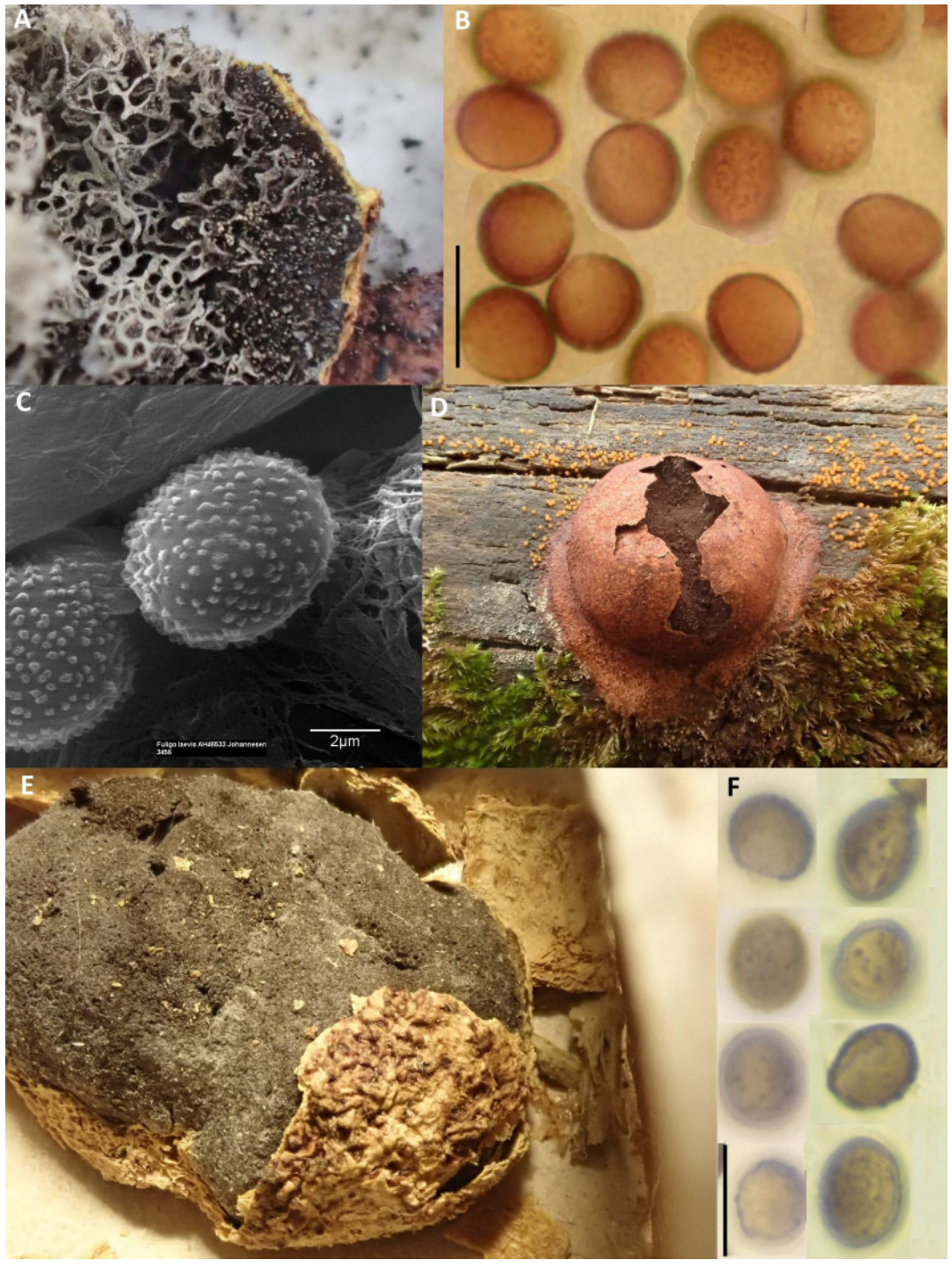


Figure 24. A-C; *Fuligo laevis* (Aremark). A; detail of aethalium with pseudocapillitium. B; spores. C; spores (SEM). D; *Fuligo leviderma* (Leg. RB), aethalium. E, F; *Fuligo luteonitens* (BA-142). E; aethalium. F; spores. Photo: A, B – Edvin Johannesen. C – Gabriel Moreno. D – Reidun Braathen. E, F – Per Vetlesen. Scale bars 2 µm (C), 10 µm (F).

Lithuania (Adamonyte 1999; Adamonyte et al. 2011, 2013, as *Arcyria leiocarpa*). According to Species Fungorum (2019), the current name and author for this species should be *Hemitrichia leiocarpa* (Massee) Lister. We have not dwelled with this nomenclatorial issue. The name and author applied here is according to Lado (2005 - 2020).

Material (not examined by the authors):
HORDALAND: Ulvik, Finse, ZM, Aug 1965, (substrate unknown), http://www.gbif.org/occurrence/78600469 (BPI 833079).

***Hemitrichia minor* G. Lister**
Fig. 25 A-D.

These are the first published records of *H. minor* from Norway. In the Nordic/Baltic region, it has only been reported from Lithuania (Adamonyte 2005). It is frequently encountered in other parts of Europe.

The small, sessile or short-stalked, yellowish or brown sporocarps, the densely spinulose spores, and a capillitium ornamented with irregular spirals and occasional spines and swellings, define the species.

Two of the examined specimens (OOL-18.32 and OOL-19.94), both developed in moist chambers, display a "leopard"-like pattern on the outer peridium. G. Lister (1915) established *H. minor* var. *pardina* Minakata (ex. G. Lister), based on personal communication with Minakata Kumagusu, who had encountered several "leopard-like" specimens alongside "smooth" sporocarps/ plasmodiocarps of *H. minor.* The peridial spots were "acutely raised". Minakata was in no doubt that these were all the same species and indicated that perhaps the spotted ones represented the typical *H. minor,* whereas the smooth ones were "not quite developed". This communication lead G. Lister to establish var. *pardina* in Minakatas name. The capillitium was described as having 4-5 inconspicuous and often irregular spirals (as in the usual form). The illustration given by G. Lister (op. cit) shows spotted plasmodiocarps. Ing (1999) later raised the taxon to species level, as *Hemitrichia pardina* (Minakata) Ing.

Our two spotted specimens are sessile, and the peridial spots are distinct, but not erect like typically described for *Hemitrichia pardina* sensu Poulain et al. (2011). The capillitium fits very well the description given by Neubert et al. (1993, as *H. minor* var. *pardina*) in being branched with few free ends, occasionally with bladder-like swellings up to 7 µm, with 3-4 irregular spiral bands with sharp edges, occasionally "fringed" and with distinct spines, especially at the junctions or swellings.

We have compared the capillitium in all our *H. minor* specimens with our single specimen of *H. pardina* (see below), as well as the ones in Poulain et al. (op. cit), and the two are quite different. In the *H. pardina* specimen cited below, the capillitium is much thinner, with faint spirals and frequent spines. Spore size varies considerably within these species among various authors and we have not emphasised this character.

Further studies will be needed to evaluate whether there are two taxa involved.

Material examined:
MØRE OG ROMSDAL: Volda, Vassbotn, OO, 10 Jan 2018, on *Hylocomium splendens* (used as substrate for hare dung), (MC), OOL-18.32. Volda, Vadstein, OO, 14 Apr 2018, on *Orthotrichum* growing on *Populus tremula*, (MC), OOL-18.45 (O). Volda, Hjellane, OO, 30

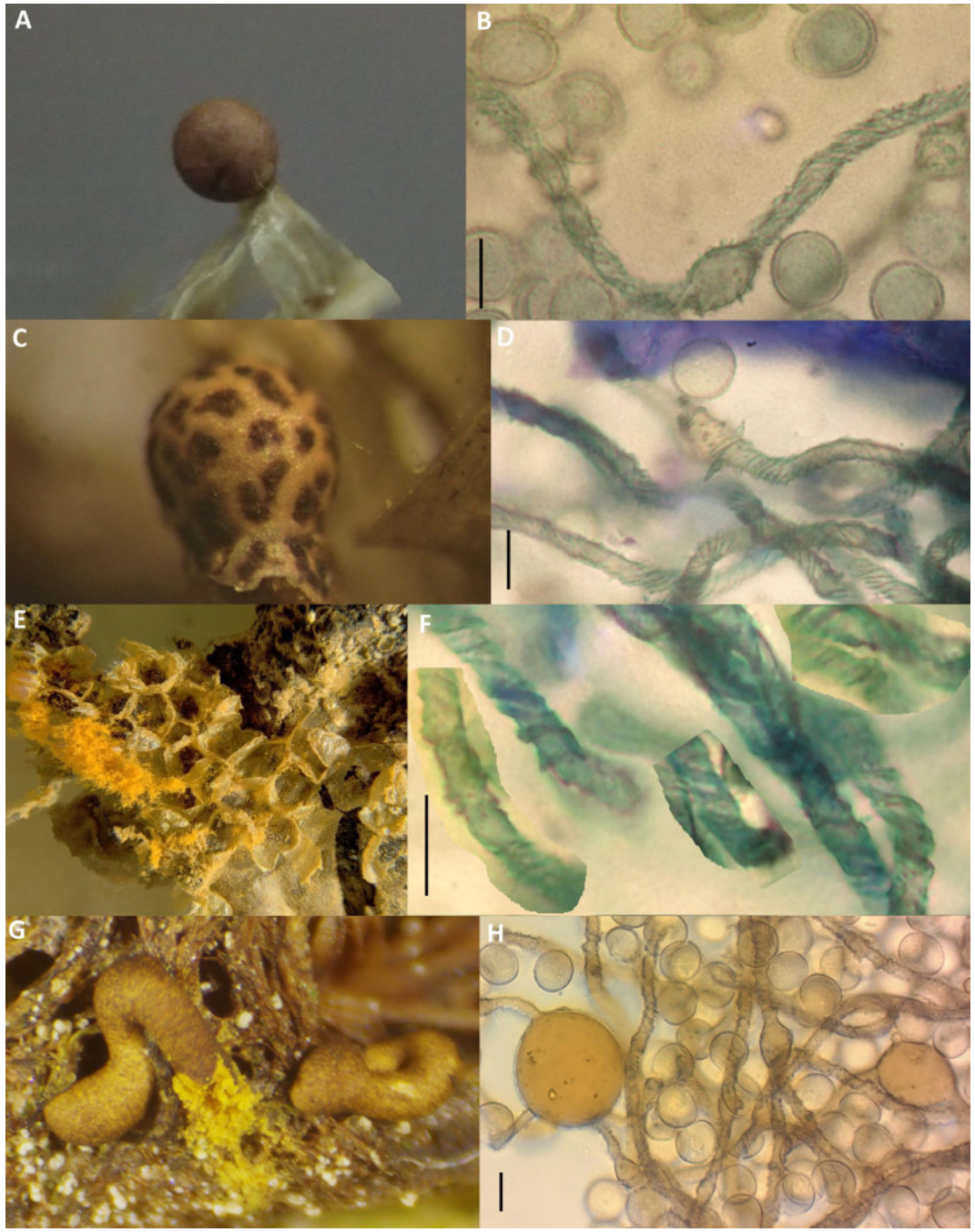


Figure 25. A-D; *Hemitrichia minor* (A, B; OOL-19.48. C, D; OOL 18.32). A, C; sporocarps. B, D; capillitium and spores (cotton blue). E, F; *Hemitrichia* cf. *montana* (PV-S494-B). E; sporocarps. F; capillitium (cotton blue). G, H; *Hemitrichia sordivesiculosa* (PV2273). G; plasmodiocarps. H; capillitium with vesicles, and spores. Photos: A-F – Edvin Johannesen. G, H – Per Vetlesen. Scale bars 10 µm.

Nov 2018, on *Ribes rubrum*, (MC), OOL-19.48 (O). Volda, Eikrem, OO, 11 Mar 2019, in south-west sloping rich deciduous wood with old *Alnus glutinosa* and *Corylus avellana*, on male *Alnus* catkin collected on the ground, (MC), OOL-19.94 (O).
SOGN OG FJORDANE: Solund, Dumba, OO, 5 Mar 2019, on *Isothecium mysosuroides* growing on bark of *Populus tremula*, (MC), OOL-19.87 (O).

***Hemitrichia* cf. *montana* (Morgan) T. Macbr.**
Fig. 25 E, F.

This nivicolous species is not previously reported from Norway, nor from the Nordic/Baltic region. There are scattered reports from elsewhere in Europe and rest of the world.

The specimen studied is not in perfect condition, but it seems normally developed. The orange capillitium is slightly elastic, with quite a few free ends. The threads are irregular in outline, with some bulb-like swellings, bearing warts and spinules, as well as 1-2 rather faint spirals. It is hard to tell whether the spirals are right- or left-handed in our specimen (cfr. *H. montanoides* Mar. Mey. & Poulain). The appearance in December could indicate a nivicolous growth habit (*H. montana* is nivicolous), but this could also be a late autumn species.

Material examined:
HEDMARK: Hamar, Hjellum, PV, 10 Dec 2015, on log of *Populus tremula*, PV-S494B (O).

***Hemitrichia pardina* (Minakata) Ing**
Fig. 26 A, B.

This is the first published record of *H. pardina* from Norway. There are quite many reports from throughout Europe. In our region it is reported from Sweden (Eliasson 2018) and Lithuania (Adamonyte 2005, Adamonyte et al. 2013) and we are aware of a collection from Finland.

H. pardina was originally described as a variety of *H. minor* (see discussion under that species above). In the current concept of *H. pardina*, it is primarily characterised by the prominent, pointed, blackish-brown peridial warts, contrasting against the yellow background. The capillitium consists of sparsely branched, slim threads with quite faint spiral bands and frequent spines, quite unlike *H. minor* (discussed above).

Material examined:
HEDMARK: Stange, Jønsbergvegen 305, PV, 12 Apr 2015, on dead stems of *Filipendula ulmaria*, (MC), PV-F084 (O).

***Hemitrichia serpula* (Scop.) Rostaf. ex Lister**
Fig. 26 C.

These are the first reported records of this species from Norway. From the Nordic/Baltic region, *H. serpula* is reported from Denmark (Raunkiær 1888; Bjørnekær and Klinge 1964; Læssøe and Kemp 2001), Finland (Hintikka 1920; Härkönen 1979; Härkönen and Varis 2012), Sweden (Santesson 1964), and from all three Baltic countries (Adamonyte 1999, 2000, 2006; Iršėnaitė et al. 2013).

This is a very striking species, easily recognised by the shining, reticulate plasmodiocarps, the reticulate spores, and the spiny capillitium.

Material examined:
AKERSHUS: Frogn, Håøya, BA, TrP, EWH, IK, TSN, SM, EWJ, ILW, GMJ, ÅB, THH, 4 May 2013, *Alnus-Fraxinus* forest, on decayed wood, (O).
HEDMARK: Hamar, Furuberget, PV, 2 May 2015, on *Picea abies* in mixed calciphilous forest, PV-S454 (O). Hamar, Furuberget, PV, 1 Sep 2017, on *Picea abies* in mixed calciphilous forest, PV-S620 (O). Hamar, Furuberget, PV, 11 Oct 2019, old timber heap, on log of *Picea abies*, PV2222, PV2223.

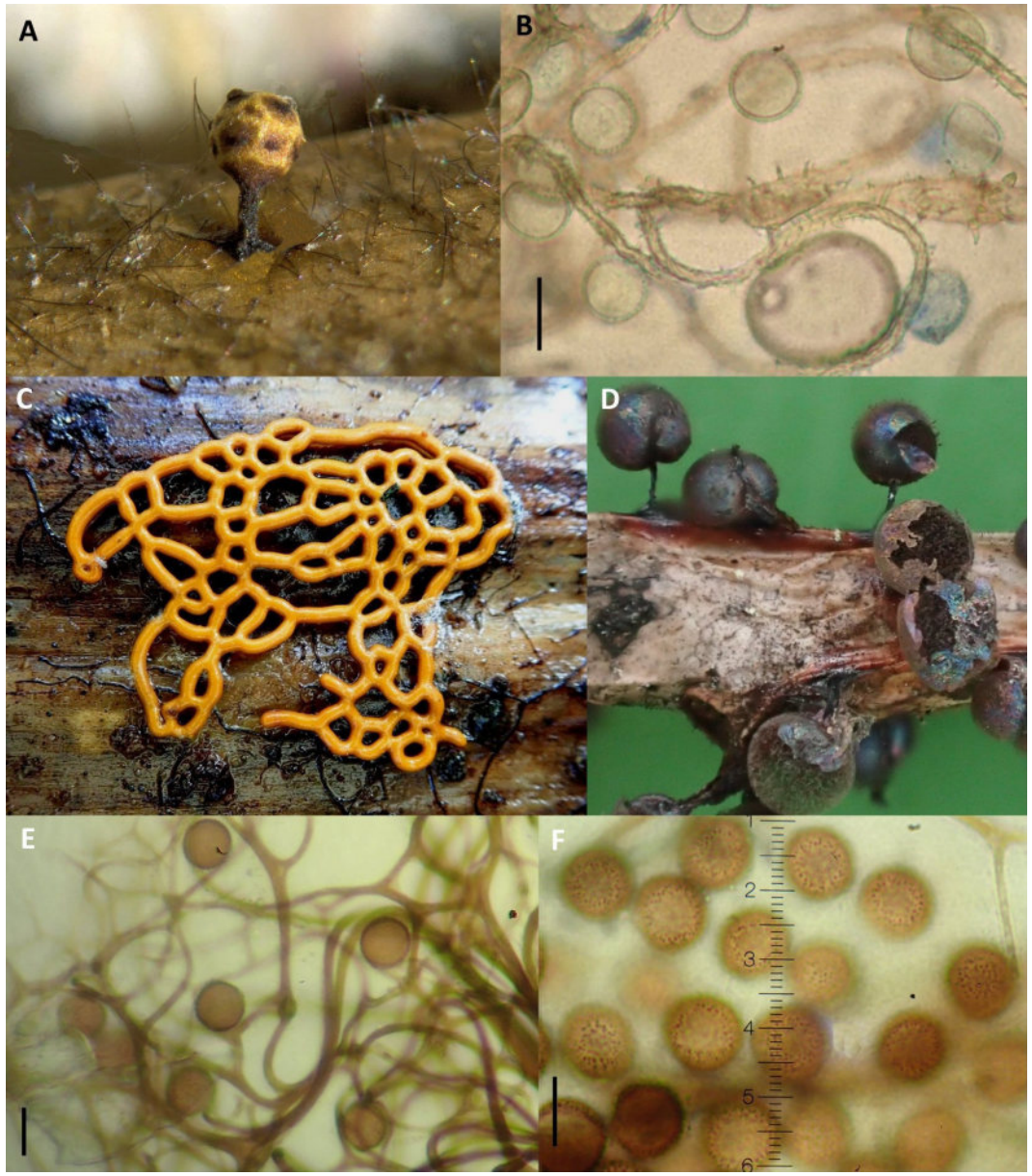


Figure 26. A, B; *Hemitrichia pardina* (PV-F084). A; sporocarp. B; capillitium and spores (cotton blue). C; *Hemitrichia serpula* (PV-S620), plasmodiocarp. D-F; *Lamproderma aeneum* (EJ 69-18). D; sporocarps. E; capillitium and spores. F; spores. Photo: A, B, D-F – Edvin Johannesen. C – Per Vetlesen. Scale bars 10 µm.

VESTFOLD: Larvik, Omrestranda, NH, PM, DM, THM, HMB, AB, 2 Jun 2018, on log in forest.

ØSTFOLD: Halden, Remmendalen, NG, EWJ, HS, SG, BK, 8 Sep 2012, on log of *Picea abies* (?) (O).

***Hemitrichia sordivesiculosa* Kuhnt**
Fig. 25 G, H.
The species was recently described by Kuhnt (2019) and the known previous distribution was Germany, Austria, and France. *H. sordivesiculosa* differs from all other species of *Hemitrichia* by the rather numerous large (up to 30 µm or larger), rounded, spherical or ovoid vesicles in the capillitium, normally filled with a yellow, oily substance (which apparently gradually disappears). The species appears to occur primarily on the bark of living trees and on or among mosses growing on such trees. It is, according to Kuhnt (op. cit.) and our own experience, frequently encountered in moist chambers.

Material examined:
HEDMARK: Hamar, Hjellum, PV, 10 Dec 2015, on *Populus tremula* log near cultivated field. Stange, Enghagan, PV, 24 Feb 2016, mixed forest, on mosses growing on living *Populus tremula*, (MC), PV2280.Stange, Jønsbergveien 305, PV, 10 Feb 2018, on *Clematis* bark in garden, PV-S707. Stange, Rotlia, PV, 6 Feb 2016, in rich deciduous forest, on bark of living *Populus tremula*, (MC). Hamar, Furuberget, PV, 20 Feb 2020, in calciphilous coniferous forest, on mosses on thin twigs of *Picea abies,* 1 m above ground, (MC), PV2276 (O). Hamar, Furuberget, PV, 20 Feb 2020, in calciphilous coniferous forest, on mosses growing on thin twigs of *Juniperus communis*, (MC), PV2273 (O), PV2277 (O), PV2278. Hamar, Furuberget, PV, 28 Jan 2020, in calciphilous coniferous forest, on mosses on thin twigs of *Picea abies,* 1 m above ground, (MC), PV2260. Stange, Jønsbergvegen 305, PV, 11 Feb 2015, on *Syringa* bark in garden. Stange, near Vollbo Congregation Centre, PV, 27 Jan 2020, on bark of *Fraxinus excelsior* near parking lot, (MC), PV2275.
MØRE OG ROMSDAL: Volda, Osdalen, OO, 6 Feb 2019, on mosses growing on bark of living *Ulmus glabra*, (MC).

***Lamproderma aeneum* Mar. Mey. & Poulain**
Fig. 26 D-F.

These are the first published records of this nivicolous species from Norway and the Nordic/Baltic region. There are only scattered reports from elsewhere in Europe, and only from Japan and Argentina outside Europe.

L. aeneum belongs to a group of species with few distinct diagnostic characters. Distingushing it from *L. arcyrioides* is not always easy. We have emphasised the relatively short stalk, the tendency of the sporocarps to have coppery or bronze reflections, the less whitish appearance of the capillitium (in reflected light) after the spores are shed, the presence of a few dark nodules in the capillitium, and the lack of needle-like crystals on the peridium, often present in *L. arcyrioides*.

Material examined:
AKERSHUS: Nittedal, Skytta, SM, EWJ, 2 May 2018, *Vaccinium myrtillus* dominated spruce forest, on ferns and mosses on the ground, near melting snow.
AUST-AGDER: Bykle, Lislefjødd, IK, PV, SM, EWJ, 21 May 2018, on *Betula* leaf in subalpine birch forest, PV-S812. Bykle, Lislefjødd, IK, SM, EWJ, PV, 21 May 2018, in subalpine birch forest, on *Vaccinium myrtillus*, PV-S842 (O).
HEDMARK: Hamar, Ormsætertajet, PV, 26 Apr 2019, in spruce forest near melting snow, on *Sorbus aucuparia*, PV2028 (O).
TELEMARK: Tokke, Øyfjell, IK, PV, SM, EWJ, 23 May 2018, on *Vaccinium myrtillus* in spruce forest, EJ 31-18 (O). Tokke, Øyfjell, IK, PV, SM, EWJ, 23 May 2018, on *Vaccinium myrtillus* in spruce forest, EJ 69-18 (O).

***Lamproderma album* H. Neubert, Nowotny & K. Baumann**
Fig. 27 A-D.

This nivicolous species is not previously reported from Norway or the Nordic/Baltic region. Most other reports worldwide are from Europe (a few from Japan).

In the studied specimens, some sporocarps have a dark base, gradually turning bluish, and then bronze towards the apex. We have emphasised this character along with the predominantly colourless capillitium (pale brown near the columella), but we are aware that *L. album* is closely related to *L. arcyrioides*.

Figure 27. A-D; *Lamproderma album* (PV- S756). A, B; sporocarps. C, D; spores and capillitium. E, F; *Lamproderma* cf. *argenteobrunneum* (PV-S811). E; sporocarps. F; spores. Photos: A, B, E – Per Vetlesen. C, D, F – Edvin Johannesen. Scale bars 10 µm.

Material examined:
HEDMARK: Hamar, Gåsbu, PV, 12 May 2018, spruce forest near melting snow, on *Lycopodium annotinum* and *Picea abies* needles, PV-S756 (O).
TELEMARK: Tokke, Øyfjell, IK, PV, SM, EWJ, 23 May 2018, *Vaccinium myrtillus* dominated spruce forest, on *Calluna vulgaris*, EJ 112-18 (O).

***Lamproderma* cf. *argenteobrunneum* A. Ronikier, Lado & Mar. Mey.**
Fig. 27 E, F.

This nivicolous species has not previously been reported from Norway or the Nordic/Baltic region. Other published records worldwide are from Austria, France, Poland, Spain, and USA.

We are by no means fully convinced that this specimen represents *L. argenteobrunneum.* The silvery grey, sessile sporocarps certainly point in that direction. The spore ornamentation (warts, some of which fuse into short ridges) is similar to what is described and depicted in Poulain et al. (2011), as well as in the original description (Ronikier et al. 2010). Furthermore, we have observed some light refractive grooves or needle-like structures in the peridium, also a feature of *L. argenteobrunneum.* The spores are much larger (15-17 µm) than normal for *L. argenteobrunneum,* but large-spored forms are not uncommon in *Lamproderma*. We have also observed that the peridium appears to partly "dissolve" and disappear in KOH. Our specimen may represent an abnormal form of *L. spinulosporum*.

Material examined:
AUST-AGDER: Bykle, Lislefjødd, IK, PV, SM, EWJ, 21 May 2018, on herbaceous stem in subalpine birch forest, PV-S811 (O).

***Lamproderma cacographicum* Bozonnet, Mar. Mey. & Poulain**
Fig. 28 A, B.

These are the first reported findings of *L. cacographicum* from Norway. Gøtzsche (1984) reported it from Iceland (as *Lamproderma* sp. at the time). The only additional reports we are aware of are from France, Russia, and the Philippines.

In its typical form, *L. cacographicum* is easily recognised by the unique spore ornamantation consisting of fine, low crests, arranged in sinuous or broken lines. It is a strictly nivicolous species.

Material examined:
OPPLAND: Vang, Tyin, IK, PV, RB, EWJ, 8 Jun 2017, on *Vaccinium myrtillus* near melting snow, EJ 25-17 (O).
Vestre Slidre, Bukonofjellet, IK, PV, RB, EWJ, 9 Jun 2017, on twig, probably of *Salix* sp., 10 m from snowbank, EJ 20-17 (O).

***Lamproderma cristatum* Meyl.**
Fig. 28 C-H.

L. cristatum is a nivicolous species which is not previously reported from Northern Europe. According to Marianne Meyer (pers. comm.), the species has been collected twice in Eastern Finland (North Karelen). It seems to be widespread in mountainous areas in France and Switzerland, but rare elsewhere (Germany, Italy, Russia, USA, Japan).

The coarse crests on the spore surface are unique within the genus. In collection EJ 60-18 (cf.), the spore ornamentation is transitional between *L. cristatum* and *L. cacographicum,* so the identification is somewhat uncertain. Collection PV-S745 is however typical in all characters.

Material examined:
AUST-AGDER: Bykle, Hovden, Lundane, IK, PV, SM, EWJ, 22 May 2018, on twig of *Betula*, near melting snow in subalpine birch forest, EJ 60-18 (O).
HEDMARK: Stange, Stor-Reemarka, PV, 30 Apr 2018, on grass in spruce forest near melting snow, PV-S745 (O).

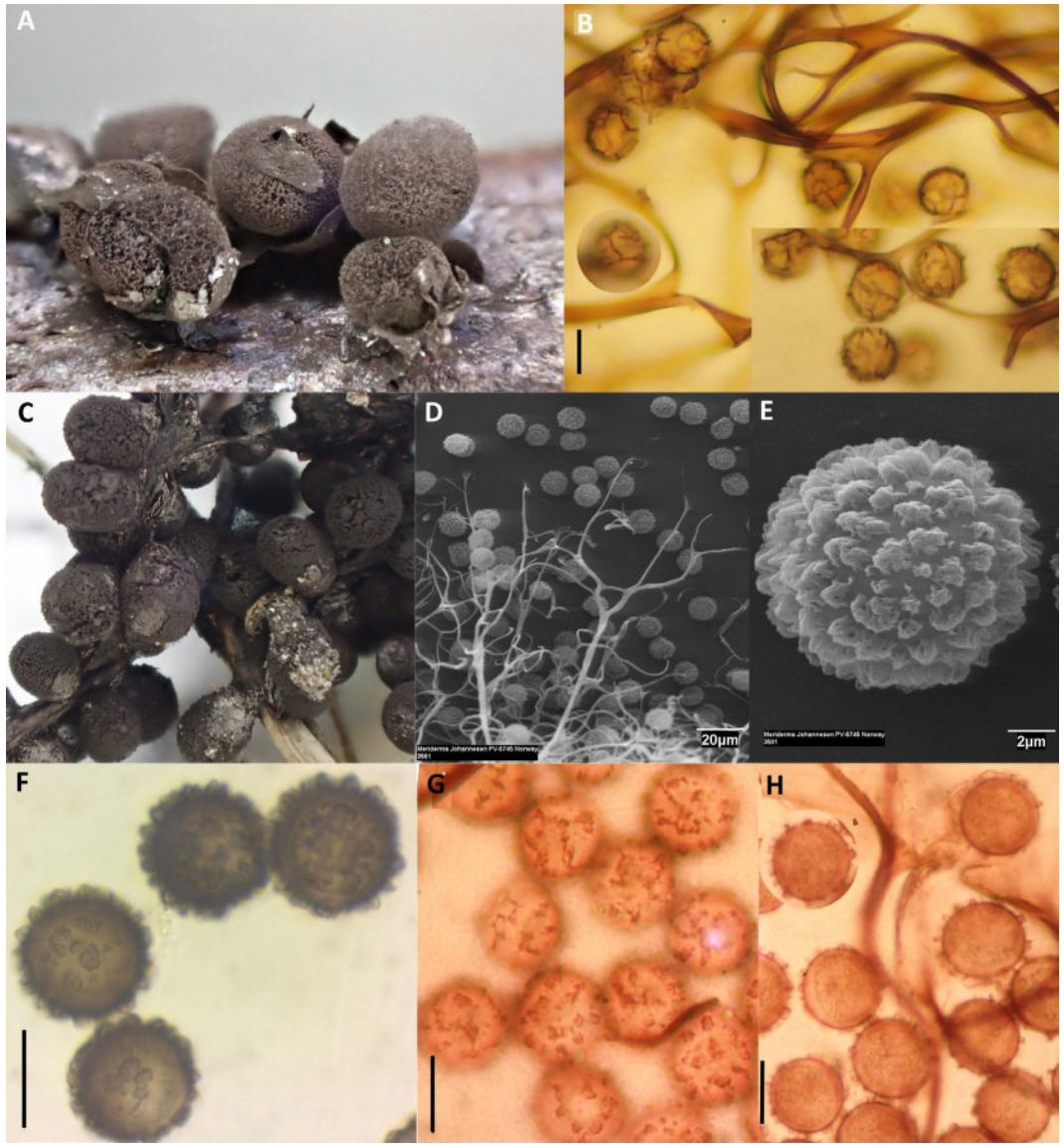


Figure 28. A, B; *Lamproderma cacographicum* (EJ 20-17). A; sporocarps. B; capillitium and spores. C-H; *Lamproderma cristatum* (C-F; PV-S745. G, H; EJ 60-18). C; sporocarps. D; spores and capillitium (SEM). E; spore (SEM). F; spores. G, H; spores and capillitium. Photo: A-C, G, H – Edvin Johannesen. D, E – Gabriel Moreno. F – Per Vetlesen. Scale bars 10 µm (B, F, G, H), 20 µm (D), 2 µm (E).

***Lamproderma echinosporum* Meyl.**
Fig. 29 A, B.

Johannesen (1982, 1984a) reported this species from Norway (Akershus). The only additional report from our region is from Finland (Härkönen and Varis 2012).

L. echinosporum macroscopically resembles *L. maculatum* and *L. pseudomaculatum* in having a mottled peridium. It differs by having paler spores with rather distant, long (ca. 1 µm) spines. Furthermore, the perispore tends to become detached on one side, giving the spores an "eyeball" appearance.

Collection EJ 77-18 is somewhat atypical in being sessile to almost plasmodiocarpous.

Material examined:
AKERSHUS: Nittedal, Bjønndalen, SM, 30 Apr 2019, in small herb spruce forest, on *Vaccinium myrtillus*.
AUST-AGDER: Bykle, Lislefjødd, IK, PV, SM, EWJ, 21 May 2018, in subalpine birch forest, on herbaceous stem, PV-S811. Bykle, Lislefjødd, IK, PV, SM, EWJ, 21 May 2018, subalpine birch forest, in wet slope with *Betula*, *Juniperus*, *Salix*, grasses and tall herbs, on thin twig of *Betula*, EJ 77-18 (O), EJ 143-18 (O), EJ 149-18 (O). Bykle, Lislefjødd, IK, PV, SM, EWJ, 21 May 2018, subalpine birch forest, in wet slope with *Betula*, *Juniperus*, *Salix*, grasses and tall herbs, on dead grass and herbaceous stems, EJ 148-18 (O).
HEDMARK: Hamar, Gåsbu, PV, 12 May 2018, roadside near melting snow, on fern, PV-S826. Stange, Stor-Reemarka, PV, 30 Apr 2018, on grass near melting snow, PV-S737 (O).
OPPLAND: Vang, Tyin, IK, PV, RB, EWJ, 8 Jun 2017, on herbaceous stems near melting snow, EJ 5-17 (O).
VESTFOLD: Larvik, Gamlestulen, NH, PM, DM, 4 Jul 2018, on lichen in rich deciduous forest.

***Lamproderma lycopodiicola* Kuhnt**
Fig. 29 C, D.

Kuhnt (2011) described this nivicolous species, partly based on collections from Norway (Trøndelag and Nordland). The only additional reports of this recently described species are from Germany and Canada (Kuhnt 2011), and Scotland (Kuhnt 2011; Fiore-Donno et al. 2012).

In the spring of 2018 (with exceptionally thick snow cover), *L. lycopodiicola* was found in the lowland (Oslo area), and in the mountainous areas around Hovden (Aust-Agder) it was quite common. Collections EJ 160-18 and EJ 43-18 (cf.), which likely represent the same plasmodium, resemble a *Diacheopsis* in lacking a columella, but according to Kuhnt (op. cit), a columella is often lacking in *L. lycopodiicola*. Furthermore, these scanty sporocarps were found on twigs of *Betula/Salix*, rather than *Lycopodium annotinum*, a substrate to which the species apparently is restricted. However, Kuhnt (pers. comm.) claims that the plasmodia occasionally move onto substrates adjacent to *L. annotinum*.

Material examined:
AKERSHUS: Nittedal, SM, 7 May 2018, on *Lycopodium annotinum* in *Vaccinium myrtillus*-dominated spruce forest, SM-18.24. Nittedal, SM, 16 May 2018, on *Lycopodium annotinum* in *Vaccinium myrtillus*-dominated spruce forest. Nittedal, Gjelleråsen, SM, 23 Apr 2019, in *Vaccinium myrtillus* dominated spruce forest, on *Lycopodium annotinum*.
AUST-AGDER: Bykle, Hovdenuten, IK, PV, SM, EWJ, 22 May 2018, on *Lycopodium annotinum* in subalpine birch forest, EJ 86-18, EJ 160-18, PV-S798, PV-S800, PV-S801, PV-S814. Bykle, Hovdenuten, IK, PV, SM, EWJ, 22 May 2018, on thin twig of *Betula* in subalpine birch forest (near *Lycopodium annotinum*), EJ 43-18.
BUSKERUD: Krødsherad, Norefjell alpine ski resort, IK, PV, SM, EWJ, 21 May 2019, in subalpine birch forest, 880 m alt., on *Lycopodium annotinum*, PV2089.
HEDMARK: Ringsaker, Sjusjøen, Sollifjell, AGJ, GNG, 25 May 2016, on *Lycopodium annotinum* near melting snow, 900 m alt., HG 16.01 (O).
TELEMARK: Vinje, Roi, IK, PV, SM, EWJ, 23 May 2018, on *Lycopodium annotinum* in subalpine birch forest, PV-S815. Tokke, Øyfjell, IK, PV, SM, EWJ, 23 May 2018, on *Lycopodium annotinum* in spruce forest.

***Lamproderma maculatum* Kowalski**
Fig. 29 E, F.

Johannesen (1982, 1984a) reported this species from Norway (Hordaland, Ulvik). The only additional reports from our region are from Finland (Härkönen 1979; Härkönen and Varis 2012).

The species is characterised by the mottled peridium, the dark brown, densely warted

Figure 29. A, B; *Lamproderma echinosporum* (EJ 5-17). A; sporocarps. B; spores. C, D; *Lamproderma lycopodiicola* (PV-S798). C; sporocarps. D; spores. E, F; *Lamproderma maculatum* (EJ 87-18). E; sporocarps. F; spores and capillitium. Photo: A-D – Per Vetlesen. E, F – Edvin Johannesen. Scale bars 10 µm.

spores, paler on one side, and the dark brown capillitium with rather thick, stiff free ends.

Material examined:
AUST-AGDER: Bykle, Hovdenuten, IK, PV, SM, EWJ, 22 May 2018, subalpine birch forest with *Juniperus*, *Empetrum*, *Vaccinum* and *Lycopodium*, on branch and twig of *Betula*, EJ 41-18 (O), EJ 44-18 (O), EJ 87-18 (O).
BUSKERUD: Sigdal, Tempelsetra, IK, PV, SM, EWJ, 20 May 2019, road slope with *Salix* spp., on *Betula* and *Salix* twigs, PV2081. Sigdal, Tempelsetra, IK, PV, SM, EWJ, 21 May 2019, subalpine zone with *Betula*, *Empetrum*, and *Juniperus*, near melting snow, on fern leaf, 950 m alt., EJ 04-19 (O). Hol, Geilo, IMA, 16 Jun 2005 (not examined by the authors). http://www.gbif.org/occurrence/78607957 (DEF20478).
OPPLAND: Vestre Slidre, Bjødnhøvd, IK, TSN, EWJ, 27 Jul 2017, on twig in subalpine birch forest (O).

***Lamproderma nigrescens* (Rostaf.) Rostaf.**
(Non *L. nigrescens* Sacc.)
Fig. 30 A, B.

The worldwide distribution of *L. nigrescens* is highly uncertain due to taxonomic (and nomenclatorial) confusion related to this and related taxa.

Marianne Meyer (pers. comm.) has studied the *L. arcyrioides* group in detail, including type specimens. She has concluded that *L. nigrescens* Rostaf. is a non-nivicolous species and she has kindly confirmed the identity of our specimen from Vestfold (based on photos). Meyer has studied specimens of *L. nigrescens* (sensu Meyer) from France, Germany, Denmark, Switzerland, and Japan, initially mis-identified as *L. arcyrioides*. It should be noted that the AG-001 specimen has splinters on the peridium, but it is otherwise very similar to the Vestfold specimen. See comments under *L. violaceum* below.

Material examined:
VESTFOLD: Stokke, Bokemoa, MF, NH, PM, SH, 1 Nov 2018, on *Fagus sylvatica* log in beech forest (O).
SOGN OG FJORDANE: Gulen, Brosviksåta-Paddebakkane, ArG, 15 Aug 2016, roadside in pine forest, on mosses, AG-001 (O).

***Lamproderma ovoideoechinulatum* Mar. Mey. & Poulain**
Fig. 30 C-E.

These are the first published records of this nivicolous species from Norway and the Nordic/Baltic region. There are several reports from further south in Europe, but outside Europe only from Japan.

L. ovoideoechinulatum is characterised by the pear-shaped (narrower at the basis), rather short-stalked sporocarps, the dense, dark brown capillitium, and the echinulate spores, with ornamentation rather lax and irregularly distributed.

Collection EJ 34-18 may represent var. *microsporum* Mar. Mey. & Poulain, with longer stalks and smaller, somewhat paler spores. Collection PV2091 also has smaller spores and possibly also represents var. *microsporum*, however deviates in having primarily sessile sporocarps.

Material examined:
AKERSHUS: Nittedal, Skytta, SM, EWJ, 2 May 2018, *Vaccinium myrtillus* dominated spruce forest near snow, on ferns and mosses, EJ 01-18 (O). Nittedal, Bjønndalen, SM, 30 Apr 2019, in small herb spruce forest, on *Vaccinium myrtillus*. Asker, Hallenåsen, SM, 15 May 2019, in small herb spruce forest, on last years fern leaf. Eidsvoll, Feiring Øverbygd, KNT, 5 May 2019, on living twig of *Sorbus aucuparia*, near the ground.
AUST-AGDER: Bykle, Lislefjødd, IK, PV, SM, EWJ, 21 May 2018, subalpine birch forest, on *Betula* and *Salix*, PV-S778 (O). Bykle, Lundane, IK, PV, SM, EWJ, 22 May 2018, subalpine birch forest with *Juniperus*, *Calluna* and grasses, on grasses and bark of *Betula*, EJ 22-18 (O), EJ 29-18 (O), EJ 94-18 (O). Bykle, Hovden, Lislefjødd, IK, PV, SM, EWJ, 21 May 2018, subalpine birch forest in moist slope with *Betula*, *Juniperus*, *Salix*, grasses and tall herbs, on thin *Salix* twig, EJ 34-18 (O).
BUSKERUD: Krødsherad, Norefjell skisenter, IK, PV, SM, EWJ, 21 May 2019, in *Salix*-dominated rivulet slope, on herbaceous stem, 880 m alt., EJ 08-19, (O). Sigdal, Tempelsetra, IK, PV, SM, EWJ, 20 May 2019, *Salix*-dominated road slope, on *Betula* shoot, PV2082. Sigdal, Tempelsetra, IK, PV, SM, EWJ, 21 May 2019, in subalpine birch forest, on dead ferns and *Chamerion angustifolium* 950 m alt.
HEDMARK: Trysil, Trysilfjellet, PV, 16 Jun 2017, in *Vaccinium myrtillus* dominated heath near melting snow, PV-S589 (O). Hamar, Ormsætertajet, PV, 29

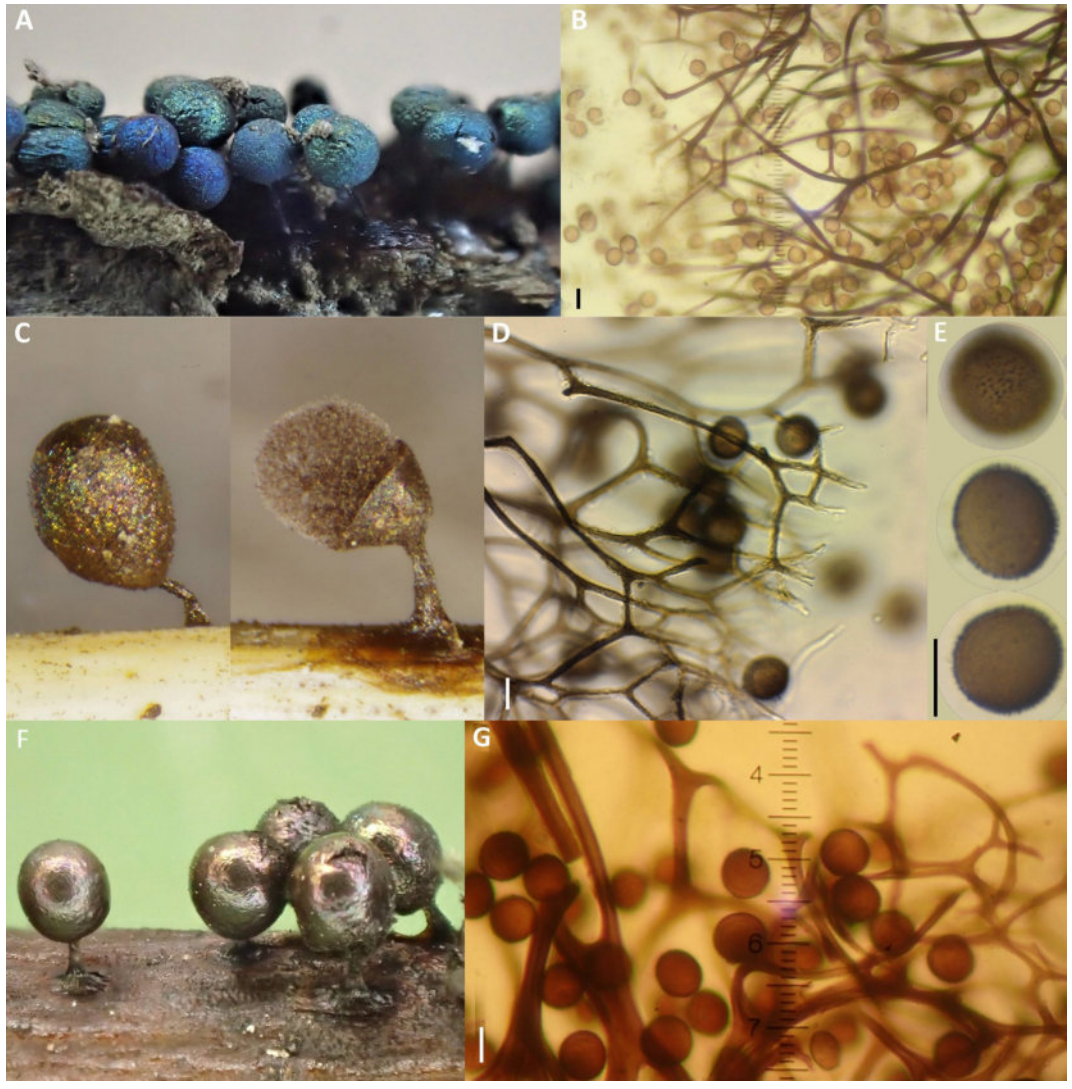


Figure 30. A, B; *Lamproderma nigrescens* (Stokke). A; sporocarps. B; capillitium and spores. C-E; *Lamproderma ovoideoechinulatum* (PV-S593). C; sporocarps. D; capillitium and spores. E; spores. F, G; *Lamproderma ovoideum* (EJ 144-18). F; sporocarps. G; capillitium and spores. Photo: A, B, F, G – Edvin Johannesen. C-E – Per Vetlesen. Scale bars 10 µm.

Apr 2018, spruce forest near snow, on grass and heather, PV-S724, PV-S727, PV-S731. Hamar, Gåsbu, PV, 12 May 2018, roadside near melting snow, on various plant litter, PV-S762, PV-S763A (O). Elverum, Nordhue, PV, 8 Jun 2018, spruce forest, on *Rubus*, PV-S829. Løten, Nordhue, PV, 8 Jun 2018, spruce forest, on herbaceous stem, PV-S831. Hamar, Ormsætertajet, PV, 26 Apr 2019, in spruce forest near melting snow, on *Vaccinium myrtillus*, PV2013 (O), PV2018, PV2027. Hamar, Ormsætertajet, PV, 29 Apr 2019, in spruce forest near melting snow, on grasses and *Betula* shoot, PV2067, PV2009. Trysil, Trysilfjellet sør, PV, 7 Jun 2019, alpine ski slope, on *Betula*, 566 m alt., PV2091 (O). Løten, Nordhuelia, PV, 3 May 2019, Spruce forest near melting snow, on *Rubus idaeus*, PV2079. Trysil,

Trysilfjellet sør, PV, 7 Jun 2019, alpine ski slope, on *Chamerion angustifolium,* 470 m alt., PV2099, PV2103.
OPPLAND: Vang, Tyin, IK, PV, RB, EWJ, 8 Jun 2017, snow bed with *Salix* on dead stem of *Geranium* and thin twig of *Salix*, EJ 4-17, EJ 8-17 (O). Vestre Slidre, Tildheim, EWH, RB, RvK, 19 May 2018, edge of rivulet. Nord-Aurdal, Hippesbygdi, 21 May 2018, in ditch.
TELEMARK: Vinje, Haukeliseter, PV, 27 Jun 2017, mountain heath on grass, PV-S593 (O). Hjartdal, Ambjørndal, PV, 21 May 2018, roadside, on *Matteuccia struthiopteris* and grass, PV-S770.

***Lamproderma ovoideum* Meyl.**
Fig. 30 F, G.

These are the first published records of *L. ovoideum* from Norway. In our region, it has been collected in Finland (Härkönen and Varis 2012).

The predominantly ellipsoid to obovoid (more rarely subglobose), short-stalked sporocarps of this species look very similar to *L. ovoideoechinulatum* and *L. piriforme*. *L. ovoideoechinulatum* has distinctly echinulate spores, with a lax, irregular distribution of the spines, *L. piriforme* has densely and regularly spinulose, larger spores, whereas *L. ovoideum* has warted (or very finely spinulose) spores, with warts densely and regularly arranged. All three species have dark brown spores which are paler on one side, and a dense and dark capillitium, and they are obviously closely related.

Material examined:
AKERSHUS: Eidsvoll, Feiring Øverbygd, KNT. 5 May 2019, on *Rubus idaeus* twig near the ground. Nittedal, Varingskollen, SM, 27 May 2019, alpine ski slope with ski patches, SM-19.015.
AUST-AGDER: Bykle, Lislefjødd, IK, PV, SM, EWJ, 21 May 2018, subalpine birch forest in moist slope with *Betula*, *Juniperus*, *Salix*, grasses and tall herbs, on stem of tall herb and *Betula* twigs, EJ 32-18 (O), EJ 33-18 (O), EJ 78-18 (O), EJ 144-18, (O), EJ 147-18 (O). Bykle, Hovdenuten, IK, PV, SM, EWJ, 22 May 2018, subalpine birch forest with *Juniperus, Empetrum, Vaccinium*, and *Lycopodium*, on *Betula* branch, EJ 84-18 (O). Bykle, Lundane, IK, PV, SM, EWJ, 22 May 2018, subalpine birch forest with *Juniperus*, *Calluna* and grasses, on thin twig of *Betula, Comarum palustre* and grasses, EJ 26-18 (O), EJ 48-18 (O), EJ 49-18 (O), EJ 50-18 (O). Bykle, Lundane, IK, PV, SM, EWJ, 22 May 2018, roadside in subalpine birch forest, on twigs of *Salix* and *Betula*, EJ 58-18 (O), EJ 59-18 (O), EJ 137-18 (O).
BUSKERUD: Sigdal, Tempelsetra, IK, PV, SM, EWJ, 21 May 2019, in subalpine birch forest, on stems of *Chamerion angustifolium* near melting snow, 950 m alt. Røyken, Katrineåsen, SM, 26 Jun 2019, on branches of *Sambucus nigra*.
HEDMARK: Hamar, Gåsbu, PV, 12 May 2018, spruce forest near melting snow, on *Vaccinium myrtillus*, PV-S757. Hamar, Ormsætertajet, PV, 26 Apr 2019, in spruce forest near melting snow, on grass and *Rubus idaeus*, PV2004 PV2020 PV2023 PV2024 PV2025, PV2019 (O), PV2031. Hamar, Ormsætertajet, PV, 29 Apr 2019, in spruce forest near melting snow, on dead herbs and leaves, *Salix* and *Sorbus* leaves and twigs, PV2006 (O), PV2048, PV2051, PV2045 (O), PV2052, PV2054, PV2055 (O), PV2057, PV2065 (O). Trysil, Trysilfjellet sør, PV, 7 Jun 2019, alpine ski slope, on *Salix* and *Chamerion angustifolium*, 470 m alt., PV2101, PV2104.
MØRE OG ROMSDAL: Nesset, Rangåfjellet, EWH, IK, RB, EWJ, WEJ, JOA, 1 May 2011, *Ulmus-Tilia* forest, on herbaceous stem (O).
OPPLAND: Vestre Slidre, Bukonofjellet, IK, PV, RB, EWJ, 9 Jun 2017, on herbaceous stem near melting snow, EJ 27-17. Vestre Slidre, Braka, RvK, 23 May 2018, tall herb dominated forest, on *Aconitum septentrionale.*

***Lamproderma piriforme* (Meyl.) Mar. Mey. & Poulain**
Fig. 31 A-C.

This is the first published record of *L. piriforme* from Norway and the Nordic/Baltic region. It was previously known from Italy, France, Switzerland, and Japan.

The delimitation from *L. ovoideoechinulatum* and *L. ovoideum* is briefly discussed under the latter.

Material examined:
AUST-AGDER: Bykle, Lundane, IK, PV, SM, EWJ, 22 May 2018, subalpine birch forest, on *Betula* twig and leaf, grass, and *Vaccinium myrtillus*, PV-S779 (O), PV-S782 (O).

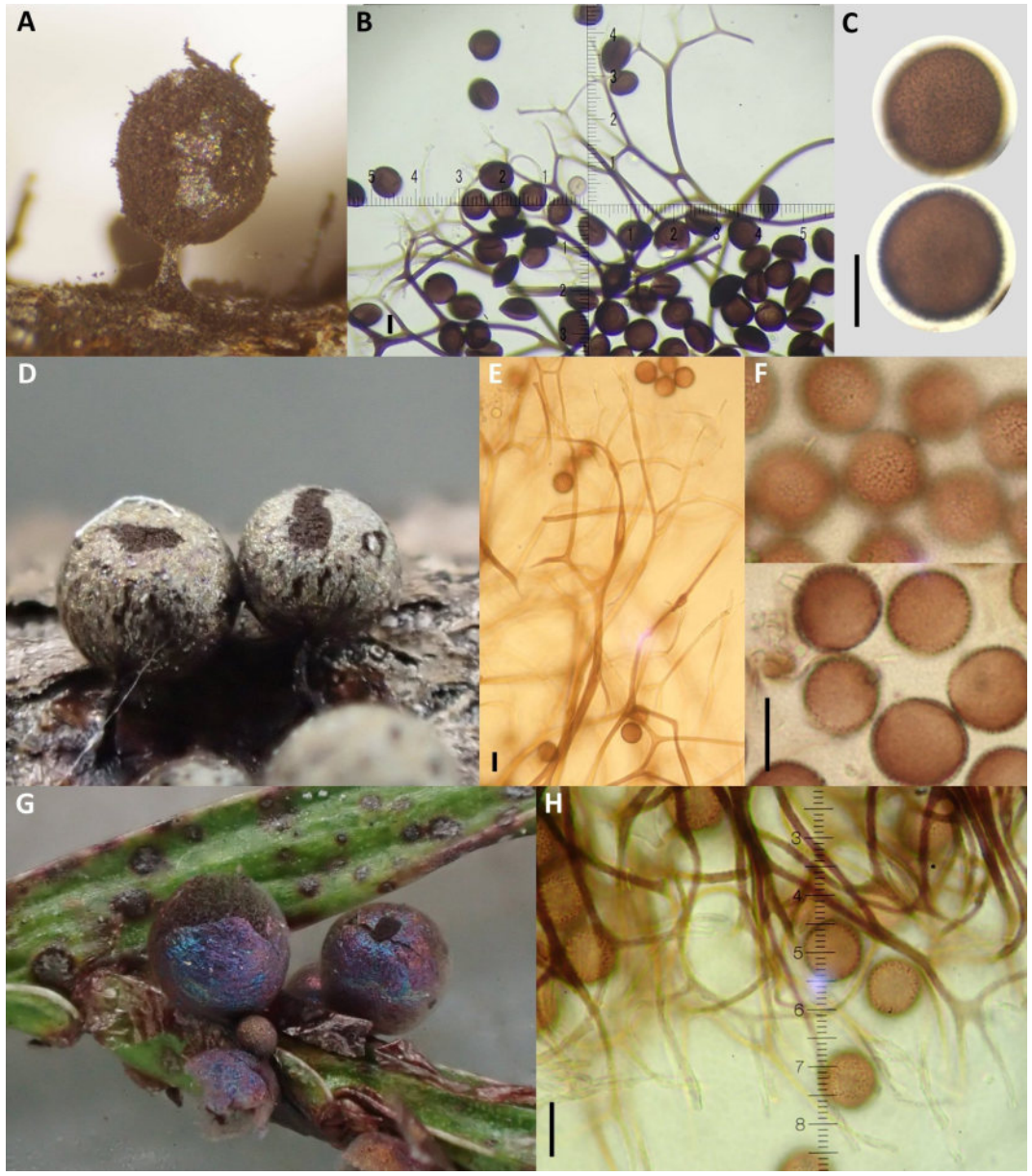


Figure 31. A-C; *Lamproderma piriforme* (PV-S779). A; sporocarp. B; capillitium and spores. C; spores. D-F; *Lamproderma pseudomaculatum* (EJ 3-17). D; sporocarps. E; capillitium and spores. F; spores. G, H; *Lamproderma pulchellum* (EJ 67-18). G; sporocarps. H; capillitium and spores. Photo: A-C – Per Vetlesen. D-H – Edvin Johannesen. Scale bars 10 µm.

***Lamproderma pseudomaculatum* Mar. Mey. & Poulain**
Fig. 31 D-F.

This nivicolous species has not previously been reported from Norway. There are published records from Finland (Härkönen and Varis 2012) and Sweden (Eliasson and Adamonyte 2009) and scattered recorded collections from France, Italy, Spain, Russia, and Japan.

The Norwegian specimen superficially resembles *L. aeneum*, but the perdium is mottled and faint brown areas can be seen in the microscope. Furthermore, the spores measure 12-13 µm and are distinctly and densely warted-spinulose, which is consistent with *L. pseudomaculatum*.

Material examined:
OPPLAND: Vang, Tyin, IK, PV, RB, EWJ, 8 Jun 2017, *Salix* thicket near snow, on twig of living *Salix*, EJ 3-17 (O).

***Lamproderma pulchellum* Meyl.**
Fig. 31 G, H.

These are the first published records from Norway and Northern Europe. There are quite a few reports from Central and Southern Europe, but elsewhere only in Russia (Murmansk and Karachay–Cherkess).

L. puchellum is closely related to *L. splendidissimum* (see below), but normally has shorter stalks and a paler capillitium which is almost colourless at the periphery.

Material examined:
AUST-AGDER: Bykle, Lislefjødd, IK, PV, SM, EWJ, 21 May 2018, subalpine birch forest in moist slope with *Betula*, *Juniperus*, *Salix*, grasses and tall herbs, on *Betula* twigs, EJ 81-18 (O), EJ 82-18 (O).
BUSKERUD: Røyken, Hallenåsen, SM, JT, 4 Apr 2019, heather dominated pine forest, on *Calluna vulgaris*, SM-19.001 (O). Sigdal, Tempelsetra, IK, PV, SM, EWJ, 21 May 2019, in subalpine birch forest with *Empetrum* spp. and *Juniperus communis*, near snow, on dead ferns and *Chamerion angustifolium*, 950 m alt., EJ 02-19 (O).
SOGN OG FJORDANE: Årdal, Mannsbergi, SM, 9 Jun 2018, alpine zone at 1430 m alt. SM-18.40 (O).
TELEMARK: Tokke, Øyfjell, IK, PV, SM, EWJ, 23 May 2018, *Vaccinium myrtillus* dominated spruce forest, on *Vaccinium myrtillus*, EJ 67-18 (O).

***Lamproderma pulveratum* Mar. Mey. & Poulain**
Fig. 32 A, B.

This nivicolous species has not previsouly been reported from Norway or the Nordic/Baltic region. There are quite a few reports from Europe, from Russia outside Europe, and from Argentina.

L. pulveratum is closely related to *L. arcyrioides* and *L. album*, but the rather conspicuous, regularly distributed warts, well contrasted against the unusually pale spore wall, makes the species easily recognisable.

Material examined:
AUST-AGDER: Bykle, Hovdenutkollen, IK, PV, SM, EWJ, 23 May 2018, subalpine birch forest, on grass, PV-S790 (O).
HEDMARK: Stange, Stor-Reemarka, PV, 30 Apr 2018, spruce forest near melting snow, on mosses and *Vaccinium vitis-idaea*, PV-S739, PV-S740 (O).

***Lamproderma puncticulatum* Härk.**
Fig. 32 C-E.

This is the first published collection of this non-nivicolous species from Norway. In our region, it has previously only been recorded from Finland, from where it was originally described (Härkönen 1978, 1979; Härkönen and Varis 2012; Ronikier and Lado 2015). Apart from Norway and Finland, *L. puncticulatum* is known from France, Germany, and Portugal.

Apart from the type collection from Finland, which was found on basidiocarps of *Cantharellus tubaeformis*, *L. puncticulatum* seems to normally be confined to mosses and liverworts. In the Norwegian specimen, growing on mosses, the brown spots on the peridium and the pale brown spots and streaks

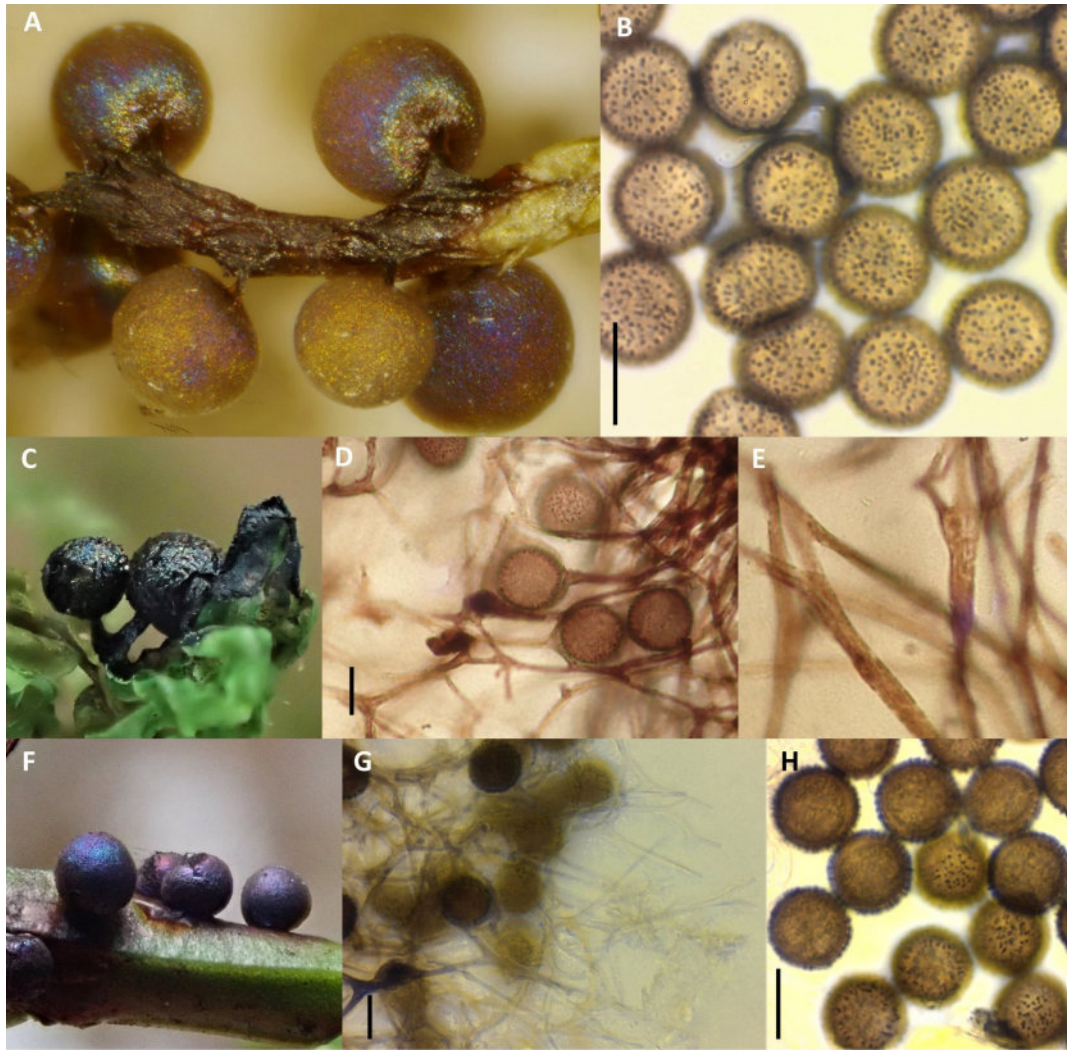


Figure 32. A, B; *Lamproderma pulveratum* (PV-S740). A; sporocarps. B; spores. C-E; *Lamproderma puncticulatum* (OOL-17.35). C; sporocarps. D; capillitium and spores. E; detail of capillitium. F-H; *Lamproderma spinulosporum* (PV- S738). F; sporocarps. G; capillitium and spores. H; spores. Photo: A, B, F-H – Per Vetlesen. C-E – Edvin Johannesen. Scale bars 10 µm.

on the flattened capillitial threads, both typical for the species, are clearly observed.

Material examined:
SOGN OG FJORDANE: Fjaler, Gyttavika, OO, 21 Aug 2017, on mosses growing on stone, OOL-17.35 (O).

***Lamproderma spinulosporum* Mar. Mey., Nowotny & Poulain**
Fig. 32 F-H.

These are the first published records of *L. spinulosporum* from Scandinavia. In the Nordic/Baltic region, there is only one report, from Finland (Härkönen and Varis 2012).

L. spinulosporum is a strictly nivicolous species. Again, 2018 appeared to be an exceptionally good year for nivicolous myxomycetes in Southern Norway (not so in Northern Norway, according to Kuhnt, pers. comm.). During just a couple of weeks in April, the species was found in four widely separated areas in Southern Norway. During our foray to Telemark and Aust-Agder in May, the species was also frequently encountered. From being an unknown species in Norway (and Scandinavia), in 2018 it was one of the most frequent (nivicolous) myxomycetes, probably only surpassed by *Diderma niveum* (Rostaf.) T. Macbr.

L. spinulosporum is quite easily recognised by the sessile, usually crowded sporocarps with blue iridescence, combined with a capillitium which turns into a colourless network towards the periphery, and the distinct, rather sparse, irregularly distributed spinules on the spores.

Material examined:
AKERSHUS: Nittedal, Bjønndalen, SM, 20 Apr 2018, on stem of *Vaccinium myrtillus* in *Vaccinium myrtillus*-dominated spruce forest, SM-18.02 (O). Nittedal, Slattum, SM, 23 Apr 2018, on stem of *Vaccinium myrtillus* in small herb-dominated spruce forest with patches of snow, SM-18.08 (O). Nittedal, Bjønndalen, SM, 24 Apr 2018, on stem of *Vaccinium myrtillus* and *Calluna vulgaris* in *Vaccinium myrtillus*-dominated spruce forest with patches of snow, SM-18.12 (O). Nittedal, Bjønndalen, SM, 27 Apr 2018, on stem of *Vaccinium myrtillus* in *Vaccinium myrtillus*-dominated spruce forest with patches of snow, SM-18.23 (O). Nittedal, Skytta, SM, EWJ, 2 May 2018, on *Calluna vulgaris*, ferns, mosses and debris on the ground in *Vaccinium myrtillus*-dominated spruce forest, edge of snow patch, EJ 03-18 (O), EJ 05-18 (O). Nittedal, Bjønndalen, SM, 19 Apr 2016, on pine needle in *Vaccinium myrtillus*-dominated spruce forest (O).
AUST-AGDER: Bykle, Lundane, IK, PV, SM, EWJ, 22 May 2018, on thin twigs of *Betula* and *Salix* in subalpine birch forest, near rivulet and melting snow, EJ 25-18, EJ 56-18 (O), EJ 96-18 (O), EJ 104-18 (O). Bykle, Hovdenuten, IK, PV, SM, EWJ, 22 May 2018, on twig of *Betula, Empetrum* sp. and *Vaccinium myrtillus* in subalpine birch forest, EJ 20-18 (O), EJ 21-18 (O). Bykle, Hovdenutkollen, IK, PV, SM, EWJ, 23 May 2018, on *Vaccinium myrtillus* in subalpine birch forest, PV-S838.
BUSKERUD: Nedre Eiker, Solbergfjellet, EWJ, IB, 18 Apr 2018, on stem of *Vaccinium myrtillus* in *Vaccinium myrtillus*-dominated spruce forest. Sigdal, Tempelsetra, IK, PV, SM, EWJ, 21 May 2019, subalpine birch forest with *Empetrum* and *Juniperus*, near melting snow, on ferns and *Chamerion angustifolium*, 950 m alt.
HEDMARK: Stange, Stor-Reemarka, PV, 30 Apr 2018, on stem of *Vaccinium myrtillus* and *V. vitis-idaea* in spruce forest near melting snow, PV-S738 (O), PV-S744 (O), PV-S746, PV-S747. Hamar, Gåsbu, PV, 12 May 2018, on stem of *Vaccinium myrtillus* in spruce forest, PV-S759, PV-S760, PV-S764. Hamar, Gåsbu, PV, 12 May 2018, on *Chamerion angustifolium* in roadside near melting snow, PV-S765. Trysil, Anderskjølen, PV, 9 May 2018, on twig of *Betula* and *Vaccinium myrtillus* in spruce forest, PV-S748, PV-S750, PV-S752. Hamar, Ormsætertajet, PV, 29 Apr 2019, spruce forest, on mosses near melting snow, PV2070.
NORDLAND: Bodø, Naurstad, HA, 19 May 1962 (O).
OPPLAND: Vang, Ellingbø, RvK, 29 May 2018, in subalpine birch forest with *Anemone nemorosa*.
SOGN & FJORDANE: Årdal, Mannsbergi, SM, 8 Jun 2018, 1140 m alt.
TELEMARK: Tokke, Øyfjell, IK, PV, SM, EWJ, 23 May 2018, on roadside grass and *Empetrum* sp. in *Vaccinium myrtillus*-dominated spruce forest, EJ 68-18, EJ 141-18. Vinje, Roi, IK, PV, SM, EWJ, 23 May 2018, on grass and *Vaccinium myrtillus* in subalpine birch forest with *Juniperus*, EJ 63-18, PV-S824.
TRØNDELAG: Leksvik, Kråkmoen, EH, 28 Apr 2018, on stem of *Vaccinium myrtillus* in *Vaccinium myrtillus*-dominated spruce forest.

***Lamproderma splendidissimum* Mar. Mey., Bozonnet & Poulain**
Fig. 33 A-C.

In our region, this species has previously only been reported from Finland (Poulain et al. 2014). Further reports worldwide are from France, Spain, Russia, and USA.

L. splendidissimum is part of a nivicolous species complex, including *L. arcyrioides, L. album, L. pulveratum, L. pulchellum* and *L. spinulosporum.* We are somewhat in doubt as

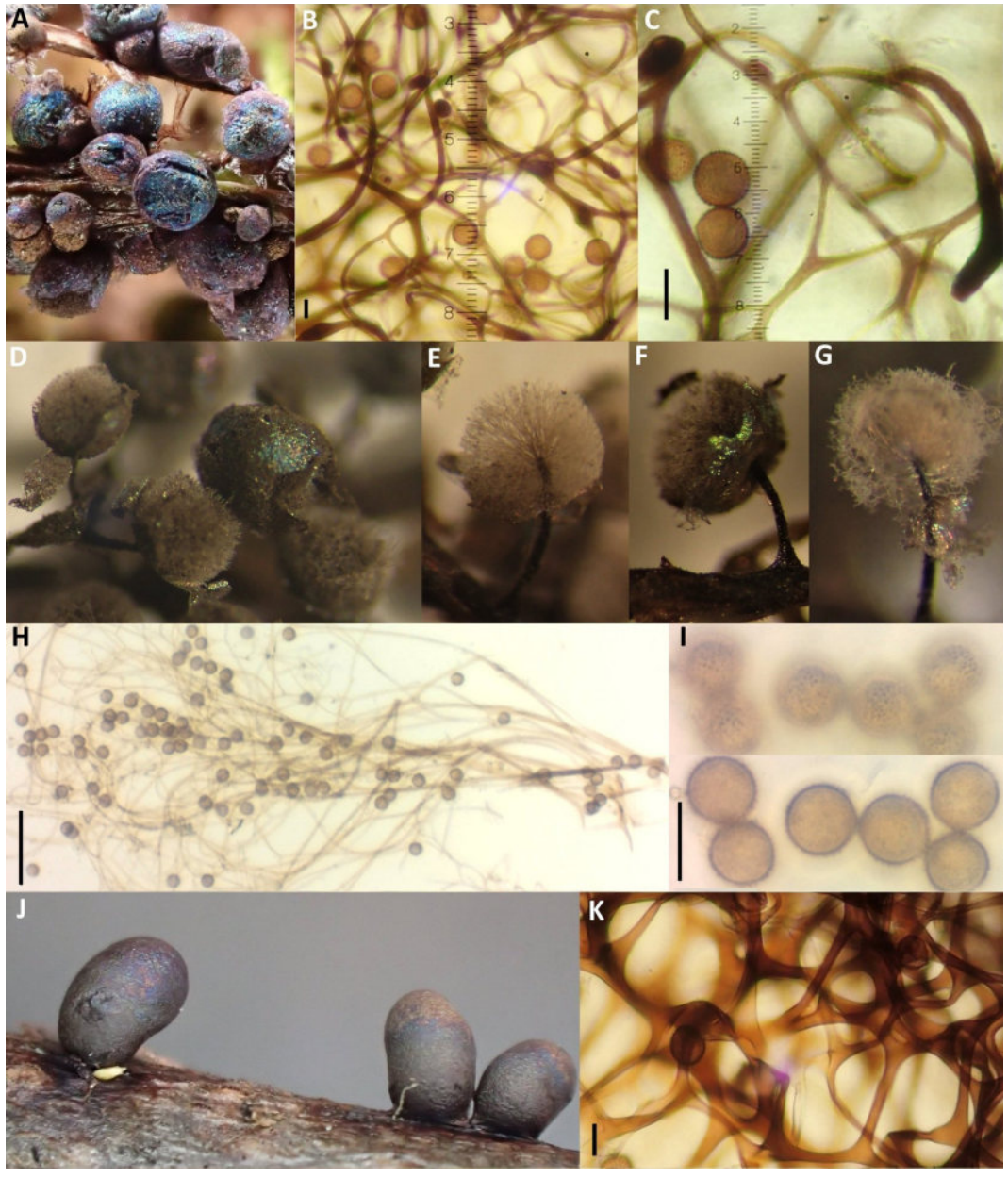


Figure 33. A-C; *Lamproderma splendidissimum* (EJ 110-18). A; sporocarps. B, C; capillitium and spores. D-I; *Lamproderma violaceum* (MP-007). D-G; sporocarps. H; capillitium and spores. I; spores. J, K; *Lamproderma zonatum* (EJ 14-17). J; sporocarps. K; capillitium. Photo: A-G, J, K – Edvin Johannesen. H, I – Per Vetlesen. Scale bars 10 µm (B, C, I, K) and 50 µm (H).

to the identity of some of our collections, e.g. Marianne Meyer (pers. comm.) claims that collection PV-S819 is approaching *L. aeneum*. However, we have compared our

collections with authentic material kindly provided by Mrs. Meyer and we feel confident that at least collection EJ 110-18 is *L. splendidissimum*.

Material examined:
AUST-AGDER: Bykle, Lislefjødd, IK, PV, SM, EWJ, 21 May 2018, on leaf of *Betula* in subalpine birch forest, PV-S819, (MM-40151).
BUSKERUD: Krødsherad, Norefjell skisenter, IK, PV, SM, EWJ, 21 May 2019, in *Salix*-dominated rivulet slope, on herbaceous stem, 880 m alt., EJ 07-19 (O).
TELEMARK: Vinje, Roi, IK, PV, SM, EWJ, 23 May 2018, on *Empetrum* sp. and *Vaccinium myrtillus* in subalpine birch forest with *Juniperus*, EJ 64-18 (O), EJ 110-18 (O).

***Lamproderma violaceum* (Fr.) Rostaf.**
Fig. 33 D-I.

The species has not previously been reported from Norway. There have been, and still are, varying opinions as to the taxonomic status of *L. violaceum.* Lado (2005-2020) treats it as a synonym to *L. arcyrioides* (var. *leucofilum*), whereas Poulain et al. (2011) considers *L. violaceum* as a distinct species and considers *L. arcyrioides* var. *leucofilum* to be a synonym. We have not dwelled with the nomenclatorial issues, but have chosen to follow the position of Poulain et al. (op. cit.)

Two of the examined collections display splinters on the peridium. This character is normally associated with the *L. arcyrioides* group, but occurs in various clades, according to Fiore-Donno et al. (2012). Furthermore, the presence or absence may vary within a species, so we have put little emphasis on this character. The most striking feature of *L. violaceum* is the very pale capillitium, giving the sporocysts a whitish, hoary appearance, similar to *L. album* (see above). However, *L. album* is a strictly nivicolous species, whereas *L. violaceum* is non-nivicolous.

Due to the confusion around this species, it is difficult to make any statements around its global or regional occurrence.

Material examined:
AUST-AGDER: Arendal, by the cotton factory, THD, 30 Oct 2013, calciphilous pine forest, on *Avenella flexuosa* (O).
MØRE OG ROMSDAL: Aure, Todalen, SHLL, ØF, ÅH, SS, OO, 11 Oct 2018, rich, moist deciduous forest, on basidiocarp under *Ulmus glabra* log, OOL-18.68 (O).
ØSTFOLD: Fredrikstad, Balterødskogen, IR, MP, 13 Oct 2019, mixed forest, on bark of *Pinus sylvestris* (stump) and surrounding vegetation, MP-007 (O).

***Lamproderma zonatum* Mar. Mey. & Poulain**
Fig. 33 J, K.

The species has not previously been reported from Northern Europe. Worldwide, it is only reported from France, Japan, and Australia.

L. zonatum is characterised by the sessile habit, the oblong sporocarps, and the iridescent zones of blue, violet, and bronze on the peridium. *L. cucumer* (not yet found in Norway) typically has a short stalk, subcylindric (cucumber-shaped), and darker, greyish sporocarps with bluish iridescence. Collection EJ 14-17 has kindly been confirmed by Marianne Meyer (based on photos).

Material examined:
AKERSHUS: Nittedal, Skytta, SM, EWJ, 2 May 2018, *Vaccinium myrtillus* dominated spruce forest, close to melting snow, on mosses and fern on the ground.
AUST-AGDER: Bykle, Lislefjødd, IK, PV, SM, EWJ, 21 May 2018, subalpine birch forest in moist slope with *Betula*, *Juniperus*, *Salix*, grasses and tall herbs, on thin *Betula* twig, EJ 72-18 (O). Bykle, Lundane, IK, PV, SM, EWJ, 22 May 2018, subalpine birch forest, near rivulet and snowbanks, on branch and twig of *Betula*, EJ 135-18 (O), EJ 136-18 (O).
HEDMARK: Hamar, Ormsætertajet, PV, 29 Apr 2018, spruce forest near melting snow, on grass, PV-S732 (O).
OPPLAND: Vestre Slidre, Bukonofjellet, IK, PV, RB, EWJ, 9 Jun 2017, edge of snowbank, on deciduous twig, EJ 14-17 (O). Nord-Aurdal, Slettestølan, KNT, 26 May 2019, boggy area with

Figure 34. A, B**;** *Lepidoderma aggregatum* (EJ 111-18). A; plasmodiocarps. B; capillitium and spores. C-F; *Lepidoderma alpestroides* (EJ 80-18). C, D; plasmodiocarps. E, F; capillitium and spores. Photos: Edvin Johannesen. Scale bars 10 µm.

Picea abies, *Salix* spp. and *Betula pubescens*, on living twigs of *Salix* sp. (O).

***Lepidoderma aggregatum* Kowalski**
Fig. 34 A, B.

This nivicolous species has not previously been reported from Norway. Its distribution is unclear due to the unresolved taxonomic status.

According to Moreno et al. (2018), *L. aggregatum* and *L. chailletii* overlap in all characters except the peridium; the lime plates of the peridium form a continuous crust in the former, but not in the latter. They support Shchepin et al. (2016), who showed by molecular analysis that there are three different clades of *L. chailletii*, one of which could represent the North American species *L. aggregatum*. Molecular studies of the American type material are needed to confirm this. Thus, the preliminary identification of our specimens is purely based on the aggregation of lime scales into a continuous crust.

Material examined:
AUST-AGDER: Bykle, Lislefjødd, IK, PV, SM, EWJ, 21 May 2018, subalpine birch forest in moist slope with *Betula*, *Juniperus*, *Salix*, grasses and tall herbs, on thin *Salix* twig, on various substrates, EJ 53-18 (O), EJ 70-18 (O), EJ 152-18 (O), EJ 159-18 (O). Bykle, Hovdenuten, IK, PV, SM, EWJ, 22 May 2018, subalpine birch forest with *Juniperus*, *Empetrum, Vaccinium*, and *Lycopodium*, on *Betula* branch, EJ 90-18 (O). Bykle, Lundane, IK, PV, SM, EWJ, 22 May 2018, subalpine birch forest, near rivulet and snowbanks, on twig of *Salix*, EJ 95-18 (O).
OPPLAND: Vang, Tyin, IK, PV, RB, EWJ, 8 Jun 2017, snowbank edge in low-alpine zone, EJ 17-17 (O).
TELEMARK: Vinje, Roi, IK, PV, SM, EWJ, 23 May 2018, subalpine birch forest with *Juniperus* and *Lycopodium annotinum*, on *Lycopodium annotinum*, EJ 111-18 (O). Tokke, Øyfjell, IK, PV, SM, EWJ, 23 May 2018, *Vaccinium myrtillus* dominated spruce forest, on *Vaccinium myrtillus*, EJ 66-18 (O).

***Lepidoderma alpestroides* Mar. Mey. & Poulain**
Fig. 34 C-F.

L. alpestroides is a strictly nivicolous species which has not previously been reported from the Nordic-Baltic region. It is known from only a few places worldwide, in Europe from France, Germany, and Austria.

According to Shchepin et al. (2016), *L. alpestroides* is genetically closely related to *L. chailletii* (clade C), however differing in several traits; the former is characterised by the plasmodiocarpous habit, the conspicuous (pseudo)columella, the smooth, egg shell-like peridium, and the irregularly spinose spores. Moreno et al. (2018) accepts *L. alpestroides* as a separate species.

The reported specimen consists of short plasmodiocarps fused together into one long (ca. 15 mm) plasmodiocarp with a continuous, whitish, partly shining outer peridium. The inner peridium is non-iridescent, frosted with lime, remote from the outer, and containing orange spots (seen in transmitted light). The capillitium is medium brown, sparsely branched with paler tips, and the spores measure 12-14 µm in diameter (excluding spines), with irregularly distributed spines, approx. 1 µm long.

Material examined:
AUST-AGDER: Bykle, Lislefjødd, IK, PV, SM, EWJ, 21 May 2018, subalpine birch forest in moist slope with *Betula*, *Juniperus*, *Salix*, grasses and tall herbs, on thin *Betula* twig, EJ 80-18 (O).

***Lepidoderma chailletii* Rostaf.**
(Syn.: *Lepidoderma carestianum* var. *chailletii* (Rostaf.) G. Lister)
Fig. 35.

These are the first published records from Norway. *L. chailletii* is apparently a rather common nivicolous species, but despite this, there are only two published reports from our region, i.e. from Finland (Härkönen 1989) and Denmark (Bjørnekær and Klinge 1964).

L. chailletii is a highly variable species and preliminary molecular studies indicate three phylogenetic clades which appear indistinguishable morphologically (Shchepin et al. 2016; Moreno et al. 2018). We have chosen to follow the species concept of Moreno et al. (op. cit.), who discuss *L. chailletii* against *L. carestianum* and *L. aggregatum*, with which it has been confused.

Material examined:
AKERSHUS: Nittedal, Skytta, SM, EWJ, 2 May 2018, *Vaccinium myrtillus* dominated spruce forest, on *Calluna vulgaris* and *Vaccinium myrtillus* near melting snow. Eidsvoll, Feiring Øverbygd, KNT, 05 May 2019, on *Sorbus aucuparia* twig near the ground. Nittedal, Varingskollen, SM, 25 May 2019, alpine ski slope with patches of snow, on dead herbaceous stem. Nittedal, Varingskollen, SM, 27 May 2019, alpine ski slope with patches of snow, six collections on various woody and herbaceous substrates.
AUST-AGDER: Bykle, Lislefjødd, IK, PV, SM, EWJ, 21 May 2018, subalpine birch forest in moist slope with *Betula*, *Juniperus*, *Salix*, grasses and tall herbs, on thin twigs/branches of *Salix*, *Betula*, *Empetrum, Juniperus,* and grasses, EJ 36-18 (O), EJ 39-18 (O), EJ 73-18 (O), EJ 79-18 (O), EJ 119-18 (O), EJ 122-18 (O), EJ 151-18 (O), EJ 158-18 (O). Bykle, Hovdenuten, IK, PV, SM, EWJ, 22 May 2018, subalpine birch forest with *Juniperus*, *Empetrum, Vaccinium*, and *Lycopodium*, on thin twig of *Betula*

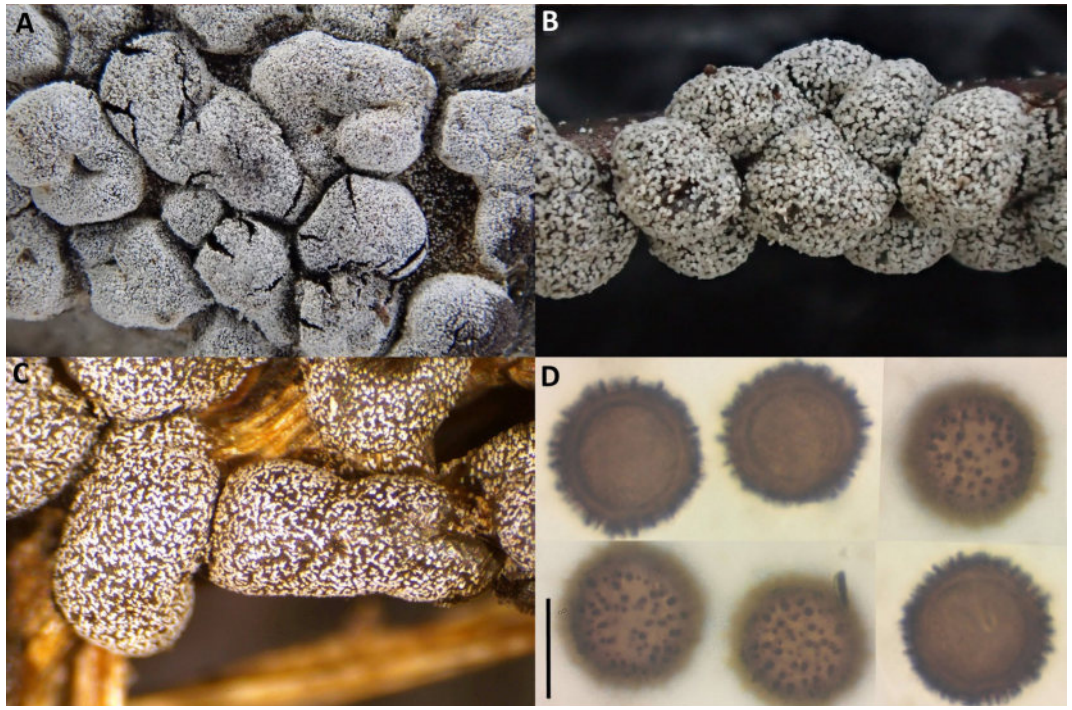


Figure 35. A-D**;** *Lepidoderma chailletii* (A, D: PV-S804. B: EJ 109-18. C: PV-S729). A-C; sporocarps. D; spores. Photo: A, C, D – Per Vetlesen. B – Edvin Johannesen. Scale bar 10 µm.

and *Empetrum* leaves, EJ 83-18 (O), PV-S804 (O). Bykle, Lundane, IK, PV, SM, EWJ, 22 May 2018, subalpine birch forest, near rivulet and snowbanks, on thin twig of *Betula* and leaves and stem of *Comarum palustre*, EJ 52-18 (O), EJ 132-18 (O), PV-S791 (duplicate MM- 40147). Bykle, Hovdenuten, PV, IK, SM, EWJ, 22 May 2018, subalpine birch forest with *Juniperus communis*, *Empetrum* spp., *Vaccinium myrtillus*, and *Lycopodium annotinum*, on thin twig of *Betula*, 880 m alt., EJ 85-18 (O).
FINNMARK: Lebesby, Oksevågdalen, West of Storvatnet, AG, GM, 2 July 2008, on twig of *Betula* and dead stem of *Veratrum album*, AG 53/08 (T).
HEDMARK: Hamar, Ormsætertajet, PV, 29 Apr 2018, spruce forest near melting snow, on leaves of *Vaccinium vitis-idaea*, grasses, *Betula* leaves, *Rubus* stems and heather, PV-S725, PV-S729, PV-S730, PV-S735. Hamar, Gåsbu, PV, 12 May 2018, roadside near melting snow, on plant litter, PV-S755. Hamar, Ormsætertajet, PV, 26 Apr 2019, in spruce forest near melting snow, on *Vaccinium myrtillus*, *Salix* sp., and grasses, PV2008, PV2014, PV2033, PV2036. Hamar, Ormsætertajet, PV, 29 Apr 2019, in spruce forest near melting snow, on various herbaceous litter, PV2047, PV2061, PV2071, PV2072, PV2073. Løten, Sloken, PV, 3 May 2019, in spruce forest near melting snow, on *Rubus idaeus*, PV2077. Trysil, Trysilfjellet sør, PV, 7 Jun 2019, alpine ski slope, on *Salix* sp., 470 m alt., PV2102.
HORDALAND: Ulvik, Osafjellet, JMS, 9 May 1993 (det. Marianne Meyer).
OPPLAND: Vang, Tyin, IK, PV, RB, EWJ, 8 Jun 2017, on herbacous stems near melting snow, EJ 6-17 (O). Vestre Slidre, Bukonofjellet, IK, PV, RB, EWJ, 9 Jun 2017, moist slope with *Juniperus, Salix*, and tall herbs, on *Salix* twigs, EJ 16-17 (O), EJ 22-7 (O), EJ 23-17 (O). Vestre Slidre, Nordre Trollhovd, EWH, RB, 17 May 2018, heather dominated heath, among patches of snow.
TELEMARK: Vinje, Haukeliseter, PV, 27 Jun 2017, mountain heath, near melting snow, on grass and *Vaccinium myrtillus*, PV-S592 (O). Vinje, Prestegård, PV, 27 Jun 2017, mountain heath, near melting snow, on *Betula pubescens*, PV-S591 (O). Vinje, Roi, IK, PV, SM, EWJ, 23 May 2018, subalpine birch forest with *Juniperus*, on thin *Salix* twig, EJ 109-18 (O). Vinje, Roi, IK, PV, SM, EWJ, 23 May 2018, roadside in subalpine zone, on grass, EJ 139-18 (O).
VESTFOLD: Færder, Brattås, TNK, PM, 25 Mar 2019, in calciphilous deciduous forest, on wood.

Lepidoderma neoperforatum **Kuhnt**

Fig. 36 A, B.

L. neoperforatum is a strictly nivicolous species which was recently described by Kuhnt (2017), partly based on three collections from Norway. The species is only known from Austria, Germany, France, and USA (Kuhnt 2017; Moreno et al. 2018).

According to Kuhnt (op. cit.), *L. neoperforatum* is most similar to *L. carestianum* (Rabenh.) Rostaf. and *L. perforatum* Mar. Mey. & Poulain, but it differs in the combination of smaller spores (12–14 µm), a blackish (in reflected light) inner peridium layer with small (smaller than *L. perforatum*) perforations, and the mostly greyish to yellowish grey colour of the densely calcareous outer peridial layer.

Material examined:
AUST-AGDER: Bykle, IK, PV, SM, EWJ, 22 May 2018, on thin twigs of *Betula* in subalpine birch forest, near melting snow and rivulet, EJ 131-18 (O).
HEDMARK: Løten, Sloken, PV, 3 May 2019, in spruce forest near melting snow, on *Vaccinium uliginosum*, PV2078 (O). Løten, Smørhølbekken, PV, 3 May 2019, in spruce forest near melting snow, on *Vaccinium myrtillus*, PV2076. Hamar, Ormsætermyra, PV, 25 May 2019, in boggy forest, on *Vaccinium uliginosum*, 630 m alt., PV2090.
TELEMARK: Vinje, Arabygdvegen, IK, PV, SM, EWJ, 23 May 2018, on thin twigs of *Betula nana* in subalpine birch forest, EJ 108-18 (O). Vinje, Roi, IK, PV, SM, EWJ, 23 May 2018, in subalpine birch forest, on *Salix* sp., 890 m alt., PV-S820 (O).

Lepidoderma trevelyanii **(Grev.) Poulain & Mar. Mey.**

(Syn.: *Diderma trevelyanii* (Grev.) Fr.)
Fig. 36 C, D.

The species was reported from Norway by Karlsen (1943), Hjortstam and Johannesen (1980), Johannesen (1982), and Elvebakk (1996), all as *Diderma trevelyanii*, the latter reported from Svalbard (det. Sigmund Sivertsen). There are several additional reports from the Nordic/Baltic region, but this appears to be a rather rare species in Norway.

This non-nivicolous species is easily recognised by the golden brown peridium and the star-like dehiscence, exposing the whitish inner peridium.

Material examined:
TRØNDELAG: Oppdal, Stølgjerdet, NL, 24 Aug 1985, (not examined by the authors)
http://www.gbif.org/occurrence/1086236807
(S:S-Fungi: F19247)
VESTFOLD: Nøtterøy, Nøtterøy, SA, 7 Nov 1982 (O). Re, Solerød, PV, 31 Oct 2017, roadside, on leaf and branch of *Populus tremula* on the ground, PV-S689 (O).
ØSTFOLD: Fredrikstad, Lahellemoveien, TJ, IR, 18 Nov 2018, decorticated *Salix caprea* (O).

Licea bryophila **Nann.-Bremek.**

Fig. 36 E-G.

This species is not previously reported from Norway or the Nordic/Baltic region. It is rarely reported elsewhere, but it may well have been overlooked due to its extremely small sporocarps.

According to Poulain et al. (2011), *L. bryophila* is restricted to living on liverworts. However, the type specimen was collected on "mossy bark collected from living elmtree" (like the present specimen) with no mentioning of liverworts. The sporocarps are extremely small (< 0.2 mm), variously coloured, but typically becoming nearly black when dry. The outer peridial layer is slimy when moist and the inner peridial layer is densely papillate. Dehiscence is by irregular fragmentation and the greyish brown spores (in mass) are relatively large (14-15 µm), minutely and densely spinulose, with a distinctly thicker and paler germination area.

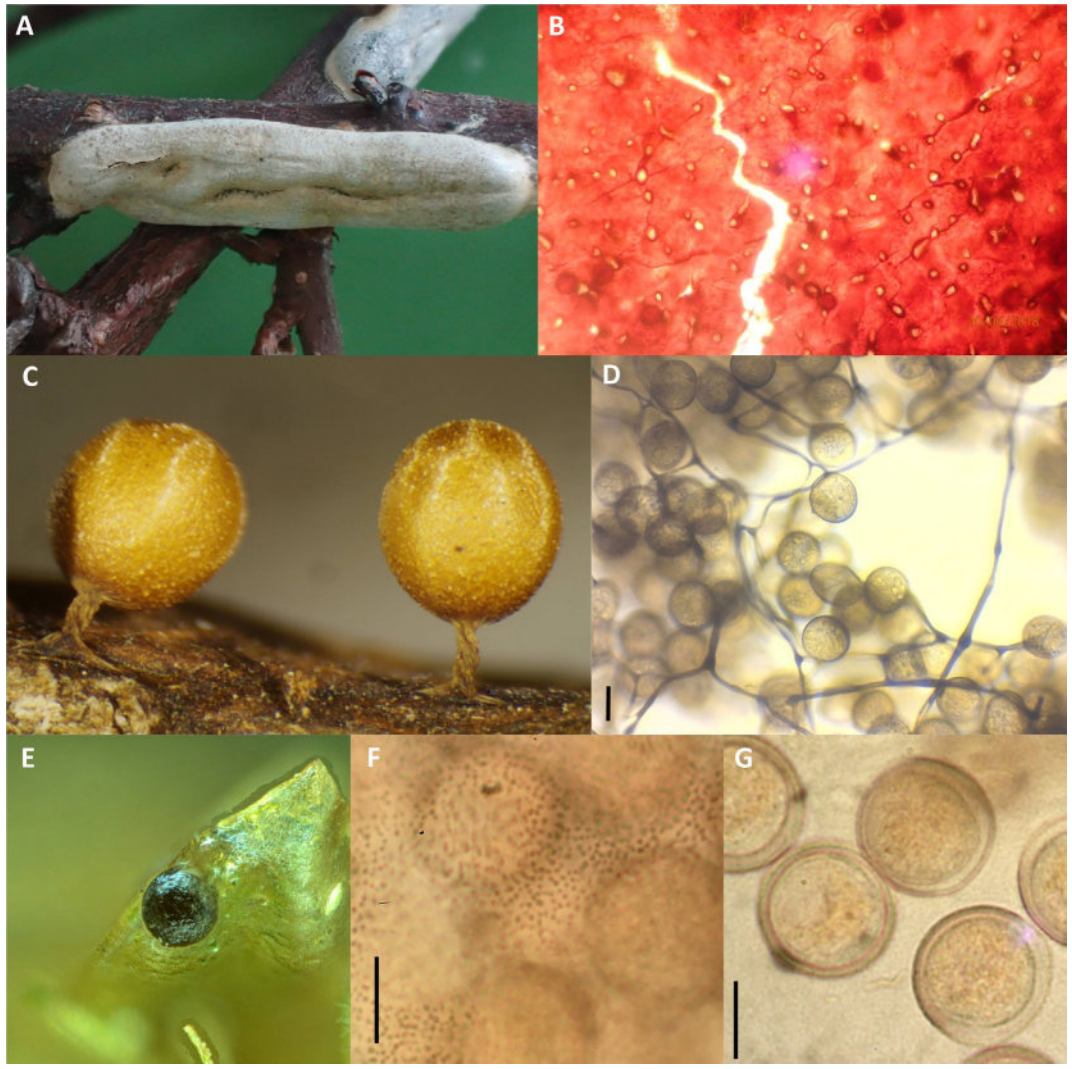


Figure 36. A, B; *Lepidoderma neoperforatum* (EJ 131-18). A; plasmodiocarp. B; detail of inner peridium (strongly overexposed to show perforations). C, D; *Lepidoderma trevelyani* (PV-S689). C; sporocarps. D; spores and capillitium. E-G; *Licea bryophila* (OOL 19.61). E; sporocarp. F; inner peridium ornamentation. G: spores. Photo: A, B, E-G – Edvin Johannesen. C, D – Per Vetlesen. Scale bars 10 µm.

Material examined:
MØRE OG ROMSDAL: Volda, Osdalen, OO, 6 Feb 2019, in steep calciphilous deciduous forest dominated by *Ulmus glabra* and *Corylus avellana*, on *Antitriciha curtipendula* growing on living *Ulmus glabra*, (MC), OOL-19.61 (O).

***Licea clarkii* Ing**
Fig. 37 A, B.

These are the first published records from Norway. *L. clarkii* was published from Lithuania by Adamonyte and Mitchell (2000). There are a few reports from Europe and one from USA.

This very inconspicuous species is characterised by the pulvinate sporocarps, the circumscissile dehiscence, and the yellowish grey, minutely verruculose spores. The Norwegian collections are found on *Rubus idaeus*, which seems to be the preferred substrate (Poulain et al. 2011). In England, it has been found on *Chamerion angustifolium* (Adamonyte and Mitchell op. cit.).

Material examined:
HEDMARK: Hamar, Domkirkeodden, PV, 24 Feb 2017, disturbed vegetation, last years stems of *Rubus idaeus*, PV-S561. Stange, Bretta, PV, 8 Mar 2017, field edge, last years stems of *Rubus idaeus*, PV-S562 (O).
MØRE OG ROMSDAL: Volda, Vadstein, PGL, OO, 28 Mar 2016, on *Rubus idaeus*, OOL-16.29 (O). Volda, Hjellane, OO, 20 Feb 2019, on stem of *Rubus idaeus* in garden, OOL-19.68 (O).

***Licea denudescens* H.W. Keller & T.E. Brooks**
Fig. 37 C-E.

These are the first published records of *L. denudescens* from Norway and the Nordic/Baltic region. Despite its small size, it has been reported from many countries worldwide, even in Europe.

The irregular dehiscence, the dark brown (in mass), rather small (8.5-11 µm), smooth spores, and especially the distinct ornamentation on the inner peridial wall, characterise the species. (Specimen PV-F216 is atypical in having an average spore size of 12.8 µm.)

Material examined:
HEDMARK: Stange, Jønsbergvegen 305, PV, 11 Feb 2015, on bark of *Syringa* sp. in garden, PV-S445 (O). Stange, Jønsbergvegen 305, PV, 9 Apr 2019, on bark of living *Syringa vulgaris* in garden, (MC), PV-F216 (O).
MØRE OG ROMSDAL: Ørskog, Sjøholt, TCM, OO, 31 Oct 2018, in calciphilous deciduous forest reserve, on bark of living *Ulmus glabra*, (MC), OOL-19.28 (O). Sande, Storeneset, OO, 28 Dec 2018, on mosses growing on bark of living *Populus tremula*, (MC), OOL-19.66 (O). Volda, Hjellane, OO, 7 Jan 2020, on *Hypnum* sp. and bark of *Populus tremula*, (MC), OOL-20.24.
OSLO: Årvoll gård, PV, 14 Sep 2019, in garden, on dead trunk of *Syringa vulgaris*, (MC), PV2203 (O).

***Licea floriformis* T.N. Lakh. & R.K. Chopra var. *aureospora* M.T.M. Willemse & Nann.-Bremek.**
Fig. 37 F-H.

Licea floriformis is not previously known from Norway or the Nordic/Baltic region. There are several reports from elsewhere in Europe, many of which are var. *aureospora* (some reported as *L. longa* Flatau (now commonly considered a synonym) or *L. capitata* Ing & McHugh).

This corticolous taxon is characterised by the stipitate, olivaceous brown sporocarps, becoming transparent and often wrinkled, and the golden yellow spore mass. The spores are greenish yellow in transmitted light and smooth.

Material examined:
MØRE OG ROMSDAL: Volda, Hjellane, OO, 20 Feb 2019, on stem of *Rubus idaeus*, (MC), OOL-19.58 (O). Volda, Hjellane, OO, 20 Feb 2019, on bark of living *Malus x domestica*, (MC), OOL-19.69 (O). Volda, Hjellane, OO, 30 Nov 2018, on bark and *Orthotrichum* sp. growing on dying branch of *Ribes rubrum*, (MC), OOL-19.16 (O).

***Licea gloeoderma* Döbbeler & Nann.-Bremek.**
Fig. 38 A-C.

These are the first published records from Norway and the Nordic/Baltic region. *L. gloeoderma* is previously only known from Germany, Austria, France, and Ireland.

All specimens studied in the original description of *L. gloeoderma* were found on the corticolous liverworts *Frullania dilatata* and *Radula complanata*. The Norwegian specimens were found on *Frullania dilatata.* Such, often brownish pigmented, liverworts

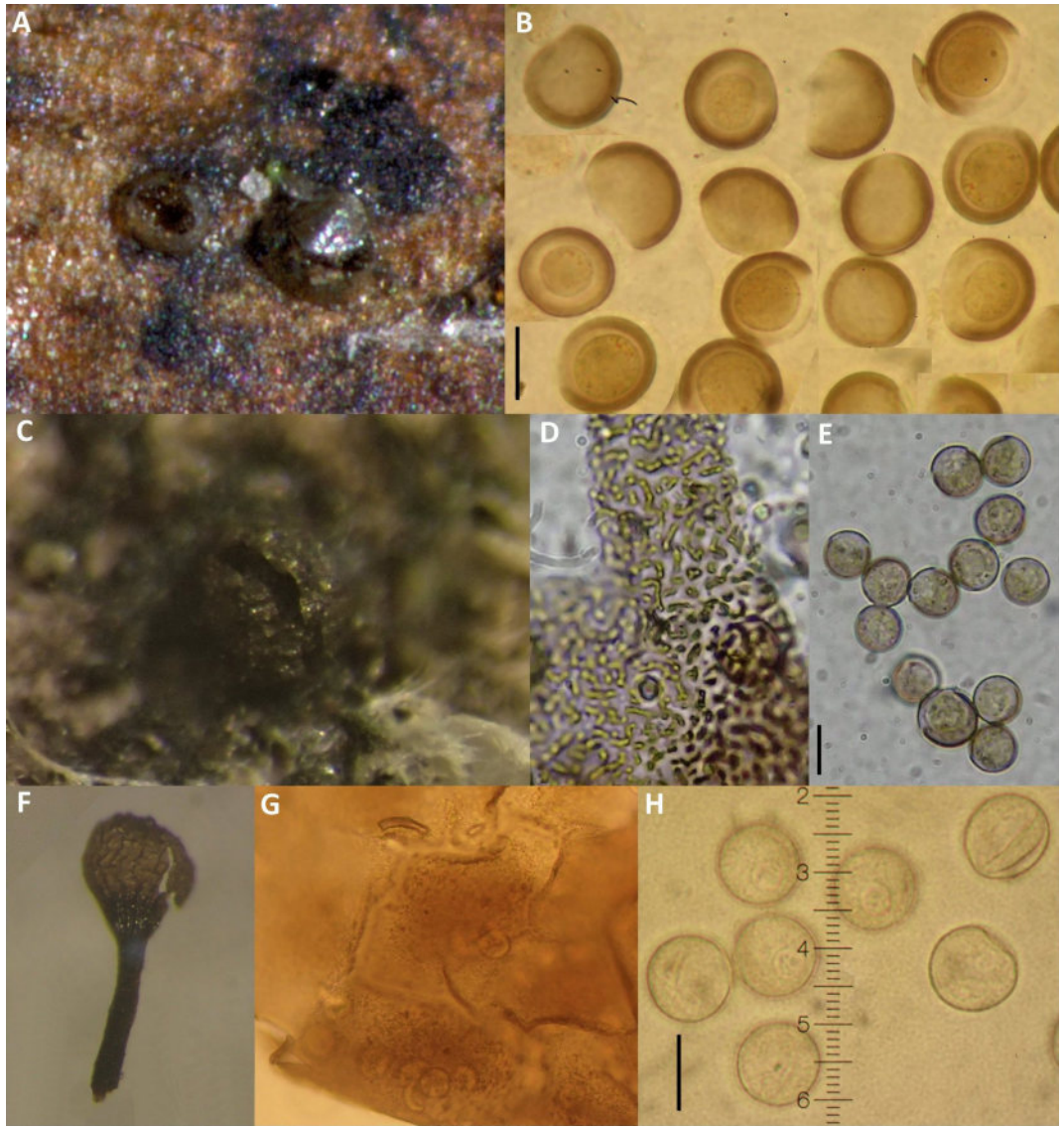


Figure 37. A, B; *Licea clarkii* (OOL 19.68). A; sporocarps. B; spores. C-E; *Licea denudescens* (OOL 19.28). C; sporocarp. D; inner peridium. E; spores. F-H; *Licea floriformis* var. *aureospora* (OOL 19.58). F; sporocarp. G; inner peridium. H; spores. Photos: Edvin Johannesen. Scale bars 10 µm.

appear to offer a highly specialised niche for this species.

There are only a few, non-stipitate *Licea* species which appear to be solely confined to corticolous mosses and liverworts, i.e. *L. bryophila, L. hepaticola* (not yet found in Norway), and *L. synsporos*, but several other corticolous species of *Licea* may also occur on mosses and liverworts. Whether *L. gloeoderma* completes its entire life cycle on the liverwort, or in fact is corticolous and only

produces its sporocarps on liverworts, is not known.

L. gloeoderma was originally described as having yellowish granules (similar to the dictydine granules in Cribrariaceae) among the spores. It is uncertain whether these granules are associated with the peridium or with the spores. We have indeed observed such granules in some of our specimens of *L. gloeoderma*, but we have also seen similar granules in collections of *L. pumila* (Fig. 39G) and *L. microscopica* (Fig 38I). We speculate that these granules, at least the ones we have observed, are minute lipid droplets, being yellowish and variable in size. Perhaps these droplets are being formed before sporulation and then end up inside the spores or attached to the spores or to the peridium. If so, this is not a specific feature of *L. gloeoderma*, but a phenomenon which occurs in several *Licea* species.

Material examined:
MØRE OG ROMSDAL: Vestnes, Urdelva, OO, TAR, 6 Nov 2017, on *Frullania dilatata*, OOL-17.92 (O). Sande, Storeneset, OO, 28 Dec 2018, on *Frullania* spp. growing on bark of living *Populus tremula*, (MC), OOL-19.64 (O). Volda, Bjørkedalsvatnet, OO, 29 Oct 2019, on *Frullania dilatata* growing on living *Populus tremula*, (MC), OOL-20.31 (O). Volda, Bjørkedalsvatnet, OO, 13 Dec 2019, on *Frullania dilatata* growing on living *Populus tremula*, (MC), OOL-20.30 (O). Ålesund, Vadset, OO, 20 Feb 2020, on *Frullania dilatata* growing on living *Populus tremula*, OOL-20.29 (O).

Licea inconspicua T.E. Brooks & H.W. Keller

Fig. 38 D, E.

Kalstø (1985) reported one uncertain collection (only one sporocarp) from Hordaland (Norway). Ing (1990) reported the species from Estonia. These are the only previous reports from the Nordic/Baltic region. Further reports worldwide are from The British Isles, Montenegro, Switzerland, Turkey, and USA.

In the original description of *L. inconspicua*, the triple peridium was emphasised, and especially the separation of the black, refuse matter-filled outer layer from the two inner layers, giving the impression of pale sporocarps within a black "shell". This was quite striking in our collection OOL-19.134. Furthermore, the golden, orange-yellow colour of the spore mass, and the spores in transmitted light, is quite striking. The double nature of the inner peridial layers is difficult to discern, but we have observed "fringes" in both specimens (not tubercles as in *L. sambucina*) at what appears to be platelet margins. One might speculate that his is caused by the two layers being torn apart during preparation. In transmitted light the extremely minute spinules on the spores can only be seen at 1000x magnification and oil immersion, and appear to be arranged in a subreticulate pattern, as described in the original species description.

Material examined:
MØRE OG ROMSDAL: Volda, Kalvatsvik, OO, 20 Feb 2019, deciduous forest in west-facing steep slope, on *Hypnum* sp. growing on bark of living *Ulmus glabra,* OOL-19.134. Volda, Vadstein, OO, 10 Dec 2019, on the bark of living *Populus tremula*, (MC), OOL-20.20A (O).

Licea marginata Nann.-Bremek.

Fig. 38 F, G.

These are the first published records from Norway. In our region, *L. marginata* is known from Finland (Härkönen et al. 1999; Härkönen and Varis 2012), Iceland (Gøtzsche 1990), and Lithuania (Adamonyte 2013).

This inconspicuous, corticolous species appears to be rather common, but generally only detected under the stereo microscope when the substrate is moistened. It appears as very dark, depressed «spots» surrounded by a ring of granular matter. Sporocarp dehiscence may be by an apical slit, but it is often irregular. The spores are pale, with a wall of

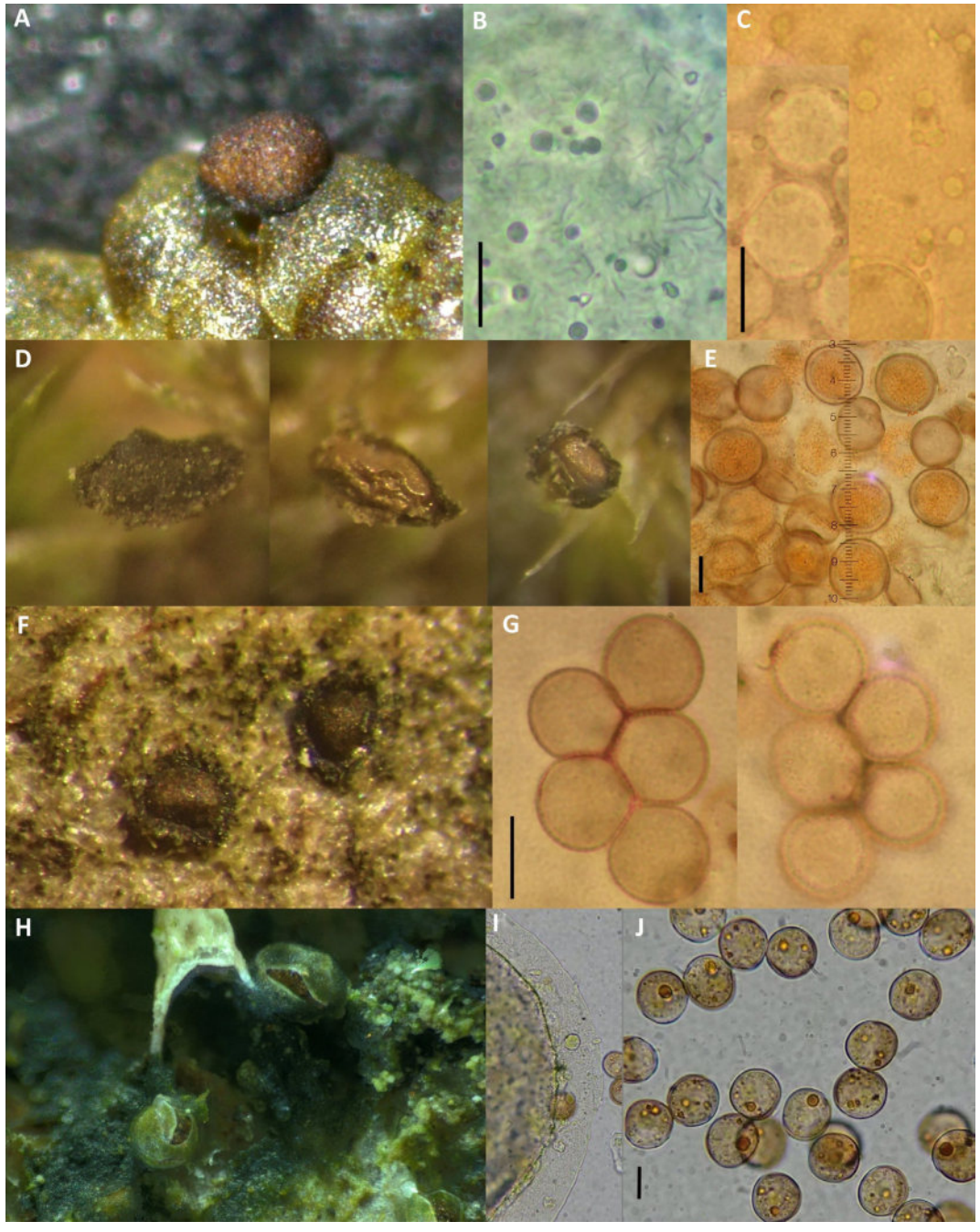


Figure 38. A-C; *Licea gloeoderma* (A; OOL-19.64. B, C; OOL-20.30). A; sporocarp. B; inner peridium with granules (phase contrast). C; spores and granules. D, E; *Licea inconspicua* (OOL-19.134). D; sporocarps (the two rightmost seen from the underside). E; spores. F, G; *Licea marginata* (OOL-17.80). F; sporocarps. G; spores. H-J; *Licea microscopica* (OOL-19.56). H; sporocarps. I; margin of peridial plate. J; spores. Photo: A-H – Edvin Johannesen. I, J – Oddvar Olsen. Scale bars 10 µm.

uniform thickness, 10-13 µm, and densely and uniformly spinulose.

Material examined:
HEDMARK: Stange, Lille skjelve, PV, 10 Dec 2014, grassland, on bark of *Juniperus communis*, PV-S430. Stange, Lille Skjelve, PV, 31 Dec 2014, grassland, on bark of *Juniperus communis*, PV-S435 (O). Stange, Lille Skjelve, PV, 19 Jan 2015, grassland, on bark of *Juniperus communis*, PV-S452. Stange, Lille Skjelve, PV, 3 Oct 2015, edge of cultivated field, on bark of *Juniperus communis*, PV-S465. Stange, Lille Skjelve, PV, 19 Jan 2015, grassland, on bark of *Juniperus communis*, PV-S441.
MØRE OG ROMSDAL: Ørsta, Melsholmane, OO, 2 Aug 2017, on *Alnus incana*, OOL-17.80 (O). Volda, Vadstein, OO, 10 Jan 2019, deciduous forest, on mossy bark of *Populus tremula*, (MC).

Licea microscopica D.W. Mitch.
Fig. 38 H, J.

This species is previously not known from the Nordic/Baltic region. It is known from England, Wales, Ireland, Germany and USA.

L. microscopica belongs to the group of species with sporocarps which are wider than high, and with a circumscissile dehiscence. The spores are shining yellowish brown in mass, smooth, thick-walled with a pale germination area, and relatively large (13-) 15-17 µm. The inner peridium is finely "papillate" or punctured on the inside.

Material examined:
HEDMARK: Stange, Vevla, PV, 11 Oct 2014, grassland, on bark of *Juniperus communis*, PV-S354 (O). Stange, Jønsberg, PV, 27 Nov 2015, in park, on bark of *Ulmus glabra* several meters above ground, PV2245. Stange, Jønsbergvegen 305, PV, 26 Apr 2018, on mosses growing on *Betula* in parkland, (MC), PV-F193 (O). Stange, Muset, PV, 10 Feb 2015, grassland, on bark and needles of *Juniperus communis*, (MC), PV-F058 (O). Stange, Vethammerodden, PV, 3 Dec 2017, on bark of *Juniperus communis* in pine forest, PV-S701 (O).
MØRE OG ROMSDAL: Ørskog, Sjøholt, TCM, OO, 13 Aug 2018, (MC), on bark of *Fraxinus*, close to lichen sorus (*Collema flaccidum*). Ørskog, Sjøholt, TCM, OO, 13 Aug 2018, on bark of living *Acer pseudoplatanus*, (MC), OOL-18.64 (O). Volda, Hjellane, OO, 20 Feb 2019, on bark of living *Thuja occidentalis* in garden, OOL-19.56 (O).
ROGALAND: Sola, Jåsund, PV, 20 Apr 2015, grassland, on bark of *Juniperus communis*, partly covered with algae, PV-S456.

Licea cf. *nannengae* Pando & Lado
Fig. 39 A-C.

In Europe, this species is only reported from Germany, Ireland and Spain.

Licea nannengae is distinguished from *L. denudescens* (see above) by its smooth inner peridium. *L. nannengae* was described based on many bark samples of *Juniperus thurifera* kept in moist chamber. The present collection was found on the epiphytic mosses on a deciduous tree (cf. *Ulmus glabra)*, also in moist chamber. We find it unlikely that *L. nannengae* is restricted to the bark of *Juniperus*. We have emphasised the similarity to *L. denudescens* and the smooth inner peridium, but the idenfication of our specimen remains uncertain.

Material examined:
MØRE OG ROMSDAL: Ørskog, Sjøholt, TCM, OO, 31 Oct 2018, in calciphilous deciduous forest reserve, on *Anomodon attenuatus, Isothecium alopecuriades*, and *Homalothecium sericeum* growing on bark of living *Ulmus glabra* (?), (MC), OOL-19.29 (O).

Licea nivicola Kuhnt
Fig. 39 D, E.

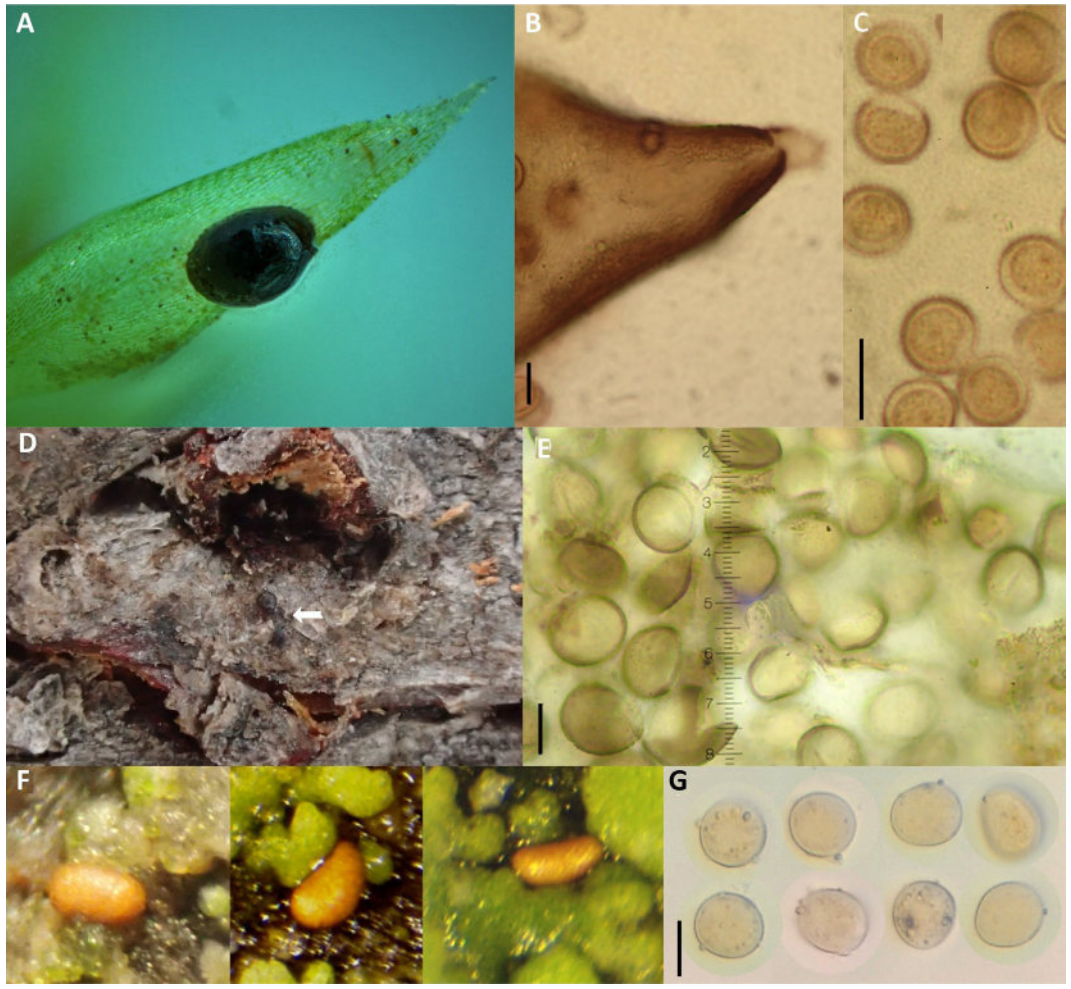


Figure 39. A-C; *Licea* cf. *nannengae* (OOL-19.29). A; sporocarp. B; detail of inner peridium. C; spores. D, E; *Licea nivicola* (Bykle). D; sporocarp (arrow). E; spores. F, G; *Licea pumila* (PV-S925). F; sporocarps. G; spores. Photo: A-E – Edvin Johannesen. F, G – Per Vetlesen. Scale bars 10 µm.

Kuhnt (2017) described this as a new species, partly based on collections from Hovden, Aust-Agder, where we found our collection (only one sporocarp discovered by chance in the stereo microscope). Apart from the Hovden area, *L. nivicola* is only reported from Austria and France (Kuhnt op. cit.).

Apart from *Licea alpina* A. Sánchez, G. Moreno, & D. W. Mitch. (described from Spain and not reported from elsewhere), this is the only species of *Licea* known (or at least presumed) to be strictly nivicolous. The nivicolous habitat, along with the blackish colour, the stalked sporocarps, and the apical lid, makes the identification easy, but it will probably only be detected during the examination of other nivicolous specimens under the stereo microscope.

Material examined:
AUST-AGDER: Bykle, Hovdenuten, IK, PV, SM, EWJ, 22 May 2018, subalpine birch forest with *Juniperus*, *Empetrum, Vaccinium*, and *Lycopodium*, on bark of *Betula* branch.

***Licea pumila* G.W. Martin & R.M. Allen**
Fig. 39 F, G.

This species is only known from three countries worldwide; Germany, Hungary, and USA.

Once detected, the very small sporocarps are quite distinct in having rather bright yellowish-orange, often elongate sporocarps with a firm, non-collapsable peridium which opens by a longitudinal area of dehiscence. *L. pumila* may superficially resemble *L. biforis*, but *L. pumila* is considerably smaller, not laterally compressed, and has no pre-formed dehiscence fissure. *L. marginata* is darker, has a dark, basal rim and a slimy coating.

Material examined:
HEDMARK: Stange, Jønsbergvegen 305, PV, 28 Jan 2019, on dead branch of *Ribes nigrum*, PV-S925 (O).

***Licea pygmaea* (Meyl.) Ing**
Fig. 40 A.

These are the first published records from Norway. There is one record of *L. pygmaea* in the Danish Fungal Records Database (Danish Mycological Society 2019) and it has been reported from Lithuania (Ernestas 2012; Adamonyte 2013), and from Latvia (Adamonyte op. cit.). The species is widespread in Europe.

For a brief discussion of *L. pygmaea* and closely related species, see *L. testudinacea* below.

Material examined:
HEDMARK: Stange, Sanderud, PV, 1 Nov 2014, small herb spruce forest, on *Picea abies* log, PV-S383. Stange, Ryahagan, PV, 5 Nov 2014, spruce forest, on *Picea abies*, PV-S389. Stange, Sanderud, PV, 19 Nov 2014, nutrient rich, mature spruce forest, on *Picea abies* log, PV-S408. Stange, Sanderud, PV, AMDB, 9 Sep 2015, nutrient rich mixed forest, on log of *Populus tremula*, PV-S474 (O). Stange, Rotlia, PV, 22 Mar 2016, rich deciduous forest, on bark of living *Populus tremula*, (MC), PV-R137. Stange, Rotlia, PV, AMDB, 13 Sep 2016, mixed forest, on dead branches of *Juniperus communis*, (MC), PV-R159. Stange, Gjetholmsjøen, PV, 6 May 2017, spruce forest, on *Picea abies* log. Hamar, Furuberget, PV, 6 Sep 2017, calciphilous mixed coniferous forest, on *Picea abies*, PV-F163 (O). Stange, Hvitbergåa, PV, 26 Sep 2017, on *Picea abies* in spruce forest. Stange, Rotlia, PV, 5 Oct 2017, on mosses growing on *Alnus incana* in mixed forest, PV-R384.
MØRE OG ROMSDAL: Volda, Berkneset, OO, 19 Dec 2015, on *Alnus glutinosa*. Ørsta, Ørsta, PGL, OO, 21 Dec 2015, on *Alnus incana* (O). Herøy, Dragsund, PGL, DH, OO, 6 Nov 2016, on *Corylus avellana* (O). Ørskog, Sjøholt, OO, TAR, 6 Dec 2016, on deciduous wood. Ørsta, Mo, OO, 30 Mar 2018, (MC), on *Sorbus aucuparia.* Ørskog, Sjøholt, TCM, OO, 31 Oct 2018, on *Ulmus glabra* (?). Skodje, Ørnakken, OO, 17 Oct 2018, on branches of *Taxus baccata* on the ground, (MC).
OSLO: Steinbruvann, SM, 18 Jun 2019, on log of *Picea abies* in *Vaccinium myrtillus* dominated spruce forest.
TELEMARK: Drangedal, Oct 2011, HGG, GHG, on dead wood (brown rot) of *Picea abies*, HG 13.127.
ØSTFOLD: Aremark, Ufredsraua, PV, BEA, 5 Feb 2017, in heather dominated mixed coniferous wood, on bark of *Juniperus communis*, (MC), BA-034.

***Licea sambucina* D.W. Mitch.**
Fig. 40 B-D.

These are the first published records of *L. sambucina* from Norway and the Nordic region. There are several reports from Europe, including Lithuania (Adamonyte et al. 2013).

L. sambucina belongs to a group of non-stipitate species with dehiscence into platelets along pre-formed lines. However, it is separated from most species in this group by the very pale, translucent peridium, which makes the lines of dehiscence hard to see in reflected light. The "suture" lines can, however, easily be seen in transmitted light, having conspicuous warts along the edge. The spores are minutely and evenly warted and free (spores clustered and much darker in *L. synsporos*).

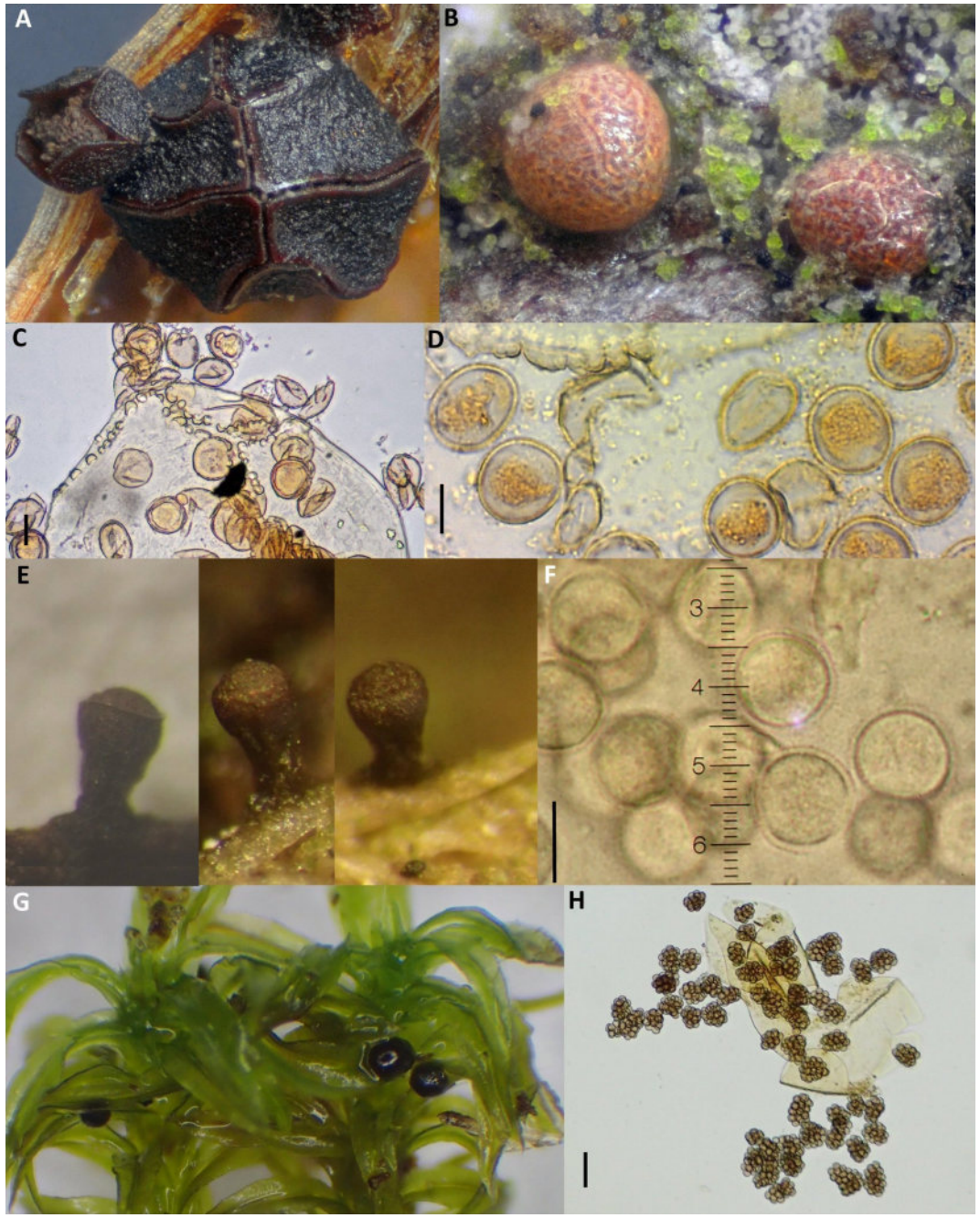


Figure 40. A; *Licea pygmaea* (HG 13.127), sporocarp. B-D; *Licea sambucina* (PV-S304). B; sporocarps. C, D; inner peridium and spores. E, F; *Licea scyphoides* (OOL 19.3). E; sporocarps. F; spores. G, H; *Licea synsporos* (OOLS-19A). G; sporocarps. H; spore clusters. Photo: A-C – Helge Gundersen. D – Per Vetlesen. E, F – Edvin Johannesen. G, H – Oddvar Olsen. Scale bars 10 µm (C, D, F), 50 µm (H).

The Norwegian collections generally have spores somewhat larger than the typical 13-14 (-15) µm range given in the literature. Our specimens have spore measures in the range (14.8) 15.9 – 18.8 (19.7) µm (Me = 17.3), in one collection (PV-S328) even exceeding 20 µm. However, according to Poulain et al. (2011), spore dimensions may exceed 20 µm.

Material examined:
HEDMARK: Stange, Jønsbergvegen 305, PV, 7 Aug 2014, on bark of *Juniperus communis* in garden, PV-S328. Stange, Jønsbergvegen 305, PV, 1 Jan 2014, on bark of *Juniperus communis* in garden, PV-S304 (O). Stange, Rotlia, PV, 17 Mar 2016, on inner bark of dying *Sorbus aucuparia* in thermophilous deciduous forest, PV-R265 (O). Stange, Jønsbergvegen 305, PV, 10 Feb 2018, on bark of *Clematis tangutica* in garden, PV-S706. Stange, Jønsberg, PV, 13 Mar 2018, on bark of living *Juniperus communis*, (MC), PV-F180 (O).
MØRE OG ROMSDAL: Volda, Vadstein, OO, 10 Dec 2019, on bark of living *Populus tremula,* OOL-20.21.

***Licea scyphoides* T.E. Brooks & H.W. Keller**
Fig. 40 E, F.

This is the first published record from Norway. In our region, the species is reported from Finland (Härkönen and Varis 2012) and Lithuania (Adamonyte et al. 2013).

L. scyphoides is characterised by having dark brown, stipitate sporocarps, a golden-brown spore mass, a paler circumscissile area of dehiscence leaving a deep cup, and relatively small spores (11-13 µm). In specimen OOL-20.23 some of the sporocarps have a bright, translucent upper half, not merely circumscissile, but are otherwise typical.

Material examined:
MØRE OG ROMSDAL: Skodje, Ørnakken, OO, 17 Oct 2018, on branches of *Taxus baccata* on the ground, (MC), OOL-19.3 (O). Volda, Bjørkedalsvatnet, 13 Dec 2019, OO, on mossy bark of *Populus tremula*, (MC), OOL-20.23 (O).

***Licea synsporos* Nann.-Bremek.**
Fig. 40 G, H.

These are the first published records of *L. synsporos* from Norway and the Nordic/Baltic region. There are only few published records worldwide, but the species is probably overlooked due to its very small size (sporocarps only 0.1-0.2 mm and often hidden in mosses on living trees). The spores are characteristic in being very dark and clustered, with warts only on the exposed side (paler and non-clustered spores in the related species *L. sambucina*). All four collections from Norway (different localities) are on the mosses *Zygodon rupestris* and *Z. viridissimus* growing on living deciduous trees.

Material examined:
MØRE OG ROMSDAL: Ørskog, Sjøholt, TCM, OO, 31 Oct 2018, on *Zygodon rupestris* growing on *Ulmus glabra*. Volda, Osdalen, OO, 6 Feb 2019, on *Zygodon rupestris* growing on *Ulmus glabra,* OOLS-19A. Aure, Todalen, SHLL, ØF, SS, ÅH, OO, 11 Oct 2018, on *Zygodon rupestris* growing on *Ulmus glabra*, (MC). Skodje, Ørnakken, OO, 27 Nov 2019, west-facing pine forest with aspen, on *Zygodon viridissimus* growing on living *Populus tremula*, (MC), OOL-19.500.

***Licea tenera* E. Jahn**
Fig. 41 A, B.

The species is not previously reported from Norway, but it is known from Sweden (Santesson 1964) and Denmark (Bjørnekær and Klinge 1964) in our region.

This is a non-stipitate, corticolous species with irregular dehiscence and pale to golden yellow spores in mass, very minutely punctate, mostly 10-12 µm in diameter. *L. inconspicua* has significantly larger spores with dense papillae arranged more or less into a reticulum.

Material examined:
HEDMARK: Stange, Rotlia, PV, 27 Dec 2016, rich deciduous forest, on inner bark of dying *Sorbus aucuparia*, (MC), PV-R184 (O). Stange, Rotlia, PV,

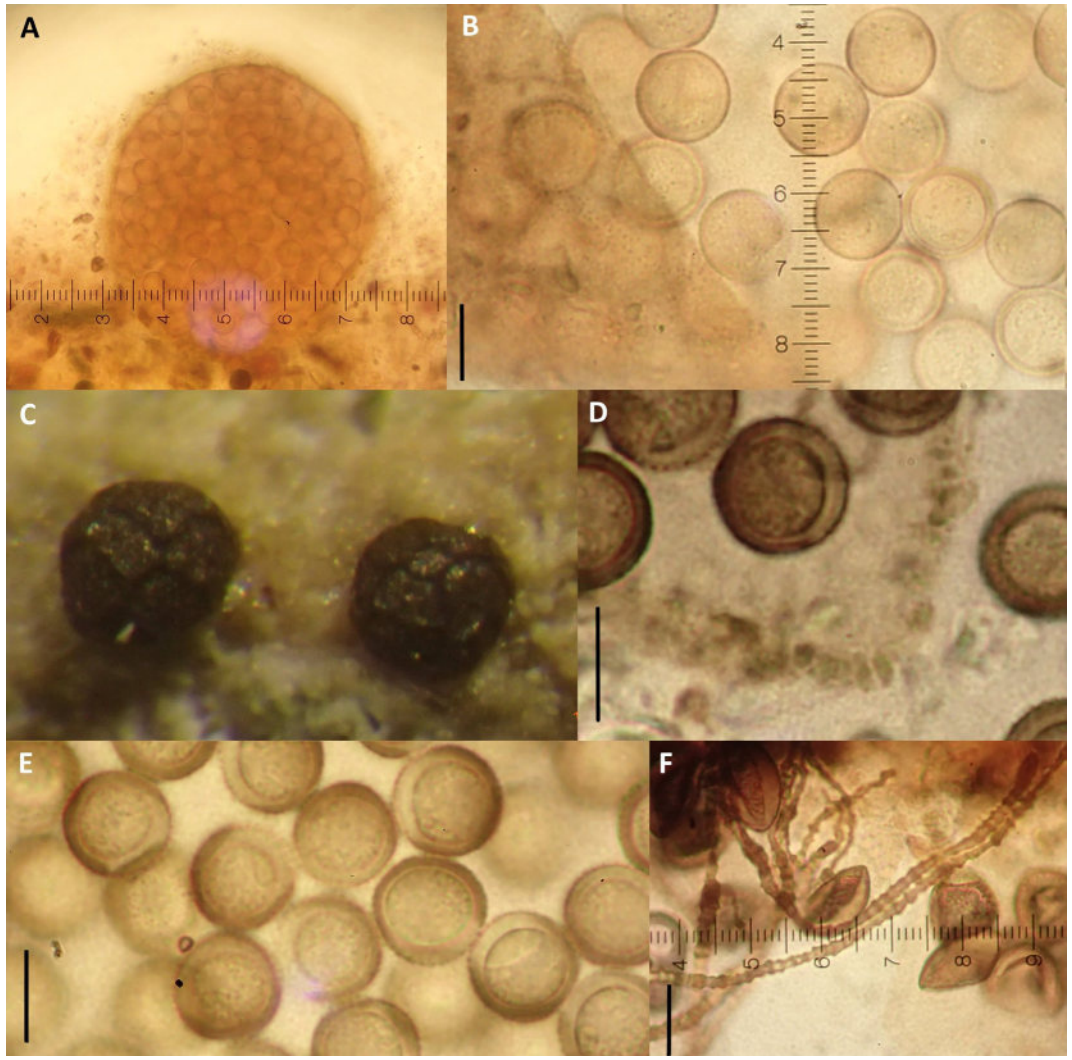


Figure 41. A, B; *Licea tenera* (OOL 18.45). A, sporocarp. B; spores and inner peridium. C-E; *Licea testudinacea* (OOL 19.9). C, sporocarps, D; spores and margin of peridial plate. E; spores. F; *Listerella paradoxa* (OOL-18.43), spores and capillitium. Photos: Edvin Johannesen. Scale bars 10 µm.

14 Dec 2016, mixed forest, on mosses growing on dying *Sorbus aucuparia*, (MC), PV-R181 (O).
MØRE OG ROMSDAL: Volda, Vadstein, OO, 14 Apr 2018, on *Orthotrichum* growing on *Populus tremula,* (MC), OOL-18.45 (O).

***Licea testudinacea* Nann.-Bremek.**
Fig. 41 C-E.

This species was reported from Norway by Marstad (1994) and by Mathiassen and Granmo (1995). Marstad (op. cit.) also collected it in Denmark (on bark, matured in moist chamber), and Adamonyte (2013) reported the species from Lithuania.

This is one of the non-stipitate species with an opaque peridium and dehiscence into conspicuous platelets along pre-formed lines. Related species include *L. minima*, *L. chelonoides*, *L. pusilla*, and *L. pygmaea*. It can be distinguished from *L. minima* by the darker spores, from *L. chelonoides* and *L. pusilla* by the smaller spores, and from *L. pygmaea* by the more numerous peridial plates with a differently ornamented margin, and the more unevenly distributed warts on the spores.

This being a corticolous species, two collections are atypical in growing on polypore hymenium and cow dung, respectively.

Material examined:
MØRE OG ROMSDAL: Volda, Høgedalen, OO, 27 Oct 2017, on polypore hymenium on *Pinus sylvestris* log, OOL-17.96. Ålesund, Emblem, OO, TAR, 4 Mar 2016, on log of *Populus tremula* (O). Skodje, Ørnakken, OO, 17 Oct 2018, on branches of *Taxus baccata* on the ground, (MC), OOL-19.9 (O).
SOGN OG FJORDANE: Hyllestad, Sponvika, OA, 18 Sep 2013, on cow dung (BG).

***Listerella paradoxa* E. Jahn**
Fig. 41 F.

These are the first published records from Norway. *L. paradoxa* has been reported from Sweden (Santesson 1948, 1964; Eliasson and Gilert 1982; Gilert 1996), Denmark (Santesson 1964; Eliasson and Gilert 1982), and Finland (Härkönen and Varis 2012).

Listerella is a monotypic genus and *L. paradoxa* is easily recognised in the microscope, due to the ring-shaped thickenings on the capillitium. Superficially, it may be taken for a species in the group around *Licea pygmaea*.

Material examined:
MØRE OG ROMSDAL: Volda, Vadstein, OO, 14 Apr 2018, (MC), on *Ulota crispa* growing on *Populus tremula*, OOL-18.43 (O). Skodje, Apalviksætra, TAR, OO, 24 Aug 2019, mixed forest with scattered *Taxus baccata*, on *Hypnum* sp. growing on *Taxus baccata* branches on the ground (two collections), (MC).
SOGN OG FJORDANE: Sogndal, Heimastølen, TAR, OO, 21 Aug 2019, deciduous forest with hollow elm trees, on mossy *Ulmus glabra,* (MC).

***Lycogala conicum* Pers.**
Fig 42 A.

There is only one collection of *L. conicum* previously reported from Norway (Sommerfelt 1826). The specimen is no longer available. The species is known from Denmark (Onsberg 1970) and Sweden (R. E. Fries 1912; Eliasson 1975; Eliasson and Sunhede 1980; Santesson 1964; Svensson 2010). It is quite frequently collected throughout Europe.

Macroscopically, *L. conicum* is recognised by the small size (for a *Lycogala*) and the taller than wide, conical or egg-shaped aethalia. The tubes of the pseudocapillitium are smooth or minutely warted.

Material examined:
AKERSHUS: Bærum, Kjaglia, EWJ, 25 Aug 2012, on deciduous log in rivulet slope (O).
SOGN OG FJORDANE: Fjaler, Gyttavika, OO, 21 Aug 2017, on decayed wood, OOL-17.37 (O).
VESTFOLD: Re, Tangenbekken, IK, BO, 14 Jun 2012, *Ulmus-Fraxinus* forest, on decayed *Ulmus glabra* log.

***Lycogala exiguum* Morgan**
Fig. 42 B-G.

The species was reported from Norway by Mathiassen and Granmo (1995, as *L.* cf. *exiguum*). It is known from Finland (Ukkola 2002), Sweden (Eliasson and Sunhede 1980), Estonia (Ing 1990), and Lithuania (Adamonyte and Eliasson 2001). It is frequently reported from elsewhere in Europe.

The small size and wider than tall aethalia may resemble small aethalia of *L. epidendrum*. However, *L. exiguum* hardly ever produces aethalia exceeding 5 mm. The

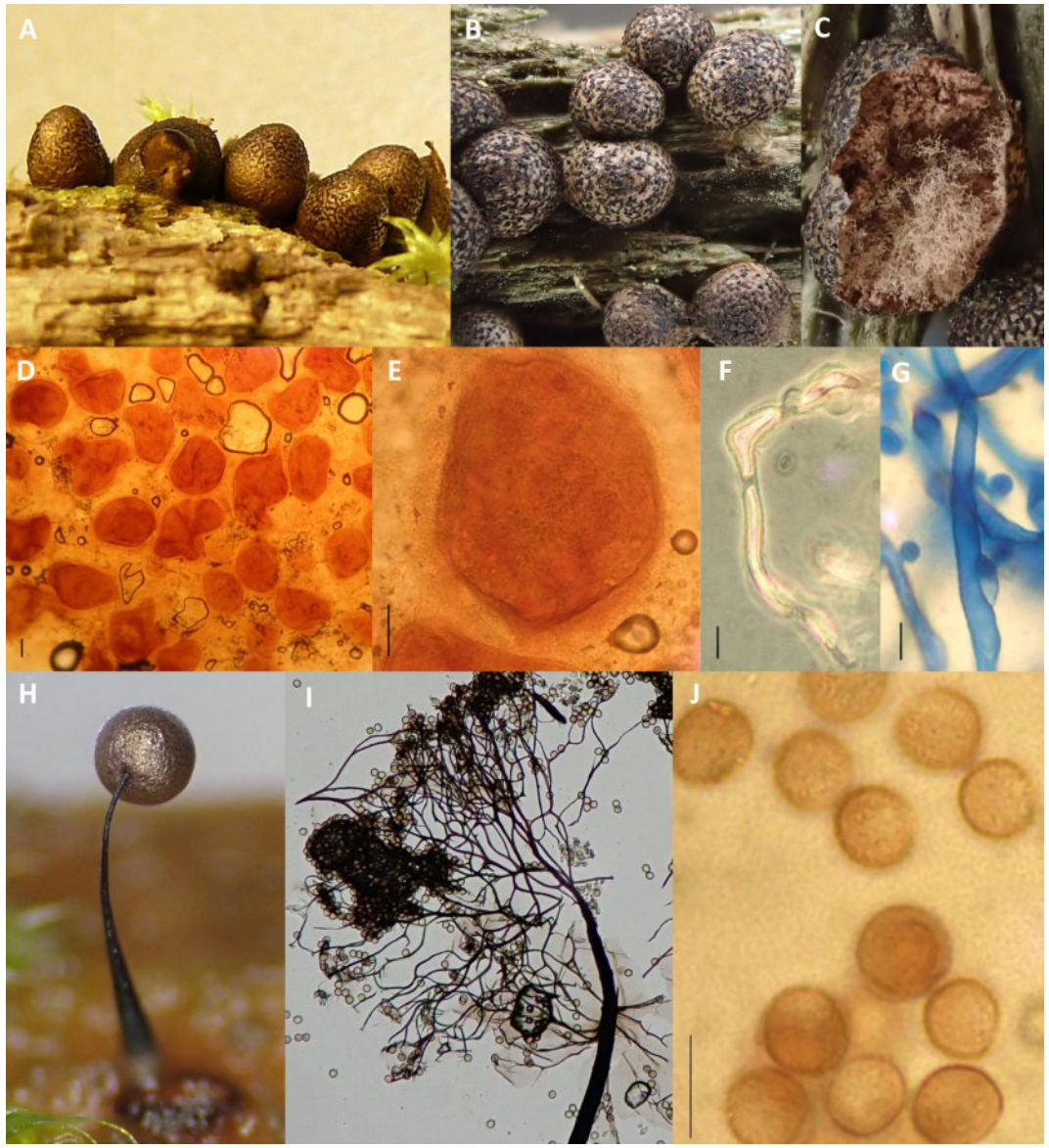


Figure 42. A; *Lycogala conicum,* (Re); aethalium. B-G; *Lycogala exiguum* (Moss). B; aethalium. C; aethalium, spore mass and pseudocapillitium. D, E; cortical warts. F, G; pseudocapillitium (F in KOH, G in cotton blue). H-J; *Macbrideola argentea* (OOL-19.117). H; sporocarp. I; capillitium; J; spores. Photo: A – Inger Kristoffersen, B-G, J – Edvin Johannesen. H, I – Oddvar Olsen. Scale bars 10 µm.

cortical scales are, in *L. exiguum*, arranged in groups and frequently sub-divided internally into "chambers" (not so in *L. epidendrum*). We have not observed such clearly "chambered" scaled in our specimens and we are uncertain as to how constant this character is.

The specimen from Østfold, Moss (Fig. 42) has a notably brittle pseudocapillitium, possibly because the threads appear partly air-filled. These cavities disappear in Cotton Blue, but not in 3% KOH.

L. confusum Nann.-Bremek. (= *L. epidendrum* var. *tesselatum*), may resemble *L. exiguum* and should be kept in mind when encountering small *Lycogala* aethalia.

Dmitry Leontyev (pers. comm.) is currently embarking on a review of the genus *Lycogala*. Norwegian specimens will be studied as part of this work.

Material examined:
AKERSHUS: Bærum, Kjaglidalen, TP, GhA, HGG, BN, IK, TJ, KB, EWJ, KH, 25 Aug 2012, on dead wood in rich tall herb dominated forest. Nannestad, AET, 28 Aug 1972 (O).
HEDMARK: Hamar, Hedmarksmuseet, PV, 29 Jun 2016, PV, AMDB, on mossy log of *Picea abies* in mixed forest, PV-S510. Stange, Sanderud, 9 Sep 2015, on *Populus tremula* log in nutrient rich mixed forest near riverbank, PV-S460. Stange, Stenbergrøsa, PV, 15 Nov 2015, field edge, on *Betula* stump, PV-S486. Stange, Gjøvika, PV, 2 Jul 2019, on *Picea abies* stump in spruce forest, PV2147 (O).
ØSTFOLD: Moss, Renneflot, RB, EWH, IK, 16 Jun 2019, small herb spruce forest, on log of *Picea abies*, (O).

***Macbrideola argentea* Nann.-Bremek. & Y. Yamam.**
Fig. 42 H-J.
The only previous report from Europe is from Madeira, Portugal (Müller 2006).
M. argentea is characterised by the extremely small sporocyst size (about 0,1 mm in diam.), the long stalk, the rather short columella, and the silvery persistent peridium, giving the impression of a miniature *Lamproderma*. The brown capillitium has few anastomoses and the warted spores have a few, darker warts.

Material examined:
MØRE OG ROMSDAL: Skodje, Apalviksætra, 24 Aug 2019, OO, TAR, in mixed forest, on *Taxus baccata* branch on the ground, (MC), OOL-19.117 (O).

***Macbrideola synsporos* (Alexop.) Alexop.**
Fig. 43 A-C.
These are the first published records from Norway and the Nordic/Baltic region. Considering its small size and its superficial similarity to *M. cornea*, *M. synsporos* has a surprisingly wide distribution worldwide.
Within this genus, *M. synsporos* is unique by having spores in compact clusters of ca. 7-15 spores.

Material examined:
MØRE OG ROMSDAL: Sula, Solavågsfjellet, OO, 28 Mar 2019, on dying branches of living *Taxus baccata* in pine forest, (MC), OOL-19.96 (O). Skodje, Apalviksætra, TAR, OO, 24 Aug 2019, mixed forest with scattered *Taxus baccata*, on *Taxus baccata* branches on the ground, (MC).

***Meriderma aggregatum* ad int.**
Fig. 43 D, E.
The species was tentatively proposed by Poulain et al. (2011), but it is not yet formally published. These are the first published records from Norway. According to the Swedish checklist (Eliasson 2018), it has been found in Sweden.
M. aggregatum is quite easily recognised by the charcoal-black, strictly sessile, and always densely crowded sporocarps. The spores are regularly set with relatively shorts pines. In our material, several specimens have spores which are much larger than normal, ranging from 15 to 25 µm in diameter, thus conforming to forma *macrosporum* ad int. (Poulain et al. op. cit.). A DNA sequencing-based revision of *Meriderma* is currently ongoing (Schnittler et al. work-in-progress)

Material examined:
AKERSHUS: Nittedal, Skytta, SM, EWJ, 2 May 2018, *Vaccinium myrtillus* dominated spruce forest, on ferns, mosses etc. on the ground, near melting snow, EJ 02-18 (O).

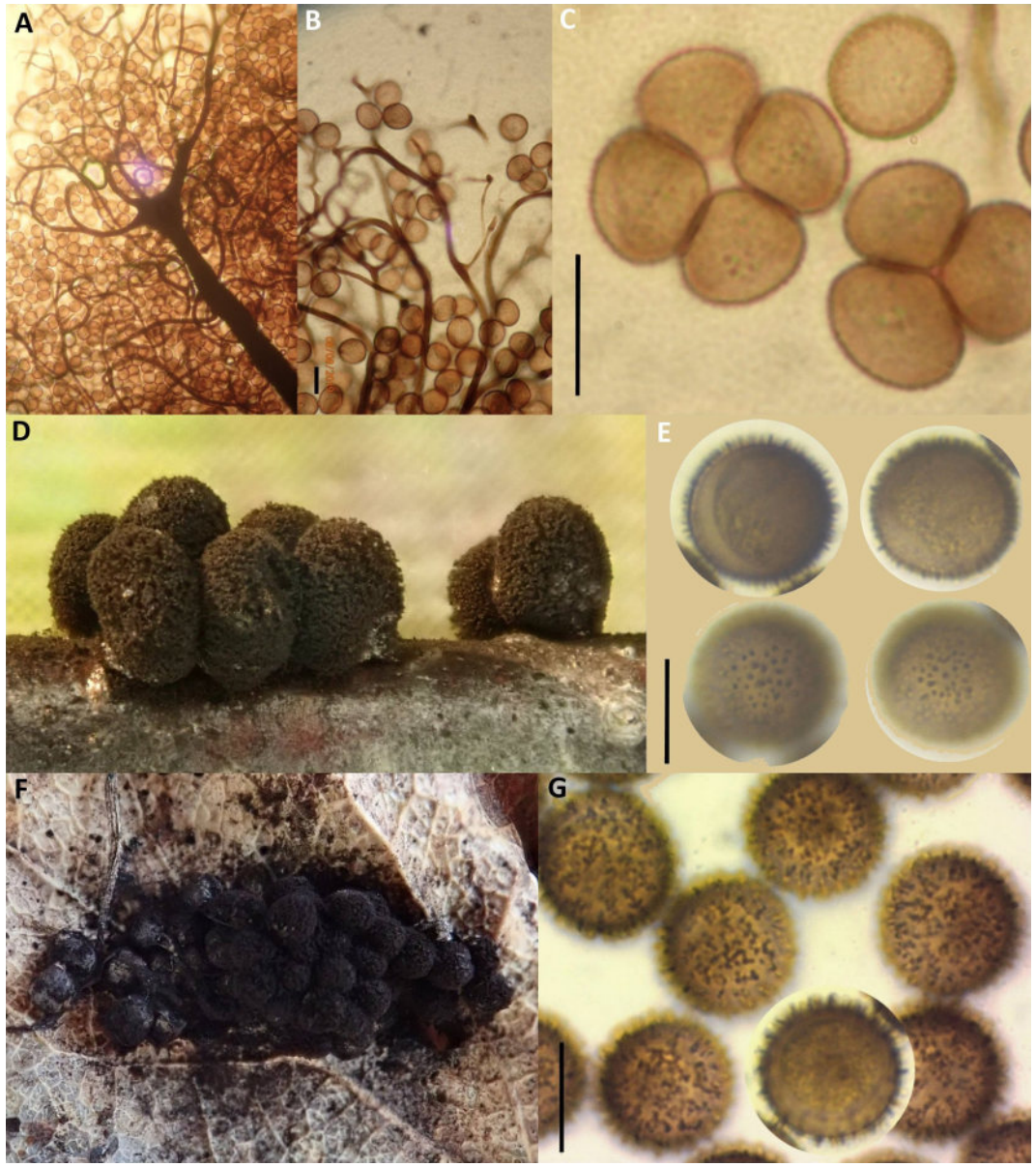


Figure 43. A-C; *Macbrideola synsporos* (OOL 19.96). A; columella and capillitium. B, capillitium and spores. C; spore clusters. D, E; *Meriderma aggregatum* (PV-S741). D; sporocarps. E; spores. F, G; *Meriderma echinulatum* (PV-S733). F; sporocarps. G; spores. Photo: A-C – Edvin Johannesen. D-G – Per Vetlesen. Scale bars 10 µm.

AUST-AGDER: Bykle, Lislefjødd, IK, PV, SM, EWJ, 21 May 2018, subalpine birch forest in moist slope with *Betula*, *Juniperus*, *Salix*, grasses and tall herbs, on *Juncus* sp., EJ 116-18 (O). Bykle, Lundane, IK, PV, SM, EWJ, 22 May 2018, on *Salix* in subalpine birch forest, PV-S797. Bykle, Hovdenuten,

IK, PV, SM, EWJ, 22 May 2018, subalpine birch forest with *Juniperus*, *Empetrum, Vaccinium*, and *Lycopodium*, on branch and twigs of *Betula*, EJ 127-18 (O). Bykle, Hovdenutkollen, IK, PV, SM, EWJ, 22 May 2018, subalpine birch forest, on *Betula nana* and *Vaccinium myrtillus*, PV-S799 (O). Bykle, Hovdenutkollen, IK, PV, SM, EWJ, 22 May 2018, subalpine birch forest, on *Betula pubescens*, PV-S803 (MM 40150). Bykle, Hovdenutkollen, IK, PV, SM, EWJ, 23 May 2018, subalpine birch forest, on *Vaccinium myrtillus*, PV-S839.
BUSKERUD: Sigdal, Tempelsetra, IK, SM, PV, EWJ, 25 May 2019, subalpine birch forest with *Empetrum* and *Juniperus*, near melting snow, on herbaceous stem, 950 m alt.
HEDMARK: Hamar, Gåsbu, PV, 12 May 2018, on *Vaccinium myrtillus* in spruce forest, PV-S766 (O). Stange, Stor-reemarka, PV, 30 Apr 2018, spruce forest near melting snow, on *Vaccinium myrtillus*, PV-S742. Stange, Stor-reemarka, PV, 30 Apr 2018, spruce forest near melting snow, on *Betula*, PV-S741.
TELEMARK: Vinje, Roi, IK, PV, SM, EWJ, 23 May 2018, subalpine birch forest, on *Vaccinium myrtillus*, PV-S823 (O).

***Meriderma echinulatum* (Meyl.) Mar. Mey. & Poulain**
Fig. 43 F, G.

There are no previous published records of *M. echinulatum* from the Nordic/Baltic region. It has been reported from mountainous regions in Europe and from Russia (Murmansk and Karachay–Cherkess).

This species is closely related to *M. carestiae* and *M. spinulosporum* (see below). In *M. carestiae,* the spores have ridges which form an incomplete net with most meshes open. *M. spinulosporum* has spores with well-separated spines, only rarely fused into short crests. *M. echinulatum* is somewhere in between in this respect; the spines are slightly taller (0.6 -0.9 µm), irregularly distributed, and connected to form labyrintuliform crests (but not forming closed meshes). This ornamentation gives the spores a somewhat «ragged» appearance. Furthermore, the stalks of *M. echinulatum* are typically shorter than in the two other species. We have occasionally struggled to place specimens confidently within this group. An ongoing DNA-sequencing-based revision of *Meriderma* (Schnittler et al. work-in-progress) will hopefully shed light on this species complex.

Material examined:
AKERSHUS: Skedsmo, Lahaug, SM, KH, 5 Apr 2019, *Vaccinium myrtillus* dominated spruce forest, on *Vaccinium myrtillus*, SM-19.007 (O).
AUST-AGDER: Bykle, Lundane, IK, PV, SM, EWJ, 22 May 2018, subalpine birch forest, near rivulet and snowbanks, EJ 27-18 (O).
BUSKERUD: Sigdal, Tempelsetra, IK, PV, SM, EWJ, 21 May 2019, in subalpine birch forest with *Empetrum* spp. and *Juniperus communis*, on bark of *Betula*, 970 m alt. Sigdal, Tempelsetra, IK, PV, SM, EWJ, 21 May 2019, near snow, on dead ferns and *Chamerion angustifolium*, 950 m alt.
HEDMARK: Hamar, Ormsætertajet, PV, 29 Apr 2018, spruce forest near melting snow, on *Rubus idaeus*, grass and *Betula* leaves, PV-S733 (MM 40137). Hamar, Ormsætertajet, PV, 29 Apr 2019, spruce forest near melting snow, on *Picea abies* shoot, PV2068 (O).
TELEMARK: Tokke, Øyfjell, IK, PV, SM, EWJ, 23 May 2018, *Vaccinium myrtillus* dominated spruce forest, on *Vaccinium myrtillus*.

***Meriderma spinulosporum* ad int.**
Fig. 44 A, B.

The species was tentatively proposed by Poulain et al. (2011), but it is not yet formally published. There are no precious published records from the Nordic/Baltic region.

For a brief discussion of *M. spinulosporum* against *M. carestiae* and *M. echinulatum*, see the latter.

Collections EJ 157-18 and PV-S777 have spore sizes in a range which would conform to forma *intermedium* ad int. or possibly forma *gigasporum* ad int. (Poulain et al. op. cit.). In one collection (EJ 134-18), tentatively named *M. carestiae* (a species not treated specifically here), the spore ornamentation is intermediate between *M. spinulosporum* and *M. carestiae*; some spores have isolated spines occasionally fused in pairs, but the majority have long ridges which are often

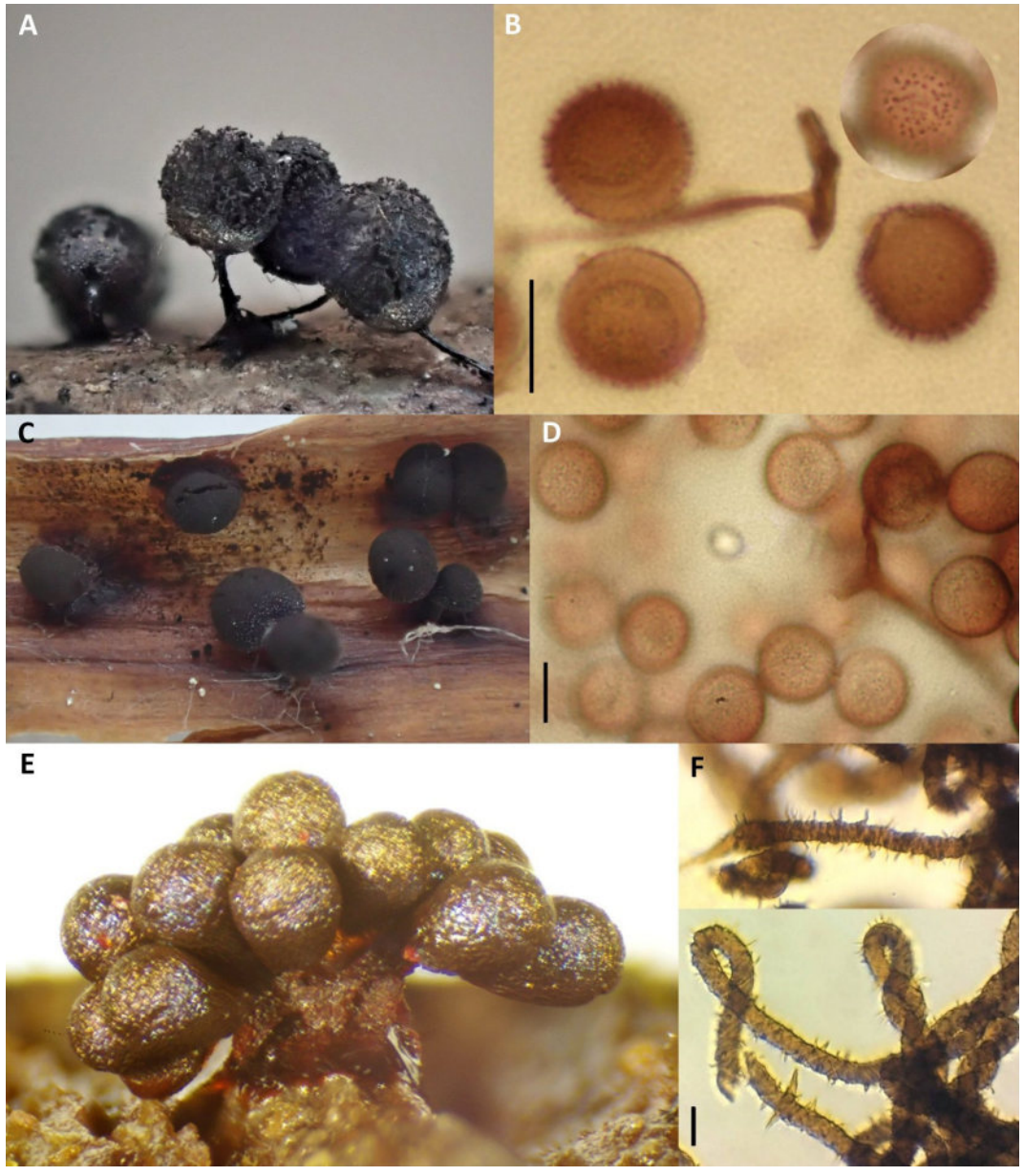


Figure 44. A, B; *Meriderma spinulosporum* (EJ 115-18). A, sporocarps. B; spores and capillitial tip. C, D; *Meriderma verrucosporum* (EJ 03-19). C, sporocarps. D; spores and capillitial tip. E, F; *Metatrichia horrida* (PV-R166). E; sporocarps. F; capillitium. Photo: A-D – Edvin Johannesen. E, F – Per Vetlesen. Scale bars 10 µm.

branched or rarely forming closed meshes. Marianne Meyer (pers. comm.) has seen a small portion of the specimen and suggests *M. spinulosporum*. A DNA sequencing-based revision of *Meriderma* is currently ongoing (Schnittler et al. work-in-progress)

Material examined:
AKERSHUS: Nittedal, Varingskollen, SM, 27 May 2019, alpine ski slope with snow patches, SM-19.016, SM-19.020, SM-19.020-1. Nittedal, Varingskollen, SM, 25 May 2019, alpine ski slope with snow patches, on dead herbs, SM-19.011.
AUST-AGDER: Bykle, Lislefjødd, IK, PV, SM, EWJ, 21 May 2018, subalpine birch forest in moist slope with *Betula*, *Juniperus*, *Salix*, grasses and tall herbs, on thin twigs of Betula, EJ 157-18 (O). Bykle, Lislefjødd, IK, PV, SM, EWJ, 21 May 2018, subalpine birch forest, on *Betula nana*, PV-S817. Bykle, Hovdenuten, IK, PV, SM, EWJ, 22 May 2018, subalpine birch forest with *Juniperus*, *Empetrum, Vaccinium*, and *Lycopodium*, on branch and twigs of *Betula*, EJ 125-18 (O). Bykle, Lundane, IK, PV, SM, EWJ, 22 May 2018, subalpine birch forest, near rivulet and snowbanks, on thin twigs of *Betula*, EJ 129-18 (O). Bykle, Lundane, IK, PV, SM, EWJ, 22 May 2018, subalpine birch forest, on *Betula nana*, PV-S794. Bykle, Lislefjødd, IK, PV, SM, EWJ, 21 May 2018, subalpine birch forest in moist slope with *Betula*, *Juniperus*, *Salix*, grasses and tall herbs, on twig of *Betula pubescens*, EJ 115-18 (O). Bykle, Lislefjødd, IK, PV, SM, EWJ, 21 May 2018, subalpine birch forest, on *Betula pubescens* and *Salix*, PV-S777 (duplicate MM 40145).
HEDMARK: Hamar, Ormsætertajet, PV, 26 Apr 2019, in spruce forest near melting snow, on dead grass and *Rubus idaeus*, PV2030, PV2037 (O).

***Meriderma verrucosporum* ad int.**
Fig. 44 C, D.

The species was tentatively proposed by Poulain et al. (2011), but it has not yet been formally published. Ths species is not previously reported from Norway and we are not aware of collections or reports from the Nordic/Baltic region.

The distinctly stalked sporocarps and the warted spores, paler on one side, are good diagnostic characters within the genus. A DNA sequencing-based revision of *Meriderma* is currently ongoing (Schnittler et al. work-in-progress).

Material examined:
BUSKERUD: Sigdal, Tempelseter, 21 May 2019, EWJ, PV, SM, IK, on stem of *Chamerion angustifolium* in subalpine birch forest, 950 m alt., EJ 03-19 (O).

***Metatrichia horrida* Ing**
Fig. 44 E, F.

This is the first known collection from Norway. There is only one, fairly recent, report from Europe (France), and only scattered reports exist from around the world.

This obviously rare species superficially resembles *M. vesparium*, which is rather common, but the capillitial threads of *M. horrida* have up to 6 µm long spines.

Material examined:
HEDMARK: Stange, Rotlia, PV, 27 Oct 2016, rich thermophilous deciduous forest, on dead wood of *Ulmus glabra*, (MC), PV-R166 (O).

***Oligonema aurantium* Nann.-Bremek.**
Fig. 46 A-C.
This is a very rare species, which has only been reported from The Netherlands and Argentina (Patagonia). One report from Ukraine is uncertain (cf.). *O. aurantium* macroscopically resembles *Trichia scabra* in having aggregated, but not heaped, golden orange sporocarps. However, microscopically it clearly belongs to the genus *Oligonema* in having long, free elaters with blunt ends, ornamented with a few distinct rings, long, scattered spines, and occasionally faint spirals. It is distinguished from other *Oligonema* species by the delicate, small-meshed, sometimes broken, reticulum on the spore surface.

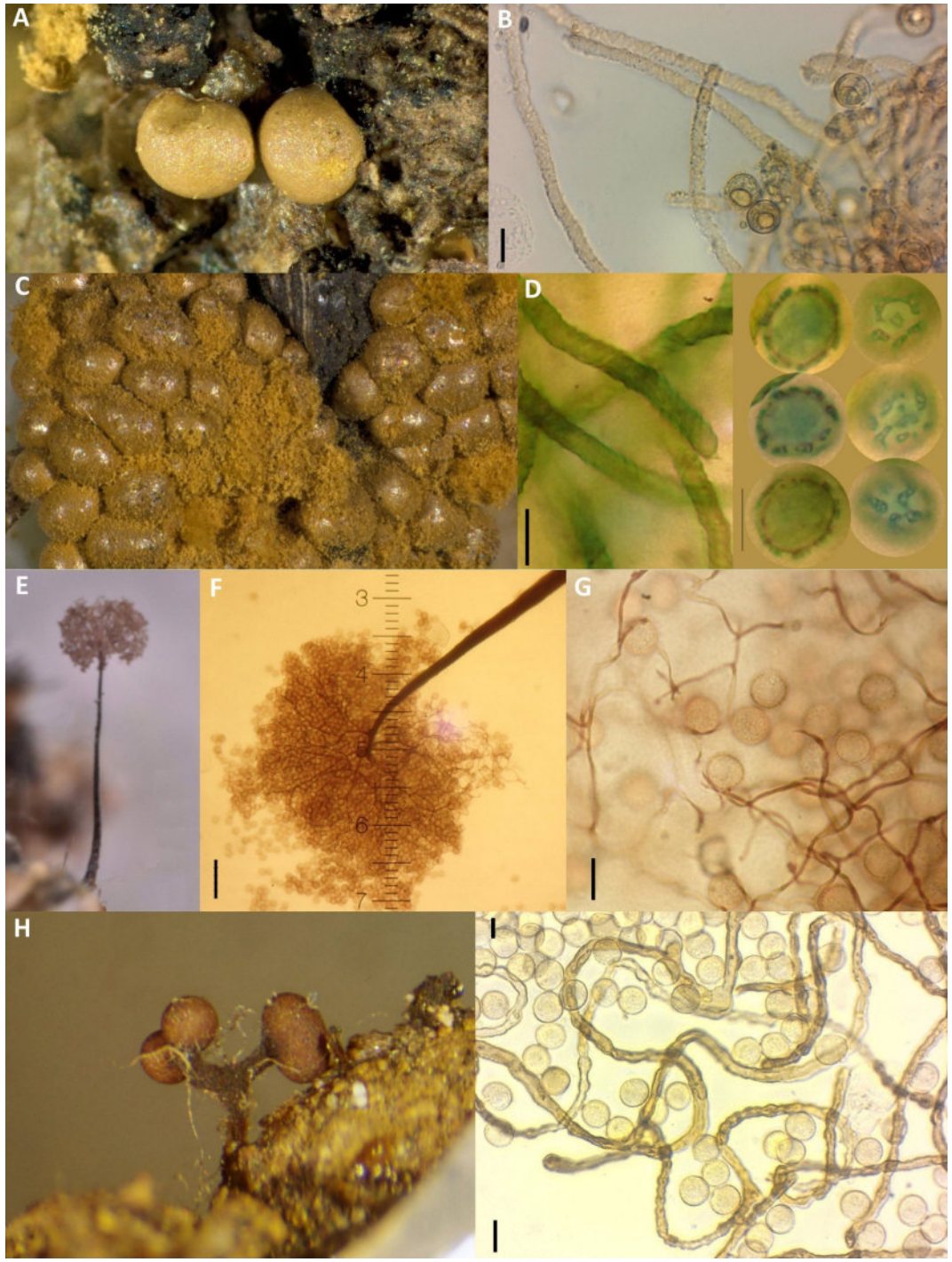


Figure 45. A, B; *Oligonema fulvum* (PV-S494 A). A; sporocarps. B; capillitium and spores. C, D; *Oligonema schweinitzii* (PV-S155). C; sporocarps. D; capillitium and spores (cotton blue). E-G; *Paradiacheopsis rigida* (PV-R048). E, F; sporocarps. G; capillitium and spores. H, I; *Perichaena pedata* (PV-F147). H; sporocarps. I; capillitium and spores. Photo: A, C-G – Edvin Johannesen. B, H, I – Per Vetlesen. Scale bars 10 µm (B, D, G, I), 50 µm (F).

Material examined:
AKERSHUS: Nittedal, Markerud, SM, 1 Jul 2019, on large, highly decayed, log of deciduous tree (*Acer*?), SM-19.029 (O).

Oligonema fulvum Morgan

Fig. 45 A, B.

The species has not previously been reported from Norway. In our region, *O. fulvum* is known from Denmark (Albertsen and Gøtzsche 1993), Greenland (Gøtzsche 1989), and Lithuania (Adamonyte 2001, as *O.* cf. *fulvum*). Outside Europe, it is only reported from USA.

Within *Oligonema* this species is easily recognised by the warted spores; the remaining species all have reticulate spores (except one species only known from China). However, it can be difficult to distinguish *Oligonema* from abnormal collections of *Trichia* with faint spiral ornamentation on the elaters. We are somewhat in doubt, regarding a few of the specimens listed below.

Material examined:
AUST-AGDER: Bykle, Hovden, Lundane, IK, PV, SM, EWJ, 22 May 2018, subalpine birch forest, near rivulet and snowbanks, on thin *Betula* twig, EJ 24-18. HEDMARK: Hamar, Hjellum, PV, 10 Dec 2015, on *Populus tremula* log, PV-S494-A. Hamar, Furuberget, PV, 1 Sep 2018, mixed coniferous forest dominated by *Pinus sylvestris*, on *Pinus sylvestris* log. Stange, Enghagan, PV, 7 Mar 2012, on *Ulmus glabra* (O). Stange, Stenberg, PV, 17 Feb 2014, on bark of *Sambucus racemosa*, PV-S310. Stange, Rotlia, PV, 11 Nov 2015, on *Salix* log in thermophilous deciduous forest, PV-R079. Stange, Rotlia, PV, 11 Nov 2015, on log of *Populus tremula* in thermophilous deciduous forest, PV-R077. Stange, Bretta, PV, 17 Sep 2018, in garden, on bark of *Syringa vulgaris*, PV-S863.
MØRE OG ROMSDAL: Aure, Todalen, SHLL, ØF, SS, ÅH, OO, 11 Oct 2018, on *Ulmus glabra*, (MC), OOL-19.24 (O). Volda, Bjørkedalsvatnet, OO, 29 Oct 2019, on bark of *Populus tremula*. (MC).
ØSTFOLD: Aremark, Metartjern, BEA, 14 Apr 2017, on *Populus tremula* log in small herb dominated spruce forest, (O).

Oligonema schweinitzii (Berk.) G.W. Martin

(Syn.: *Oligonema nitens* (Lib.) Rostaf.)
Fig. 45 C, D.

This is the first published record from Norway. *O. schweinitzii* has been reported from Denmark (Elliott 1926, as *Oligonema nitens*); Bjørnekær and Klinge 1964) and Lithuania (Adamonyte and Eliasson 2001; Kutorga et al. 2012) in our region.

O. schweinitzii is recognised by the large-meshed, banded-reticulate spores (similar to what is seen in the *Trichia favoginea* complex), and the elaters, ornamented with faint spirals, sometimes with prominent rings, and swollen ends with or without one or two long spines. In the Norwegian specimen, the elaters have faint spirals and we have seen spines at the ends.

Material examined:
HEDMARK: Hamar, Domkirkeodden, WV, PV, 18 Nov 2012, on dead *Abies alba* in the museum area, PV-S155 (O).

Paradiacheopsis rigida (Brândză) Nann.-Bremek.

Fig. 45 E-G.

We have found no published reports of *P. rigida* from the Nordic/Baltic region. There are numerous reports from throughout Europe and around the world. This species has very tiny sporocarps and is normally only detected under the stereo microscope.

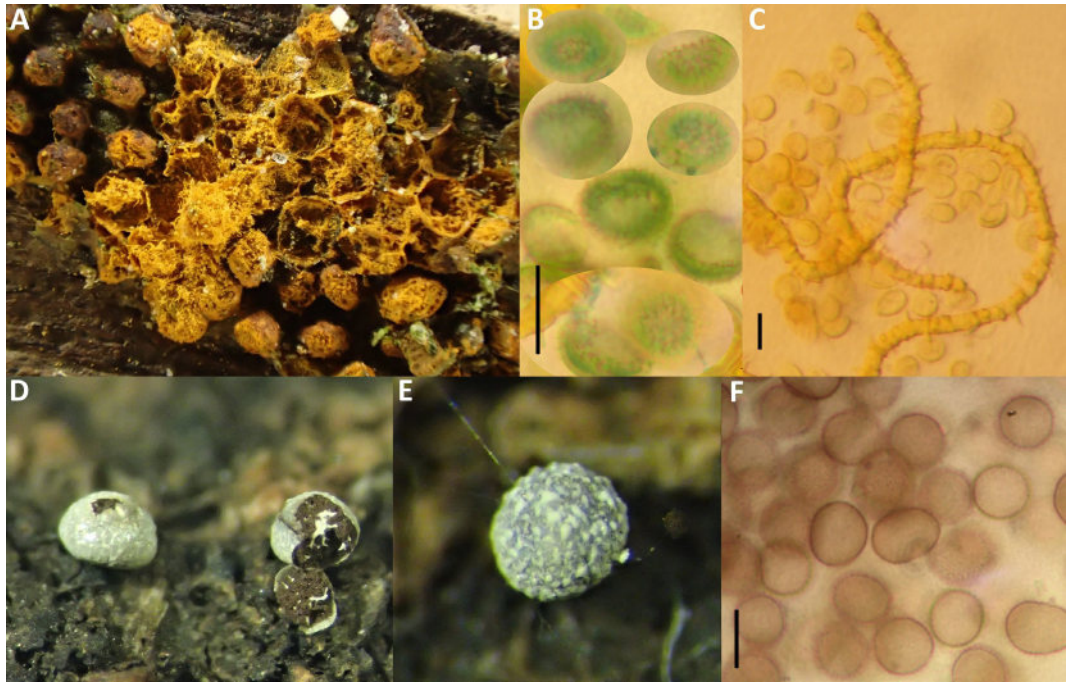


Figure 46. A-C; *Oligonema aurantium* (SM-19.029). A; sporocarps. B; spores (cotton blue). C; capillitium and spores. D-F; *Physarum corticola* (OOL-20.26). D, E; sporocarps. F; spores. Photos: Edvin Johannesen. Scale bars 10 µm.

P. rigida has smaller spores (7-10 µm) than other relatively common species within the genus; *P. cribrata, P. solitaria,* and *P. fimbriata* (all > 10 µm).

Material examined:
HEDMARK: Hamar, Furuberget, PV, 14 Sep 2017, calciphilous mixed forest, on bark/resin of *Pinus sylvestris* attacked by pathogenic rust, PV-S667. Ringsaker, Nydal, PV, 13 Oct 2014, dense forest/thicket, on old *Picea abies* log in timber heap, PV-S393. Stange, Rotlia, PV, 1 Jul 2015, on log of *Populus tremula* in thermophilous deciduous forest, PV-R022. Stange, Rotlia, PV, 17 Aug 2015, on log of *Populus tremula* in thermophilous deciduous forest, on log of *Acer platanoides*, PV-R048 (O). Stange, Rotlia, PV, 25 Oct 2015, *Pinus-Corylus* forest on bark of *Juniperus communis*, (MC), PV-R108. Stange, Rotlia, PV, 30 Jan 2016, mixed forest, on branch of *Populus tremula*, PV-R252. Stange, Rotlia, PV, 30 Jan 2016, rich thermophilous forest, wood of dead *Corylus avellana*, PV-R233. Stange, Rotlia, PV, 30 Jan 2016, mixed forest, on decayed wood of *Populus tremula*, PV-R249. Stange, Rotlia, PV, 14 Feb 2016, thermophilous deciduous forest, on stump of *Corylus avellana,* (MC). Stange, Sanderud, PV, 14 Oct 2016, moist nutrient rich spruce forest, on *Picea abies* log, PV-S555 (O). Stange, Rotlia, PV, 20 Oct 2016, coniferous forest, on log of *Pinus sylvestris*, (MC), PV-R168. Stange, Jønsberg, PV, 17 Jan 2018, parkland, on branches of *Quercus* on the ground, (MC), PV-F173. Stange, Nebbvika, PV, 13 Apr 2018, lakeside forest, on decayed branch of *Pinus sylvestris*, (MC), PV-F188 (O). Stange, Jønsberg, PV, 14 Apr 2018, parkland, on *Pinus sylvestris* twig on the ground, (MC), PV-F187. Stange, Nebbvika, PV, 18 Apr 2018, lakeside forest, on decayed branch of *Pinus sylvestris* on the ground, (MC), PV-F191. Stange, Røne, PV, 14 Sep 2018, mixed forest, branch of *Pinus sylvestris* on the ground, PV-S859.
MØRE OG ROMSDAL: Volda, Trongedalen, OO, 12 Feb 2018, (MC), on mosses growing on dead branch of *Alnus* or *Sorbus*. Ørsta, Mo, OO, 30 Mar 2018, (MC). Ørsta, Mo, OO, 30 Mar 2018, on log of *Sorbus aucuparia*, (MC).

***Perichaena pedata* (Lister & G. Lister) Lister ex E. Jahn**
Fig. 45 H, I.

These are the first published records from Norway. The species is not previously reported from the Nordic countries, but it has been reported from Latvia (Adamonyte 2006) and Lithuania (Adamonyte 2005).

P. pedata is characterised by distinctly stalked, golden brown sporocarps, branched, irregular capillitium threads marked with scattered spinules, and spinulose spores 9-11 µm in diam. (Collection PV-F130B was very scanty and is only preserved as a microscopic slide.)

Material examined:
HEDMARK: Hamar, Åker, PV, 4 Jul 2017, disturbed vegetation/wasteland, on plant litter, (MC), PV-F147 (O). Stange, Jønsbergvegen 305, PV, 2 Jun 2015, on bark of *Syringa* sp. in garden, (MC), PV-F108 (O). Hamar, Furuberget, PV, 20 Feb 2017, on bark of *Juniperus communis* in calciphilous pine forest, (MC), PV-F130B (O).
VESTFOLD: Horten, Lystlunden, PV, 30 Oct 2019, in park, on bark and moss growing on living *Acer platanoides*, PV2241.

***Physarum albescens* Ellis ex T. Macbr.**
Fig. 47 A.

Johannesen (1982, 1984a) reported two collections from Norway (Akershus). There are no additional reports of this nivicolous species from the Nordic/Baltic region. It is widespread elsewhere in Europe.

Ph. albescens is easily recognised even in the field, by the whitish to yellow sporocarps born in small clusters, usually on yellow stalk-like extensions of the hypothallus (somewhat reminiscent of *Badhamia utricularis*). The sporocarps sometimes lack a lime deposit on the peridium and are then iridescent in various colours.

Material examined:
AKERSHUS: Nittedal, Varingskollen, SM, 25 May 2019, alpine ski slope with patches of snow, four collections on dead herbaceous stems, deciduous twig, and *Vaccinium myrtillus* SM-19.010 (O).
AUST-AGDER: Bykle, Lundane, IK, PV, SM, EWJ, 22 May 2018, subalpine birch forest with *Juniperus*, *Calluna* and grasses, on twigs of *Betula* and *Salix* and on twig and needles of *Juniperus communis*, EJ 45-18 (O), EJ 92-18 (O), EJ 93-18 (O). Bykle, Lundane, IK, PV, SM, EWJ, 22 May 2018, subalpine birch forest, near rivulet and snowbanks, on dead wood, probably *Betula*, and on *Empetrum*, EJ 54-18 (O), EJ 97-18 (O). Bykle, Lundane, IK, PV, SM, EWJ, 22 May 2018, subalpine birch forest with *Juniperus*, *Empetrum, Vaccinium*, near snow, on thin twig, EJ 105-18 (O). Bykle, Hovdenutkollen, IK, PV, SM, EWJ, 22 May 2018, on *Betula pubescens* in subalpine birch forest, PV-S802.
BUSKERUD: Sigdal, Tempelnatten, PM, 24 May 1992, on dead herbs at snow edge, above tree line. Sigdal, Ulefjell, PM, 24 May 1992 (not examined by the authors). Krødsherad, Norefjell ski resort, IK, PV, SM, EWJ, 21 May 2019, subalpine birch forest, four collections on *Betula*, *Salix*, and *Empetrum* twigs, 870-950 m alt.
HEDMARK: Trysil, Skarvhøa, PV, 16 Jun 2017, acidic mountain heath, on *Vaccinium myrtillus* near melting snow, PV-S587, PV-S590 (O).
OPPLAND: Ringebu, Ringebu Østfjell, PV, 1 Jun 2017, near melting snow above tree line, on *Empetrum* and *Vaccinium myrtillus*, PV-S573, PV-S574. Øyer, Uksbåsen, PV, 23 Jun 2016, acidic vegetation above tree line, on *Vaccinium myrtillus* near melting snow, PV-S505. Øystre Slidre, Gravolskampen, RvK, 13 Jun 2017, mountain, between boulder and snowbank, on grass, RvK 26-17.
SOGN OG FJORDANE: Årdal, Mannsbergi, SM, 8 Jun 2018, above tree line, SM-18.33, SM-18.35 (plus seven collections in same area between 1140 and 1330 m alt.).
TELEMARK: Vinje, Arabygdvegen, IK, PV, SM, EWJ, 23 May 2018, subalpine birch forest with *Juniperus*, on thin twig of *Betula nana*, EJ 140-18 (O) (plus three additional collections at same site on *Vaccinium* and *Calluna*). Vinje, Roi, IK, PV, SM, EWJ, 23 May 2018, subalpine birch forest, on *Salix*.

***Physarum alpestre* Mitchel, S.W. Chapm. & M.L. Farr**
Fig. 47 B, C.

These are the first published records of this nivicolous species from North Europe (nearest records are from Poland and

Figure 47. A; *Physarum albescens* (EJ 105-18), sporocarps. B, C; *Physarum alpestre* (EJ 75-18), B; sporocarps. C; spores and lime node. D; *Physarum auripigmentum* (Kristiansand), sporocarps. E-G; *Physarum bryocorticola* (OOL-20.16). E; sporocarp. F; open sporocarp showing capillitium. G; spores. H, I; *Physarum daamsii* (PV-S658). H; sporocarps. I; spores. Photo: A-C, E-I – Edvin Johannesen. D – Martin Gotink. Scale bars 10 µm.

Scotland). There are scattered reports from around the world.

Apart from being strictly nivicolous, *Ph. alpestre* can be recognised by the yellow to ochraceous plasmodiocarps, the distinctly double peridium, and the coarsly warted spores. Apparently, the spore size may vary considerably within this taxon. For instance, all specimens studied by Poulain et al. (2011) had significantly smaller spores than stated in the original description.

Material examined:
AUST-AGDER: Bykle, Lislefjødd, IK, PV, SM, EWJ, 21 May 2018, subalpine birch forest in moist slope with *Betula*, *Juniperus*, *Salix*, grasses and tall herbs, on twig and needles of *Juniperus communis*, EJ 75-18 (O), PV-S807 (MM 40153). Bykle, Hovdenutkollen, IK, PV, SM, EWJ, 23 May 2018, on *Vaccinium myrtillus* in subalpine birch forest, PV-S836.
HEDMARK: Hamar, Ormsætertajet, PV, 29 Apr 2018, spruce forest near melting snow, on *Rubus idaeus,* PV-S734.

***Physarum auripigmentum* G.W. Martin**
Fig. 47 D.

Marstad (1994) reported this species from moist chamber (Norway, Vestfold). The specimen from Vest-Agder (also from moist chamber) is reported here with permission from the collector (Martin Gotink). The specimen has been identified by Hans van Hooff. This is apparently a rare species, in Europe only reported from France.

Material (not examined by the authors):
VEST-AGDER: Kristiansand, Møvik, MG, 29 Dec 2015, on dead stems of Lycopodiaceae, (MC).

***Physarum bryocorticola* Kuhnt**
Fig. 47 E-G.

This corticolous species was recently described and is previously known only from Germany, Austria, and France (Kuhnt 2019). It is, apart from its ecology, characterised by the small (< 1 mm), whitish (with a darker base), sessile or subsessile sporocarps, the nearly badhamioid capillitium, and the distinct, evenly distributed spinules on the spores. Kuhnt (op. cit.) describes the spores as frequently having a paler germination area and that the spores collapse after some time in Hoyer's medium (contrary to *Ph. corticola* Kuhnt, described in the same paper; see below). We have observed paler areas on some spores (only seen during focusing the microscope), but the spores in our specimens do not have a distinctly paler side. We have not sacrificed sporocarps in order to test the Hoyer's medium effect.

According to Kuhnt, *Ph. bryocorticola* is bryophilous and restricted to mosses growing on the bark of living trees. In that respect, specimen OOL-19.77B is atypical since the sporocarps are situated directly on the bark (of a living tree). In specimen OOL-20.23, however, the sporocarps are mostly situated on moss, but partly on bark. Since these specimens are otherwise morphologically in agreement with *Ph. bryocorticola*, we hypothesise that this may be caused by its development on small pieces of mossy bark in a moist chamber. The identity of two of our specimens has been confirmed by Kuhnt (pers. comm.), based on photographs and descriptions.

Material examined:
MØRE OG ROMSDAL: Volda, Hjellane, OO, 2 Feb 2019, in garden on bark from living plum tree, (MC), OOL-19.77 B (O). Volda, Vadstein, OO, 14 Apr 2018, on *Ulota crispa* growing on living *Populus tremula*, (MC), OOL-18.54 (O). Volda, Bjørkedalsvatnet, 29 Oct 2019, OO, on mosses and liverworts on the bark of living *Populus tremula*, (MC). Skodje, Ørnakken, OO, 27 Nov 2019, on mossy *Taxus baccata,* (MC), OOL-20.16 (O). Volda, Vadstein, OO, 10 Dec 2019, on *Orthotrichum* sp. growing on living *Populus tremula*, (MC), OOL-20.20C (O).

Figure 48. A-C; *Physarum flavicomum* (HG 00.0931). A, B; sporocarps. C; spores. D; *Physarum flavidum* (OOL-16.44), sporocarps. E, F; *Physarum licheniforme* (Færder). E; sporocarps. F; spores. G-I; *Physarum loratum*; G; sporocarps (OOL 19.91). H; sporocarp showing capillitium (OOL 19.90). I; spores (OOL 19.90). Photo: A-C – Helge Gundersen. D-I – Edvin Johannesen. Scale bars 10 µm.

***Physarum corticola* Kuhnt**
Fig. 46 D-F.

This strictly corticolous species was recently described and is previously known only from Germany (Kuhnt 2019). It is closely related to *Ph. bryocorticola* (above), differing primarily in the paler spore mass (medium brown) and the denser and much less prominent warts on the spores, hardly visible at 400x magnification. The spores are also larger (10-12 µm vs. 8.5-10 µm) and do not have a paler (thinner) germination area (and thus do not collapse in Hoyer's medium).

Ph. corticola is described as consistently being sessile, whereas *Ph. bryocorticola* frequently forms short-stipitate sporocarps. Furthermore, *Ph. corticola* seems to be restricted to the bark itself, whereas *Ph. bryocorticola* forms sporocarps on bark-inhabiting mosses.

Kuhnt (pers. comm.) has kindly confirmed the identity of our specimen based on photographs and a brief description.

Material examined:
MØRE OG ROMSDAL: Volda, Hjellane, OO, 23 Nov 2019, on branch of *Ribes nigrum*, (MC), OOL-20.26 (O).

***Physarum daamsii* Nann.-Bremek.**
Fig. 47 H, I.

The species has not previously been reported from Norway. In our region, it has only been reported from Finland (Härkönen 1981; Härkönen and Varis 2012). There are only few reports from Europe and one from outside Europe (Australia).

Ph. daamsii is closely related to *Ph. cinereum*, which is more common. *Ph. daamsii* is described as having more densely crowded and usually heaped sporocarps and normally having larger, more prominent lime nodes of the capillitium, often forming a pesudocolumella. The spores are darker in *Ph. daamsii*. *Ph. didermoides* also has crowded or heaped sporocarps, but the peridium is double, with layers readily separating at maturity and dehiscence, and furthermore has larger, more prominently warted spores.

Material examined:
HEDMARK: Hamar, Jernbanemuseet, PV, 27 Sep 2017, parkland, on grass among pine trees, PV-S658 (O).
VESTFOLD: Horten, Lystlunden, PV, 30 Oct 2019, in park, on mosses and bark of dead oak tree, PV2240 (O).

***Physarum flavicomum* Berk.**
Fig. 48 A-C.

These are the first published records from Norway. In the Nordic/Baltic region, *Ph. flavicomum* is only reported from Finland (Varis et al. 2016), Latvia (Adamonyte and Vimba 2003; Varis 2016) and Lithuania (Adamonyte 2013).

Specimen PV-S362 has subglobose, only slightly flattened sporocarps, almost totally devoid of lime deposits on the peridium and thus iridescent. The stalks are slender and orange brown, somewhat darker towards the base. The spore mass is greyish brown and rather compact, making it difficult to study the nature of the capillitium. Apparently, the capillitium is also very poor in lime nodes. The general appearance is very similar to the specimen illustrated in Poulain et al. (2011). We consider the depicted specimen (HG 00.0931) to be typical, however, in all aspects.

Material examined:
HEDMARK: Hamar, Stafsberg, PV, 16 Oct 2014, on *Picea abies* wood, PV-S362 (O).
TELEMARK: Tokke, South of Rukkeåi, HGG, GHG, 19 Jul 2000, rotten *Picea abies* log, HG 00.0931.

***Physarum flavidum* (Peck) Peck**
Fig. 48 D.

This is a rare species, not previously reported from Norway. In our region, *Ph. flavidum* is only known from Sweden (Schinner 1983). There are only few reports from elsewhere in Europe (Spain, Romania, The Netherlands).

Ph. flavidum, unlike any other *Physarum* species, has rather short-stalked, ochraceous to yellowish or orange sporocarps with a double peridial layer. The outer, limy layer separates from the inner, membraneous layer. The lime nodes of the capillitium are quite

Figure 49. A-C; *Physarum murinum* (HG 12.211). A; sporocarp. B; capillitium and spores. C; capillitium with lime nodes. D-F; *Physarum mutabile* (Vestre Toten). D; sporocarps. E; capillitium and spore mass. F; spores. Photos: Helge Gundersen. Scale bars 10 µm.

large and angular. Specimen OOL-16.44 (Fig. 47) has a wrinkled outer peridium. We do not know how common this feature is, since there are very few illustrations of reliably identified specimens available.

Material examined:
MØRE OG ROMSDAL: Volda, Hjellane, OO, 30 Nov 2018, on dead branch of *Ribes rubrum* in garden, (MC), OOL-19.49 (O).
SOGN OG FJORDANE: Sogndal, Mundalsdalen, OO, TAR, 17 Oct 2016, on bark-inhabiting mosses in old *Ulmus-Alnus* forest, OOL-16.44 (O). Sogndal, Heimastølen, OO, 21 Aug 2019, in deciduous forest with hollow *Ulmus glabra* trees, on wood of *Ulmus glabra* and *Hypnum* sp. (MC), OOL-19.118 (O).

***Physarum licheniforme* (Schwein.) Lado**
(Syn.: *Physarum lividum* Rostaf.)
Fig. 48 E, F.

These are the first published records of *Ph. licheniforme* from Norway. In the Nordic/Baltic region, it is only reported from Finland (Härkönen and Varis 2012) and recently from Sweden (Eliasson and Svensson 2019).

This species resembles *Ph. spectabile* and *Ph. ovisporum*, all three being dark-spored species with sessile sporocarps which are not laterally compressed, and all having a single peridium (or with two closely appressed layers) with white lime. *Ph. licheniforme* differs in having spores with one distinctly paler side. *Ph. licheniforme* has also been confused with *Ph. didermoides* (Pers.) Rostaf., which however has a double peridium and uniformly coloured spores.

Material examined:
OSLO: Svartdalsparken, HGG, 12 Apr 2007, on bark of living *Picea abies*, HG 12.071 + 12.072 (O).
VESTFOLD: Færder, Ekenes, 7 Oct 1982, farmland, on cultivated *Brassica napa* (O).

***Physarum loratum* Shuang L. Chen, Yu Li & H.Z. Li**
Fig. 48 G-I.

Physarum loratum is hitherto only known from Japan and China.

Given the apparent rarity of this species, and the similarity to *Ph. bivalve*, we have studied the three Norwegian specimens in detail. All three specimens appeared on alder catkins from three different sites, in moist chambers. Our specimens have laterally compressed plasmodiocarps, just like *Ph. bivalve*, but unlike the latter, the peridium appears single, without an outer limy layer separable from the inner membranous layer. Furthermore, the capillitium is very prominent with large, irregular lime nodes, and the plasmodiocarps are typically wrinkled on the sides and become limeless and blackish towards the base, all being characters described for *Ph. loratum*. The spores are approx. 10 µm in diameter (excl. ornamentation) and have a distinctly paler side, which is also a feature of *Ph. loratum*. It may well be that collections of *Ph. loratum* have previously been mistaken for *Ph. bivalve*.

Material examined:
MØRE OG ROMSDAL: Volda, Vadstein, OO, 20 Feb 2019, on *Alnus glutinosa* catkin, (MC), OOL-19.91 (O). Volda, Eikrem, OO, 11 Mar 2019, on mosses underneath *Alnus glutinosa* catkin in moist chamber (MC), OOL-19.90 (O). Volda, Berkneset, OO, 9 Aug 2019, on *Alnus glutinosa* catkin, (MC), OOL-19.139 (O).

***Physarum murinum* Lister**
Fig. 49 A-C.

This species is apparently not rare in Europe, but only one collection has previously been reported from Norway (Kalstø 1985). Regional reports are from

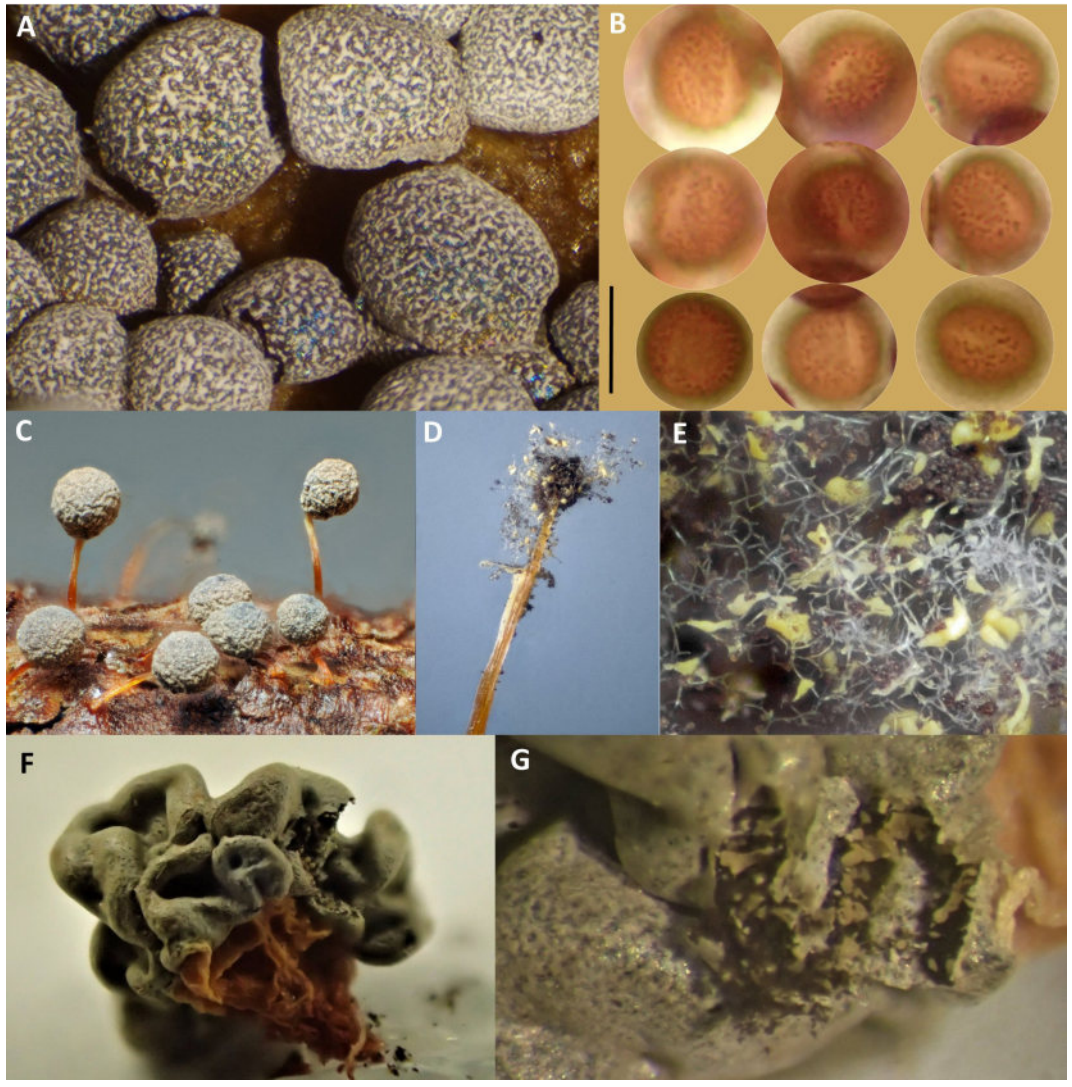


Figure 50. A, B; *Physarum ovisporum* (PV-S558). A; sporocarps. B; spores. C-E; *Physarum penetrale* (Østfold, Marker). C; sporocarps. D; empty sporocarp showing columella. E; capillitium. F, G; *Physarum polycephalum* (PV2205). F; sporocarp. G; sporocarp detail. Photo: A – Per Vetlesen. B, F, G – Edvin Johannesen. C-E – Helge Gundersen. Scale bar 10 µm.

Sweden (Lister 1897; R. E: Fries 1899, 1912; Santesson 1964; Schinner 1983), Finland (Härkönen 1989; Härkönen and Varis 2012), and Lithuania (Adamonyte 1999).

Ph. murinum resembles *Ph. globuliferum* in several aspects. Both species have lime-filled stalks, a short, hemispheric or conic columella, a densely reticulate capillitium with small, rounded nodes, and similar spores. The main difference lies in the colour of all lime containing structures (peridium, stalk, and capillitial nodes); white in *Ph. globuliferum*, cream, beige to greyish brown in *Ph. murinum*.

Collection HG 11.202 is somewhat atypical in having spores 12-15 µm in diam.

Material examined:
HEDMARK: Hamar, Furuberget, PV, 6 Sep 2012, mixed coniferous forest, on stump of *Picea abies*, PV-S101 (O).
OSLO: Skullerud, HGG, July 2012, on dead wood, HG 12.211.
TELEMARK: Drangedal, Bråten, HGG, 11 Oct 2006, on highly decayed wood, HG 11.202 (O).

***Physarum mutabile* (Rostaf.) G. Lister**
Fig 49 D-F.

Johannesen (1984b) reported one collection of *Ph. mutabile* from Norway (Akershus) on *Fragaria* cult. In our region this widespread, but nowhere common species is also known from Finland (Varis et al. 2016), Iceland (Gøtzsche 1984), and Sweden (A. Lister 1901; R.E. Fries 1906, 1912; Santesson 1964; Eliasson 2018).

The specimen reported here is somewhat atypical in being non-stipitate (which is known to occur), and in having a rather inconspicuous pseudocolumella. Gabriel Moreno (pers. comm.) has confirmed the identity of the specimen as a non-stipitate form of *Ph. mutabile*.

Material examined:
OPPLAND: Vestre Toten, Vestbakken, GS, 1 Sep 2010, on *Picea abies* cone (O).

***Physarum ovisporum* G. Lister**
Fig. 50 A, B.

Apart from two tentatively (cf.) identified specimens reported by Kalstø (1985) from Norway, Hordaland, the only known report of this species from the Nordic/Baltic region is one from Finland (Härkönen and Varis 2012). However, *Ph. ovisporum* appears to be widespread in Europe.

This species is distinguished from *Ph. licheniforme* primarily by having spores which are mostly ovoid in shape and with a paler line of dehiscence.

Material examined:
AUST-AGDER: Arendal, Kvernhuskjerr, THD, 8 Oct 2012, border between rich deciduous forest and cultivated field, on log of *Populus tremula* and on *Trametes hirsuta* growing on the log, THD 396/2012.
BUSKERUD: Flesberg, Fønset, EWJ, HLJ, THH, 2 Oct 2016, roadside timber heap, on old *Antrodia* polypore (O).
HEDMARK: Hamar, Hjellum, PV, 2 Nov 2016, cultivated field, on log of *Populus tremula*, PV-S558 (O).

***Physarum penetrale* Rex**
Fig. 50 C-E.

This species has not previously been reported from Norway. In our region, *Ph. penetrale* is reported from Finland (Härkönen and Varis 2012), Sweden (Lister 1897; R. E: Fries 1899, 1912; Santesson 1964; Eliasson 1975), and Lithuania (Adamonyte 1999). It is frequently reported from other parts of Europe.

Ph. penetrale macroscopically resembles *Ph. flavicomum*, but differs in having a long, slender, “penetrating” columella, which is basically a continuation of the stalk into the sporocyst.

Material examined:
ØSTFOLD: Marker, Klokkarnebba, EWH, IK, RB, EW, 1 Aug 2009, small herb forest, on fallen branch (O).

***Physarum polycephalum* Schwein.**
Fig. 50 F, G.

Interestingly, this globally widespread species has not previously been reported from the Nordic/Baltic region. It is surprisingly infrequent throughout Europe.

Our specimen developed on grouse droppings collected in a mountainous area, and then placed in a moist chamber. A yellowish white plasmodium developed after two weeks. Sporocarps developed after 3 ½ months. The spores are quite variable in size (not uncommon in moist chambers) and very densely and minutely warted/spinulose. The

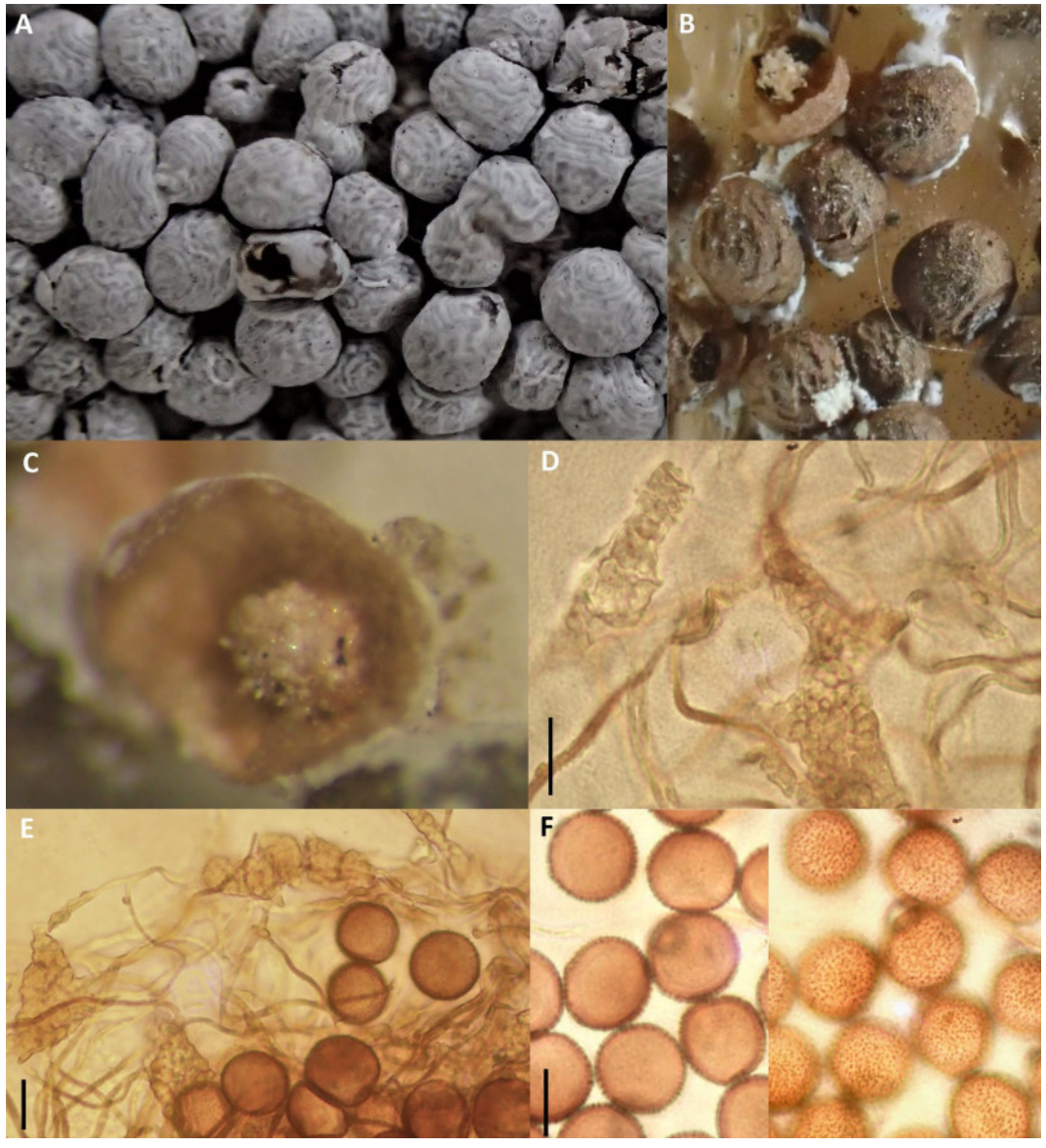


Figure 51. A-F; *Physarum pseudodiderma* (EWJ785). A; sporocarps. B; sporocarps showing inner peridium. C; sporocarp showing (pseudo)columella. D; capillitium, E; capillitium and spores, F; spores. Photos: Edvin Johannesen. Scale bars 10 µm.

multi-lobed, convoluted, greyish sporocarps, the brick-red, grooved and twisted stalks, and the black spore mass should exclude other species.

Material examined:
BUSKERUD: Sigdal, Tempelsetra, IK, SM, EWJ, PV, 14 Sep 2019, subalpine zone, on grouse droppings, (MC), PV2205 (O).

***Physarum pseudodiderma* Nann.-Bremek. & Y. Yamam.**
Fig. 51.

This species is previously known only from Japan. One of the authors of this paper (EWJ) was present when the specimen reported here was collected in 1980. It was described in detail as *Didymium* sp. by Johannesen (1982). A duplicate was sent to Mrs. Nannenga-Bremekamp (Coll. No. 12453). In 1987, Nannenga-Bremekamp and Yamamoto described *Physarum pseudodiderma* based on the type collection from Japan (Nannenga-Bremekamp and Yamamoto 1987). We have located (in database) the Norwegian duplicate in the collection of Meise Botanic Garden sub ref. 064664,62, identified by Nannenga-Bremekamp as *Ph. pseudodiderma*, including a sketch of the Norwegian specimen. When comparing the description of *Didymium* sp. (Johannesen op. cit.) with the original description of *Ph. pseudodiderma*, there is little doubt that the characters of the holotype and our specimen are conspecific. The Japanese holotype specimen was collected in late July, but there is no mentioning of the altitude. The Norwegian specimen was collected in May (lowland) near melting snow. Both collections have a partly vitreous outer peridium (reminiscent of *Lepidoderma*), which may indicate peridial lime dissolving and crystallizing. This is not uncommon in nivicolous species with a limy peridium, e.g. *Diderma* spp. Indeed, the species epithet reflects the *Diderma*-like habit, and the *Diderma*-like brown capillitium, however with paler swellings partly filled with granular lime.

Material examined:
OSLO: Bygdøy, 11 May 1980, BoA, EWJ, on living *Asplenium trichomanes* near melting snow, EWJ 785 (O).

***Physarum serpula* Morgan**
Fig. 52 A, B.

Johannesen (1984a) reported *Physarum* cf. *serpula* from Norway, Vestfold, noting that the material was poorly matured and the spores somewhat deviating. Marstad (1994) also reported three collections from Norway (Vestfold, Akershus). Apart from these, the only reports from our region are from Sweden (Eliasson and Strid 1976) and Denmark (Marstad 1994). The current specimen is typical in all characters.

Material examined:
MØRE OG ROMSDAL: Volda, Hjellane, OO, 20 Feb 2019, on bark of living *Prunus domestica*, (MC), OOL-19.77 A (O).

***Physarum straminipes* Lister**
Fig. 52 C-G.

These are the first published records of *Ph. straminipes* from Norway. In the Nordic/Baltic region, *Ph. straminipes* has been reported from Finland (Hintikka 1920; Härkönen 1979; Härkönen and Varis 2012) and Sweden (Kylin 1997).

Interestingly, *Ph. straminipes* is often claimed to be confined to various plant debris. All examined Norwegian specimens were collected on dead or dying *Populus tremula.* Interestingly, the Swedish and Finnish collections were also reported on *Populus tremula*. This is hardly a coincidence. We have not studied the substantial number of reports of *Ph. straminipes* from around the world, with regards to substrate preferences, but there can be little doubt that *Populus tremula* is the preferred substrate in our region. Given the wide distribution of *Populus tremula*, this substrate is hardly overseen elsewhere.

Physarum straminipes is extremely variable macroscopically, ranging from distinctly stalked or sessile sporocarps to several millimeter long, branched plasmodiocarps. Sporocarps can be scattered, densely crowded or somewhat heaped. The peridium may range from nearly limeless to heavily incrusted with

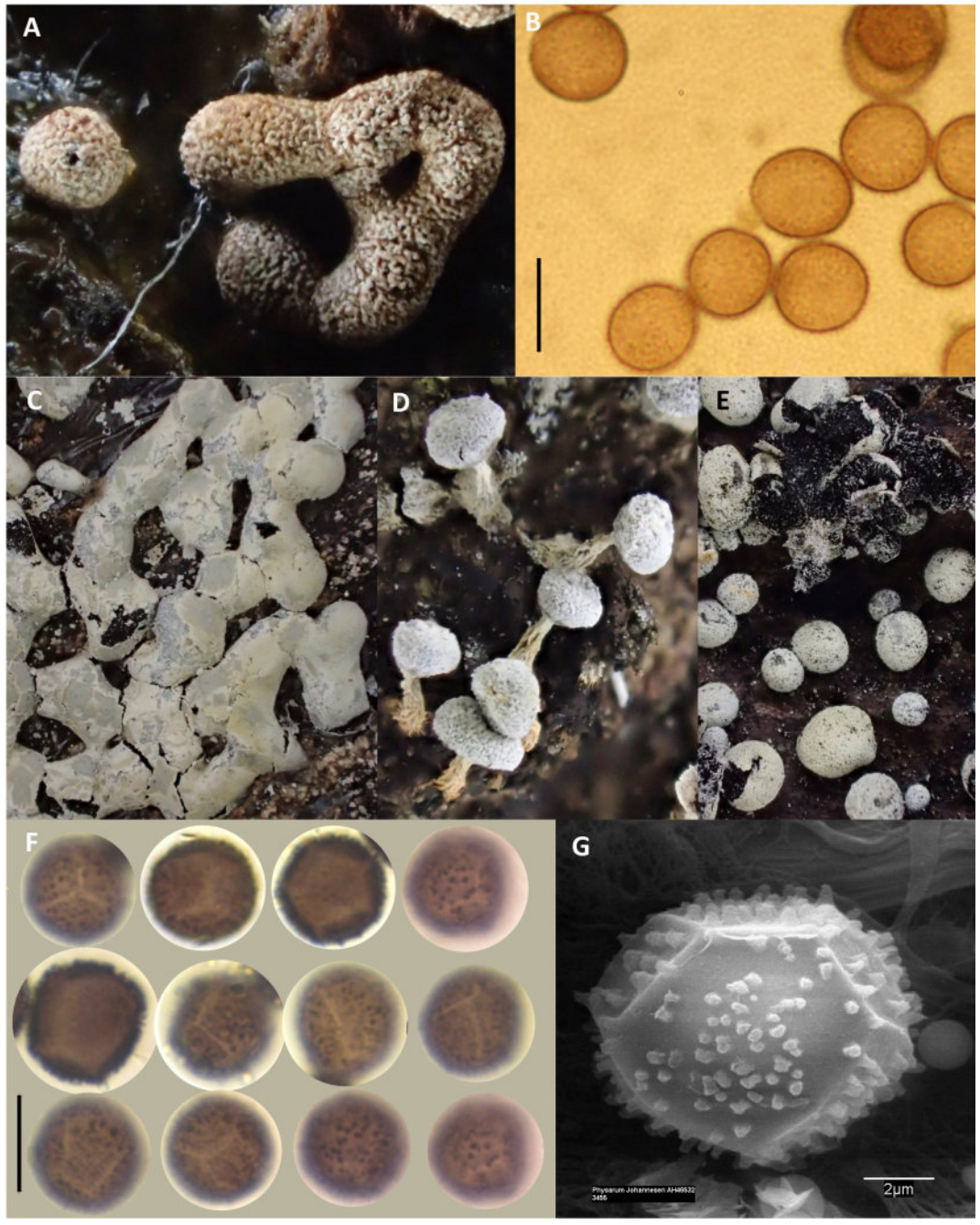


Figure 52. A, B; *Physarum serpula* (OOL 19.77A). A; sporocarps/plasmodiocarps. B; spores. C-G; *Physarum straminipes* (C; PV-R352. D; PV-S999. E, G; OOL-17.71. F; BA-030). C; plasmodiocarps. D; sporocarps. E; sporocarps. F; spores. G; spore (SEM). Photo: A-E – Edvin Johannesen. F – Per Vetlesen. G – Gabriel Moreno. Scale bars 10 µm (B), 2 µm (G).

lime, the two peridial layers readily separating or appearing as one. The hypothallus and strand-like stalks (if present) may contain lime or be limeless. The spore mass, however, is always black and the capillitium consists of a dense network with rather small lime knots, often aggregated into an irregular mass (pseudocolumella). The entire capillitial mass with the spores, often retains its shape if the peridium is carefully removed.

Microscopically, *Ph. straminipes* is quite easily recognised by the spore features. The spores in our collections are consistently 10-11 (-12) µm in diameter (excl. ornamentation) and ornamented with distinct, irregularly scattered warts or spines (0.5 - 1 µm long), separated by elevated, pale ridges forming a very wide-meshed network. Within a single mesh, warts/spines may sometimes be nearly absent. Normally, spores are rather dark in transmitted light, but some collections have a mixture of dark and distinctly paler spores.

Dr. Gabriel Moreno has kindly confirmed the identity of specimen OOL-17.71 and provided SEM images of the spores.

Material examined:
HEDMARK: Stange, Kråkholmen, PV, 5 Nov 2011, on log of *Populus tremula*, 1 m above ground, PV-S999 (O). Hamar, Hjellum, PV, 7 Nov 2015, edge of cultivated field, on log of *Populus tremula*, PV-S480. Stange, Rotlia, PV, 3 Nov 2016, bark of *Populus tremula* in thermophilous deciduous forest, PV-R352 (O). Stange, Hvitberg, PV, 9 Nov 2017, nutrient rich deciduous forest, on *Populus tremula* log, PV-S694 (O). Stange, Vethammaren, PV, 18 Dec 2017, mixed forest, on bark and mosses growing on dying *Populus tremula*, PV-S703 (O). Stange, Rotlia, PV, 5 Oct 2017, mixed forest, on bark of *Populus tremula* log, PV-R386. Stange, Gjøvikodden, PV, 22 Mar 2018, lakeside forest, on dying *Populus tremula*, PV-S713.
MØRE OG ROMSDAL: Stranda, Hellesylt, OO, TAR, 15 Dec 2016, on *Populus tremula*, OOL-17.5 (O). Stranda, Hellesylt, OO, 5 Oct 2017, on *Populus tremula* log, OOL-17.71 (O).
OSLO: Brannfjell, HGG, 3 Oct 2011, on mossy bark of dead *Populus tremula*, HG 11.185 (O).
VESTFOLD: Andebu, Flisefyr/Hidalen, TL, BjN, EWH, IK, RB, PM, TNK, JBJ, TSN, KH, JOA, 26 Oct 2013, *Alnus-Fraxinus* forest with *Tilia* and *Populus*, on bark of *Populus tremula* (O). Himberg, PM, 9 Oct 1987, in coniferous forest (Det. Nannenga-Bremekamp, not examined by the authors).
TELEMARK: Kragerø, Skottmyra, NH, PM, 17 Apr 2014, *Vaccinium myrtillus* dominated forest, on *Populus tremula* log, PM 80-14 (O).
TRØNDELAG: Heim, Rennsjølia, 8 Oct 2019, SHLL, in mature aspen forest, on bark of old, standing *Populus tremula*, SHLL1108.
ØSTFOLD: Aremark, Metartjern, BEA, 15 Feb 2017, small herb spruce forest, on *Populus tremula* log, BA-030 (O).

***Reticularia liceoides* (Lister) Nann.-Bremek.**
(Syn.: *Enteridium liceoides* (Lister) G. Lister)
Fig. 53 A, B.

Karlsen (1943) reported this species from Western Norway (as *Enteridium liceoides*). In our region it is also known from Sweden (Eliasson 2018; Santesson 1964, as *Enteridium liceoides*) and Lithuania (Kutorga et al. 2012).

R. liceoides is distinguished from the more common *R. olivacea* by the smaller and darker, plasmodiocarp-like aethalia (resembling *Licea variabilis*) and the poorly developed pseudocapillitium. It has been regarded by some as a variety of *R. olivacea.*

Material examined:
HEDMARK: Imsdalen, Rokkåa, HGG, 12 Sept 2002, on *Picea abies* log, HG 12.286.

***Siphoptychium reticulatum* Leontyev, Schnittler & S. L. Stephenson**
Fig. 53 C-E.

The species was recently described by Leontyev et al. (2019b), who resurrected the genus *Siphoptychium* Rostaf. and established the new genus *Thecotubifera* for *T. dictyoderma.* Our specimen was initially determined to be *Tubifera dictyoderma* Nann.-Bremek. & Loer., as interpreted by Neubert et al (1993), Poulain et al. (2011), and others. Dr. Dmitry Leontyev has kindly

Figure 53. A, B; *Reticularia liceoides* (HG 12.286). A; aethalium (moist condition). B; spore clusters. C-E; *Siphoptychium reticulatum* (BA-201). C; pseudoaethalium surface. D; detail of sporothecae showing columella (arrow). E; columella and associated vesicles. F; *Siphoptychium violaceum* (EJ 512-18), pseudoaethalium surface. Photo: A, B – Helge Gundersen. C – Dmitry Leontyev. D, E – Per Vetlesen. F – Edvin Johannesen. Scale bars 50 µm (B), 10 µm (E).

studied an exsiccate of our specimen as part of the cited study, and he has identified it as *Siphoptychium reticulatum* (Leontyev pers. comm.).

Leontyev et al. (op. cit.) describes *S. reticulatum* as a temperate/subarctic species in North America and as alpine in Europe (our collection not included). The species is not reported from the Nordic-Baltic region (see also comment under *S. violaceum* below).

According to Leontyev (pers. comm.) *S. reticulatum* can be difficult to distinguish from *S. violaceum* without some experience. The main differences, according to Leontyev, are as follows (*S. violaceum* in parentheses): Pseudoaethalia rounded, pillow-like, in the European ribotype not exceeding 3 cm (vs. irregular, elongate, up to 10 cm), surface of lids rough and plicate (vs. rather smooth), peridium reddish-brown (vs. violaceous to lead-grey-brown), and spores mostly 7-8 µm (vs. 6.5-7.5 µm).

Material examined:
ØSTFOLD: Aremark, Skrikebekkmyra, BEA, 23 Oct 2018, small herb spruce forest, on old, mossy *Picea abies* log, BA-201 (O).

***Siphoptychium violaceum* Leontyev, Schnittler & S. L. Stephenson**
Fig. 53 F.

The species was recently described by Leontyev et al. (2019b), who resurrected the genus *Siphoptychium* Rostaf. and established the new genus *Thecotubifera* for *T. dictyoderma.* Our specimens were initially determined to be *Tubifera dictyoderma* Nann.-Bremek. & Loer. as interpreted by Neubert et al (1993), Poulain et al. (2011), and others. Dr. Dmitry Leontyev has kindly studied exsiccates of some of our specimens as part of the cited study, and he has identified them as *Siphoptychium violaceum* (Leontyev pers. comm.).

Thecotubifera dictyoderma has been reported (as *Tubifera dictyoderma*) from Latvia in our region (Adamonyte 2006) and Lithuania (Adamonyte and Eliasson 2001; Adamonyte 2005). It is possible that also these collections are actually *S. violaceum* (or *S. reticulatum*, above).

For a discussion of morphological differences between *S. violaceum* and *S. reticulatum*, see comments under the former, above.

Material examined:
AKERSHUS: Bærum, Hujonfjellet, RZ, EWJ, 8 Sep 2018, mature small fern spruce forest with some old deciduous trees, on old *Picea abies* log, EJ 512-1 (O). Bærum, Hujonfjellet, RZ, EWJ, 3 Oct 2018, small herb spruce forest, on old *Picea abies* log, EJ 514-18. Nittedal, Askkroken, SM, 1 Sep 2018, *Vaccinium myrtillus* dominated spruce forest, on old *Picea abies* log.
BUSKERUD: Lier, Horn, SM, EWJ, 18 Sep 2018, small herb spruce forest, on old *Picea abies* log with brown rot, on calcareous ground, EJ 510-18 (O), EJ 511-18 (O), EJ 513-18 (O). Ringerike, Skamarka, TSN, 24 Sep 2019, small herb spruce forest, on *Picea abies* log, (O).
TELEMARK: Nome, Ormtjønnliane, RS, 1 Sep 2019, on rotting log of *Picea abies*, WP 564 (O).

***Stemonaria irregularis* (Rex) Nann.-Bremek., R. Sharma & Y. Yamam.**
(Syn.: *Comatricha irregularis* Rex)
Fig. 54 A, B.

Johannesen (1982, 1984a) reported one collection of this rather rare species from Norway (Vestfold, as *Comatricha irregularis*). Since then, there have been published reports from Finland (Härkönen 1974, as *C. irregularis*; Härkönen 1989; Härkönen and Varis 2012), Sweden (Eliasson et al. 2010), and Estonia (Adamonyte and Veiko 2011).

Most species of *Stemonaria* are described from Japan and have only been collected there. *S. irregularis* differs from the two other species of *Stemonaria* with a widespread distribution (*S. longa* and *S. laxa*), by having warted spores, distinctly paler on one side, without any sort of reticulation.

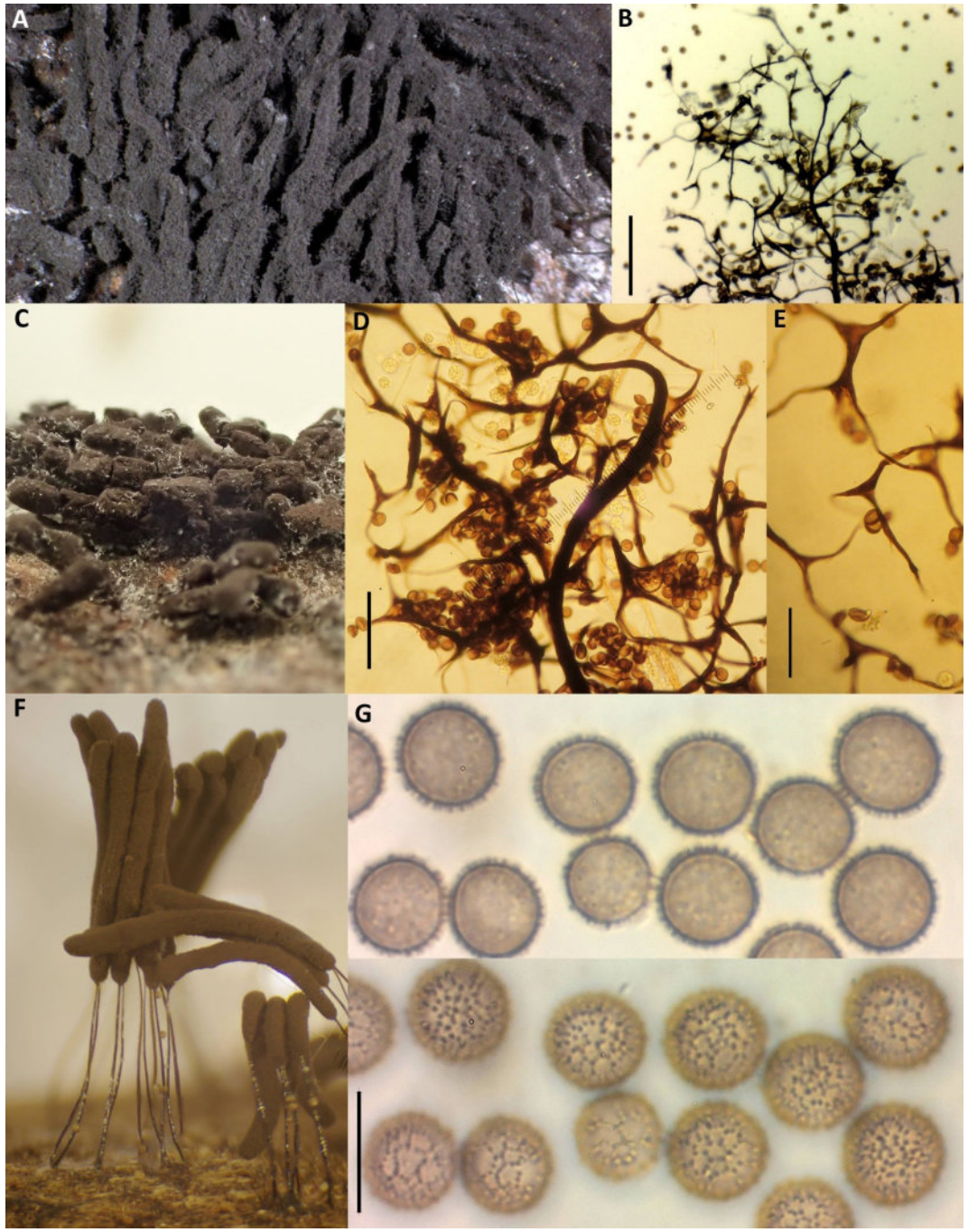


Figure 54. A, B; *Stemonaria irregularis* (PV-S54). A; sporocarps. B; sporocarp apex with capillitium and spores. C-E; *Stemonitis* cf. *laxifila* (Horten). C; sporocarps. D, E; detail of capillitium. F, G; *Stemonitis marjana* (PV-F198). F; sporocarps. E; spores. Photo: A, C-E – Edvin Johannesen. B, G, F – Per Vetlesen. Scale bars 100 µm (B), 50 µm (D, E), 10 µm (G).

Material examined:
HEDMARK: Hamar, Midtstranda, PV, 2 Jun 2012, mixed forest, on *Salix* stump, PV-S54 (O). Hamar, Hjellum, PV, 7 Nov 2015, edge of cultivated field, on *Populus tremula* log, PV-S481 (O).
ØSTFOLD: Aremark, Tjøsteltjern, BEA, 20 Nov 2017, small herb spruce forest, on *Populus tremula* log (O).

Stemonitis cf. *foliicola* Ing

This rather rare, but possibly misinterpreted, species is not previously reported from Scandinavia. It has been reported from Finland (Härkönen and Varis 2012; Kunttu et al. 2014). Elsewhere in Europe, it has been reported from England, Scotland, Ukraine, and Germany. The specimen cited here was identified by one of the authors (EWJ) in 2012. Unfortunately, the specimen cannot be retrieved for a re-examination, which would be desirable due to the unusual substrate. However, personal notes (EWJ) from 2012 state that there is perfect match with *S. foliicola* in all morphological characters, so we have chosen to report the finding here.

Material examined:
VESTFOLD: Sandefjord, Furuly, IK, 22 Jun 2012, on top of *Betula* stump in garden.

Stemonitis cf. *laxifila* Nann.-Bremek. & Y. Yamam.

Fig. 54 C-E.

This is the first published record from Northern Europe. The only published reports we have been able to find worldwide are from France, Australia, and Nepal.

The Norwegian specimen is in rather poor condition, infected with a hyphomycete. The short, small sporocarps, the large-meshed surface net and the distinctly and very regularly spinulose spores suggest *S. laxifila*. The identity of this specimen should be considered uncertain.

Material examined:
VESTFOLD: Horten, Løvøya, EWH, IK, RB, 17 Jun 2017, on deciduous twig in wet forest (O).

Stemonitis marjana Y. Yamam.

Fig. 54 F, G.

These are the first published records from Scandinavia. *S. marjana* is known from Finland (Varis et al. 2016), but is otherwise only reported from The Netherlands, China, and Japan.

The very small (1-3 (-4) mm tall), dark brown sporocarps, the irregular capillitial surface meshes with free ends pointing outwards, and the rather long spinules on the spores, arranged in a net with meshes of variable size, characterises this species.

Material examined:
AKERSHUS: Eidsvoll, Minnesund, PV, EWJ, HGG, 17 Nov 2016, nutrient rich *Alnus* forest, on inner bark of living *Sorbus aucuparia*, (MC), PV-F126 (O). Nittedal, Liskogen, SM, 21 Aug 2018, on deciduous twig in ravine, SM-18.36 (O).
AUST-AGDER: Risør, Store Vardøya, SM, 25 Jul 2019, on deciduous wood, SM-19.030.
HEDMARK: Stange, Rotlia, PV, AMDB, 13 Sep 2016, on twigs of dead *Juniperus communis* in mixed forest, (MC), PV-R160 (O). Stange, Vangen, PV, 7 May 2017, on bark of *Juniperus communis* in bushy grassland, (MC), PV-F139. Stange, Vethammerodden, PV, 17 Dec 2017, on bark of *Juniperus communis* in pine forest, (MC), PV-F169 (O). Stange, Gjøvika, PV, 17 Jun 2018, on dead *Juniperus communis* in spruce forest, (MC), PV-F198 (O).
MØRE OG ROMSDAL: Ålesund, Verpingsvika, TCM, OO, 20 Jan 2018, (MC), on *Acer pseudoplatanus* in graveyard, OOL-18.51 (O).

Figure 55. A, B; *Stemonitopsis amoena* (PV-S864). A; sporocarps. B; spores. C-E; *Stemonitopsis gracilis* (HG 13.035). C; sporocarps. D; sporocarp surface. E; sporocarp surface and spore. F-H; *Stemonitopsis reticulata* (PV-S221). F; sporocarps. G; capillitium and spores. H; spores. I-K; *Symphytocarpus confluens* (Ørland). I; pseudoaethalium. J; pseudoaethalium surface. K; capillitium and spores. Photo: A, B – Per Vetlesen. C, D, F – Helge Gundersen. E, G, H, J, K – Edvin Johannesen. I – Edel Humstad. Scale bars 10 µm.

TRØNDELAG: Leksvik, Øverland, OO, 19 Jul 2017, on *Alnus incana* (?), OOL-17.30 (O). Leksvik, Fera, OO, 23 Sep 2017, on *Alnus incana* (?) (O).
SOGN OG FJORDANE: Sogndal, Heimastølen, TAR, OO, 21 Aug 2019, deciduous forest, on dead wood of *Corylus avellana* log, (MC).

***Stemonitis splendens* Rostaf.**

This species has not previously been reported from Norway, quite surprisingly, since there are about twenty reports from elsewhere in Scandinavia, and many more from throughout Europe.

The tall, slender sporocarps, the very lax internal capillitial branches, and the warted spores make this species rather easy to identify.

Material examined:
AUST-AGDER: Åmli, Åmtone, EWH, RB, HK, TSN, RvK, SOD, JJ, EW, 28 Sep 2019, on *Populus tremula* log in small herb coniferous forest.
FINNMARK: Sør-Varanger, Sametluoppal, GF, TSN, SM, WEJ, 17 Aug 2011, on *Pinus sylvestris* log in heather dominated pine forest.
HEDMARK: Ringsaker, Nydal, PV, 4 Sep 2017, on *Picea abies* log in old timber heap, PV-S625. Stange, Rotlia, PV, 6 Aug 2015, on *Populus tremula* log in thermophilous deciduous wood, PV-R032.
OPPLAND: Vestre Slidre, Furulund, RvK, 18 Jun 2018, moist deciduous forest with some *Picea abies*, on old *Picea abies* log.
TELEMARK: Hjartdal, Brudalen, IK, RS, NH, PM, SM, GB, 29 Jun 2017, tall herb deciduous forest, on deciduous wood.

***Stemonitopsis amoena* (Nann.-Bremek.) Nann.-Bremek.**
Fig. 55 A, B.

Kalstø (1985) reported six collections (from Hordaland) of *S. amoena* in her thesis. We have not studied these collections. From the Nordic/Baltic region, the species is known from Sweden (Eliasson and Adamonyte 2009), Estonia (Adamonyte and Kastanje 2011), and Lithuania (Adamonyte and Eliasson 2001; Kutorga et al. 2012).

Within the genus *Stemonitopsis*, *S. amoena* can be recognised by the very small, rusty brown to dark brown, short-cylindric sporocarps. In particular, the spores have rows of spinules arranged in an evenly meshed reticulum, only partly connected by ridges. *S. amoena* may be mistaken for *S. hyperopta*, which however has smaller spores with a reticulum consisting of ridges, and with meshes of uneven size.

Material examined:
HEDMARK: Stange, Bogvika, PV, 8 Jul 2015, on bark of *Juniperus communis*, collected in slope with *Pinus sylvestris*, (MC), PV-F110. Stange, Nøttestadmarka, PV, 22 Jun 2017, on bark of *Juniperus communis* in slope with *Pinus sylvestris*, (MC), PV-F153 (O). Stange, Såstadmarka, PV, 19 Sep 2018, on branch of *Pinus sylvestris* in pine forest, PV-S864, PV-S865. Ringsaker, Nydal, PV, 17 Sep 2016, on stump of *Picea abies* in logged area with tall nitrophilous herbs, collected as plasmodium and matured in moist chamber (MC), PV-S539 (O). Elverum, Løvbergsmoen, PV, 4 Sep 2019, on stump of *Pinus sylvestris* in lichen dominated pine forest, PV2201.

***Stemonitopsis gracilis* (G. Lister) Nann.-Bremek.**
Fig. 55 C-E.

This is the first published record of *S. gracilis* from Norway. In the Nordic/Baltic region, the species is known from Sweden (Eliasson and Adamonyte 2009), Estonia (Ing 1990), and Lithuania (Adamonyte and Eliasson 2001).

S. gracilis is characterised by its small size (< 2 mm total height), the small, minutely

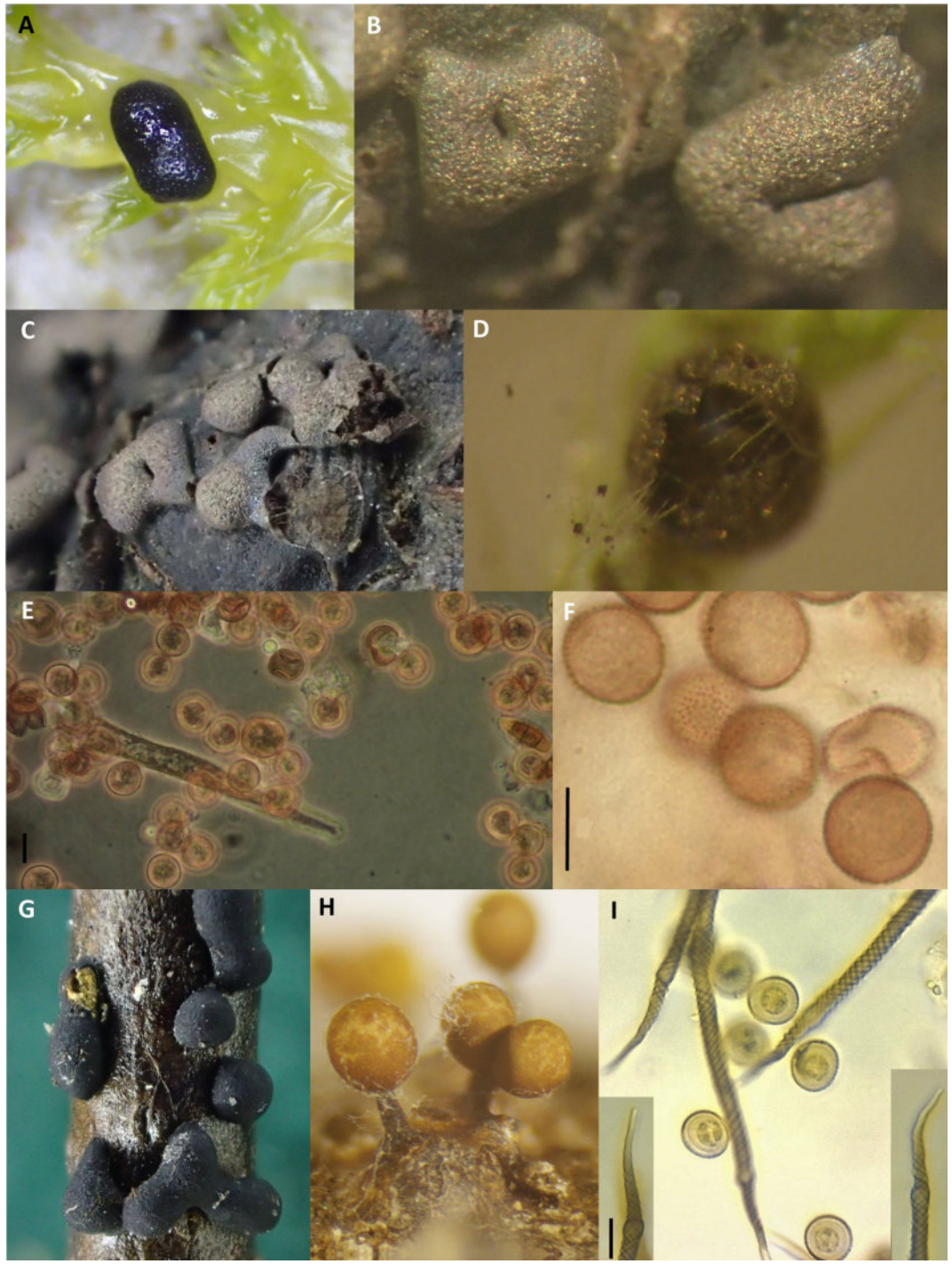


Figure 56. A-F; *Trabrooksia applanata* (A, D; OOL-18.10. B, C, E, F; OOL 18.47). A-C; plasmodiocarps. D; peridial spikes. E; spores and peridial spike. F; spores. G; *Trichia alpina* (EJ 28-18), plasmodiocarps. H, I; *Trichia ambigua* (PV-S663). H; sporocarps. I; spores and capillitium. Photo: A – Oddvar Olsen. B-G Edvin Johannesen. H, I – Per Vetlesen. Scale bars 10 µm.

warted spores, and capillitium meshes with no free ends or spines.

Material examined:
OSLO: Skullerud, Småmyr, HGG, 13 Jul 2013, on log of *Picea abies*, HG 13.035 (O).

***Stemonitopsis reticulata* (H.C. Gilbert) Nann.-Bremek. & Y. Yamam.**
Fig. 55 F-H.

This apparently rare species has not previously been reported from Scandinavia. In the Nordic/Baltic region, it is only known from Finland (Ukkola 2002; Härkönen and Varis 2012). Further south in Europe, it is only reported from Germany, Poland, and Spain).

S. reticulata is closely related to *S. hyperopta*. We have emphasised the dark lilac-grey colour of the sporocysts (becoming brown in *S. hyperopta*), and more importantly, the larger spores and the more regular-sized meshes of the spore reticulum. The spore reticulum does have a few, smaller meshes, but these are not marked by thicker ridges as in *S. hyperopta*. *S. hyperopta* var. *landewaldii* Bossel (also reported in this paper), has spores with the same size, but the sporocarps are much taller and more slender.

Material examined:
HEDMARK: Ringsaker, Kongsvegen, PV, 17 Jul 2013, on *Sambucus racemosa* log in mixed forest, PV-S221 (O).

***Symphytocarpus confluens* (Cooke & Ellis) Ing & Nann.-Bremek.**
(Syn.: *Stemonitis confluens* Cooke & Ellis)
Fig. 55 I-K.

This species has hitherto only been reported from Sweden in the Nordic/Baltic region (Santesson 1964, as *Stemonitis confluens*), which is surprising, given its wide distribution in Europe.

S. confluens is characterised by the black pseudoaethalia and the free, evenly warted, rather large (11-14 µm) spores.

Material examined:
TRØNDELAG: Ørland, Austråttlunden, EH, KAM, 2 Sep 2018, on park bench of unknown origin (probably coniferous), along forest path in rich deciduous forest (O).

***Trabrooksia applanata* H. W. Keller**
Fig. 56 A-F.

These are the first published records from Norway and the Nordic/Baltic region. In Europe, *T. applanata* is known only from England, Ireland, and Germany.

Trabrooksia is a monotypic genus with uncertain taxonomic status (Columellomycetidae Incertae sedis). Leontyev et al. (2019a) indicate that the genus may represent a limeless form of *Didymium*. The flattened, limeless plasmodiocarps occurring on corticolous mosses, may even be taken for a limeless *Badhamiopsis ainoae*, which we initially did. The interior contains limeless spikes or tubules, sometimes forked, originating from invaginations in the peridium. In fresh specimens these can be seen as small pits on the peridium.

Material examined:
MØRE OG ROMSDAL: Volda, Trongedalen, OO, 12 Feb 2018, in moist deciduous forest, on *Hypnum cupressiforme* growing on bark of living *Sorbus aucuparia*, (MC), OOL-18.10 (O). Hjellane, OO, 20 Feb 2019, on bark of living *Prunus domestica*, (MC), OOL-19.82 (O). Volda, Hjellane, OO, 20 Feb 2019, on bark and mosses growing on living *Thuja occidentalis*, (MC). Sande, Storeneset, OO, 10 Mar 2018, on bark of dying *Prunus padus*, (MC), OOL-18.47. Volda, Bjørkedalsvatnet, OO, 29 Oct 2019, on

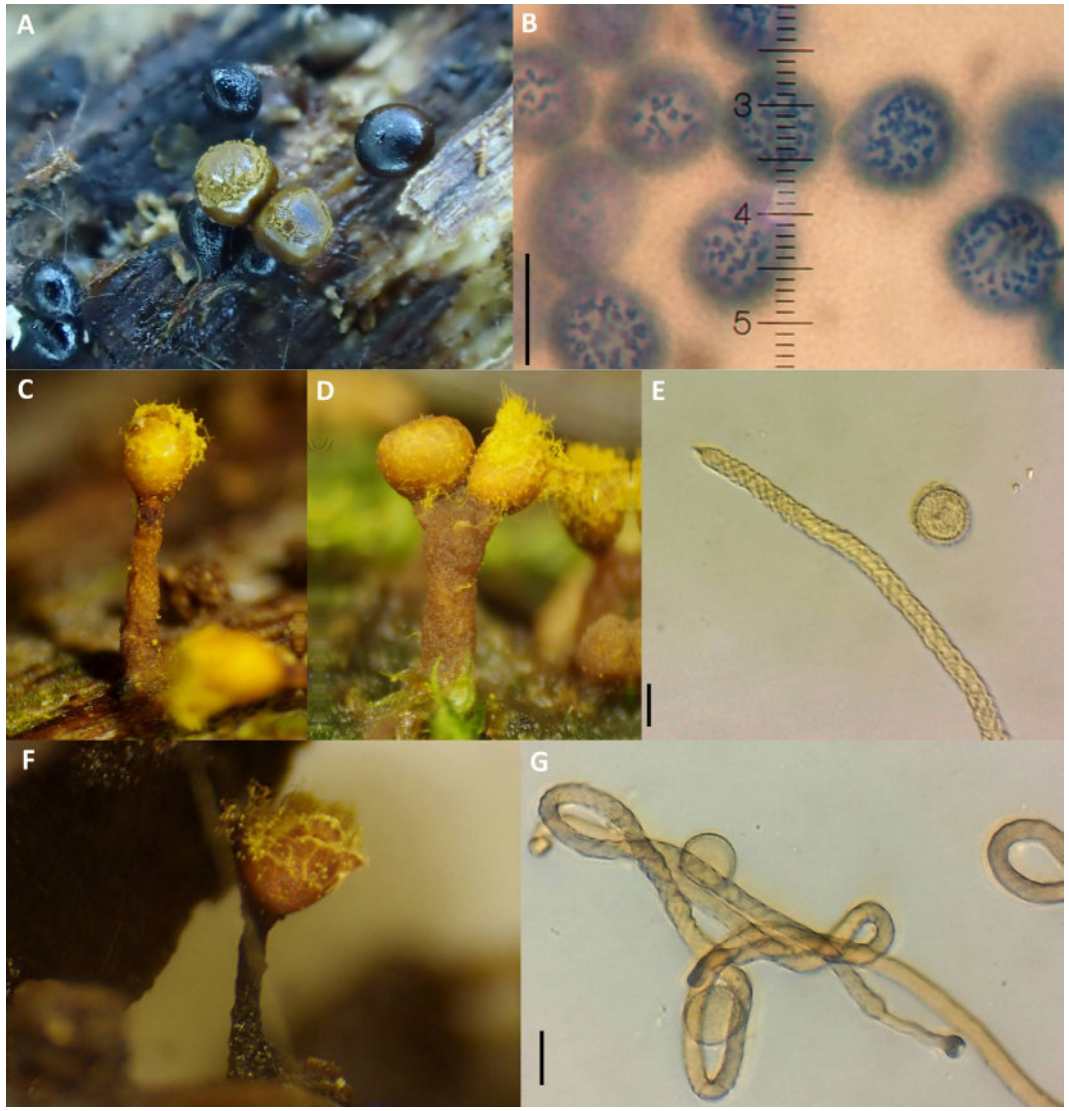


Figure 57. A, B; *Trichia crateriformis* (Leg. AKM). A; sporocarps. B; spores (cotton blue). C-E; *Trichia erecta* (PV-S549). C, D; sporocarps. E; elater and spore. F, G; *Trichia flavicoma* (PV-S533). F; sporocarp. G; elaters and spore. Photo: A, B – Edvin Johannesen. C-G – Per Vetlesen. Scale bars 10 µm.

mossy bark of living *Populus tremula,* (MC), OOL-20.4 (O). Volda, Hjellane, OO, 23 Nov 2019, on mossy bark of cherry tree in garden, (MC). Skodje, Ørnakken, 27 Nov 2019, OO, on mossy bark of living *Populus tremula*, (MC).
ROGALAND: Hjelmeland, Førre, TAR, OO, 3 Apr 2019, on *Leucodon scuiroides* growing on living *Ulmus glabra*, (MC).

***Trichia alpina* (R.E. Fries) Meyl.**
Fig. 56 G.

In Norway, *T. alpina* has been reported by Karlsen (1943), Hjortstam and Johannesen (1980), Johannesen (1982), and Mathiassen and Granmo (1995). Apart from Norway, it has only been reported from Sweden (R. E. Fries 1906, 1912; Santesson 1964; Rammeloo 1986).

This strictly nivicolous species (the only nivicolous *Trichia* species apart from *T. sordida* and *Trichia nivicola*), is easily recognised in the field by the blackish (rarely dark brown), short plasmodiocarps.

Material examined:
AKERSHUS: Ås, Rustadporten, collector unknown, 3 May 1987, on four-year-old plank of *Pinus sylvestris*.
AUST-AGDER: Bykle, Lislefjødd, IK, PV, SM, EWJ, 21 May 2018, on *Betula pubescens* in subalpine birch forest, PV-S776. Bykle, Lundane, IK, PV, SM, EWJ, 22 May 2018, subalpine birch forest, near rivulet and snowbanks, on *Betula nana*, PV-S795 (O), PV-S785 (O), EJ 28-18 (O).
BUSKERUD: Krødsherad, Rundsetra, IK, PV, SM, EWJ, 20 May 2019, *Salix* dominated road slope, on *Betula* branch on the ground, PV2080.
HEDMARK: Hamar, Gåsbu, PV, 12 May 2018, on roadside plant litter near melting snow, PV-S754 (O).
OPPLAND: Dombås, MS, 12 Aug 1990, 1000-1100 m alt. (Not examined by the authors.) http://www.gbif.org/occurrence/1100013079. (M-0070433)

***Trichia ambigua* Schirmer, L.G. Krieglst. & Flatau**
Fig. 56 H, I.

This species was recently described (Schirmer et al. 2015). Thus far, there are no published reports from Europe outside Germany, but there are undoubtedly specimens of *T. ambigua* deposited in various fungaria, identified as *Trichia botrytis* or possibly as some other species in the *T. botrytis* complex.

The most prominent character separating *T. ambigua* from other species in the *T. botrytis* group is the intermediate length tapering of the elaters (30-50 µm) and especially the frequent swelling of the elaters around the start of the tapering. The colour of the peridium and the nature of the pale dehiscence bands may vary considerably.

Material examined:
AKERSHUS: Nannestad, Romerike landskapsvern-område, KNT, 13 Sep 2019, in ravine forest dominated by *Alnus incana*, on twig of *Picea abies*.
HEDMARK: Hamar, Hjellum, PV, 10 Dec 2015, on *Picea abies* log in small herb spruce forest, PV-S495. Hamar, Furuberget, PV, 19 Sep 2017, on twig of *Picea abies* in mixed forest on lime rich soil, PV-S648. Hamar, Furuberget, PV, 6 Oct 2017, on *Picea abies* in abandoned timber heap, PV-S663 (O). Stange, Rotlia, PV, 9 Oct 2015, on *Prunus padus* log in thermophilous deciduous forest, PV-R057. Stange, Ryahagan, PV, 5 May 2016, on *Picea abies* log in small herb spruce forest, PV-S501. Stange, Rotlia, PV, 7 Nov 2016, on *Picea abies* log in spruce forest.
MØRE OG ROMSDAL: Volda, Fyrde, OO, 9 Dec 2015, on *Populus tremula*, OOL-15.20 (O).
OPPLAND: Nord-Fron, Massdøla, EWJ, 6 Oct 2018, on *Picea abies* log in small herb spruce forest.
ROGALAND: Karmøy, Bratthammar, AK, 15 Nov 2018, thicket near cultivated field, on bark of decaying *Betula* log on the ground, AK008.
TRØNDELAG: Bjugn, Råmarka, KAM, 08 Apr 2019, on deciduous branch in mixed deciduous forest.
VESTFOLD: Larvik, Åsmundrød, SH, 24 Nov 2017, on *Quercus* bark in small herb dominated forest, SH-002. Re, Rød, PV, 30 Oct 2017, on bark of *Picea abies* log in mixed forest, PV-S681 (O). Re, Hem, PV, 31 Oct 2017, mixed forest, on branch of *Quercus* on the ground, PV-S687. Re, Rød, PV, 2 Nov 2017, on *Alnus incana* log in *Alnus* forest near rivulet.
ØSTFOLD: Aremark, Fonkebekkmyra, BEA, 20 Oct 2018, on *Pinus sylvestris* log in *Vaccinium myrtillus* dominated spruce forest.

***Trichia crateriformis* G. W. Martin**
(Syn.: *Trichia decipiens* var. *olivacea* (Meyl.) Meyl.)
Fig. 57 A, B.

The species was described in 1963, but the taxon has commonly been regarded as a variety of *T. decipiens* (var. *olivacea*). Moreno and Castillo (2013) studied the type specimens of *Trichia crateriformis*, *T. fallax* Pers. *var. olivacea* Meyl., and *T. fernbankensis* Frederick, and they concluded that *T. decipiens* var. *olivacea* is synonymous with *T. crateriformis*, whereas *T. fernbankensis* is synonymous with *T. decipiens* (var. *decipiens*). We have chosen to

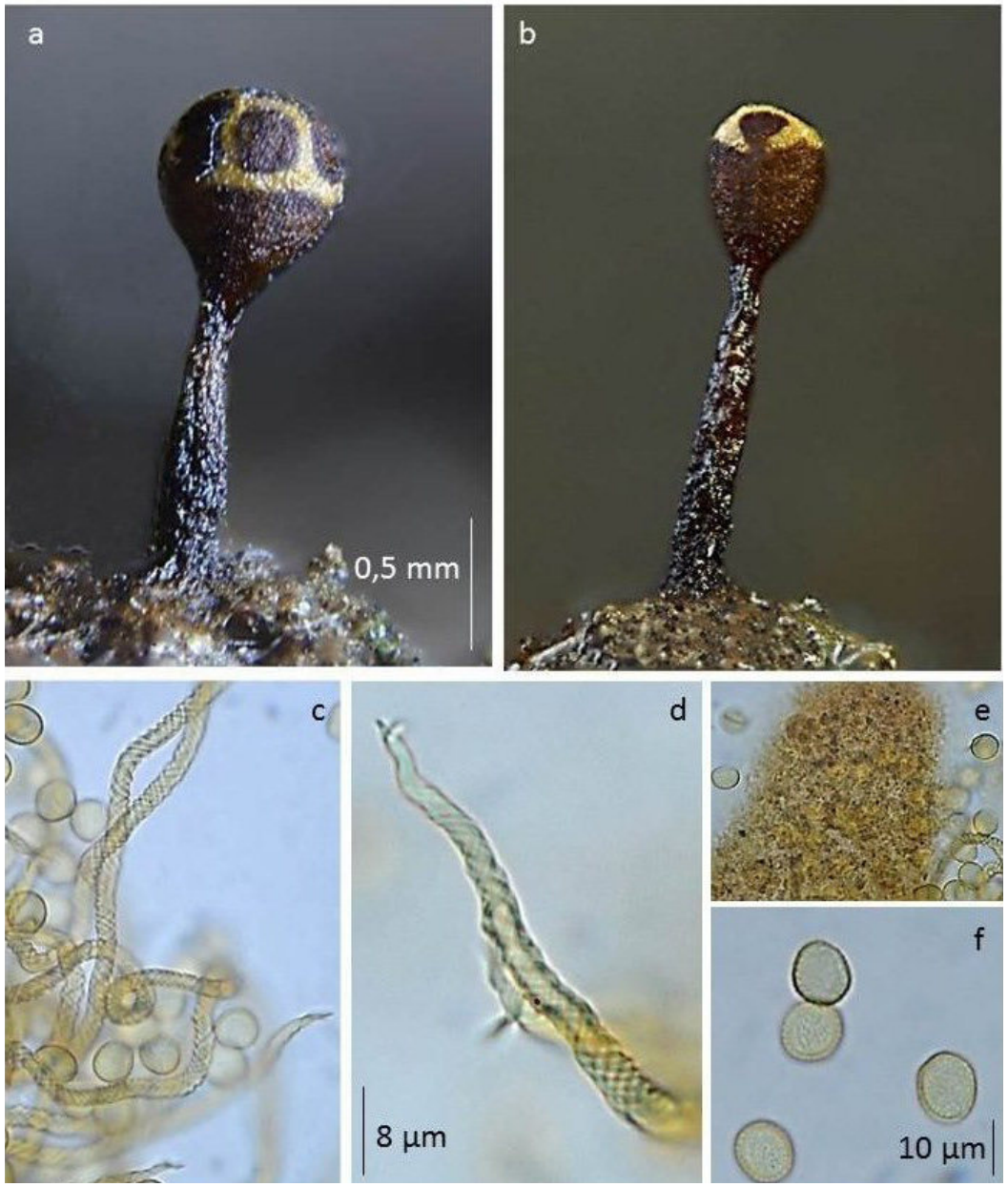


Figure 58. *Trichia munda* (Bygdøy). A, B; sporocarps. C-F; spores, capillitium, and fragment of peridium. Photos and plate, courtesy of Hans van Hooff.

follow their acceptance of *T. crateriformis* as a distinct species, which is also in accordance with Lado (2005-2020).

There are probably collections of this taxon in Norwegian fungaria, catalogued as *Trichia decipiens*. Thus, the species is likely to be

more common in Norway than indicated by the approx. 25 collections we have seen in recent years. We have chosen not to list these specimens in detail. Collections have been made in the following counties: Akershus, Buskerud, Finnmark, Hedmark, Møre og Romsdal, Oppland, Oslo, Rogaland, Sogn og Fjordane, Trøndelag, Vestfold, and Østfold.

***Trichia erecta* Rex**

Fig. 57 C-E.

There is only one collection of this uncommon species reported from Norway (Kalstø 1985), but there are reports from Finland (Härkönen 1981; Ohenoja and Saari 1988; Härkönen and Varis 2012), Sweden (R. E. Fries 1897; Eliasson 1975), and Lithuania (Adamonyte 2001; Kutorga et al. 2012).

The relatively long, stout stalks, small sporocysts, and the short, blunt or acutely pointed apices of the elaters, identify this species.

Colletion PV-S549 is somewhat atypical in having a golden yellow peridium without lines of dehiscence. However, this character is known to vary considerably within this group of species.

Material examined:

HEDMARK: Ringsaker, Nydal, PV, 17 Aug 2017, on mosses growing on old *Picea abies* log in timber heap, PV-S618. Stange, Temmen, PV, 27 May 2014, on *Picea abies* in small herb spruce forest, PV-S320 (O). Stange, Sanderud, PV, 14 Oct 2016, on *Picea abies* log in rich, moist spruce forest, PV-S549 (O).
MØRE OG ROMSDAL: Ørsta, Ørstaelva, OO, 2 Oct 2016, in wet *Alnus/Prunus* forest, on *Alnus incana* (O). Volda, Eikrem, OO, 11 Mar 2019, on mosses underneath *Alnus glutinosa* catkins, (MC).
SOGN OG FJORDANE: Hornindal, Kjøshammaren, OO, 22 Feb 2019, on *Hypnum* sp. growing on *Betula pubescens*, OOL-19.51, (O).

***Trichia flavicoma* (Lister) Ing**

Fig. 57 F, G.

Kalstø (1985) reported this species from Hordaland, Norway. Apart from this, *T. flavicoma* has only been reported from Lithuania in the Nordic/Baltic region (Adamonyte 1999; Kutorga et al. 2012, as *T.* cf. *flavicoma*).

T. flavicoma is closely related to *T. munda* (see below), with which it has probably been confused. We have chosen to follow the interpretation of these species by Schirmer et al. (2015). The elaters in our material are very pale and slender, with rather faint spirals, very similar to what is depicted for *T. flavicoma* in Figure 5 by Schirmer et al. (op. cit.), and quite different from *T. munda* (Figure 6 in the same paper).

Collection PV-S570 is atypical in being collected on bark of *Juniperus communis*, since *T. flavicoma* is considered a species confined to (herbaceous) plant litter.

Material examined:

HEDMARK: Hamar, Finsalbekken, PV, 1 Sep 2016, rich meadow, on litter from *Petasites hybridus*, PV-S533 (O). Ringsaker, Lykset, PV, 22 Jul 2017, on plant litter in spruce forest, (MC), PV-F157 (O). Stange, Hammerstadmarka, PV, 10 May 2017, forest edge, on bark of dying *Juniperus communis*, PV-S570 (O).
MØRE OG ROMSDAL: Volda, Berkneset, OO, 9 Aug 2019, north-facing slope dominated by *Alnus glutinosa*, on female catkin, (MC).
SOGN OG FJORDANE: Sogndal, Heimastølen, TAR, OO, 21 Aug 2019, deciduous forest with hollow elm trees, on various mosses incl. *Hypnum* sp. growing on *Ulmus glabra*, (MC), OOL-19.121 (O).

***Trichia munda* (Lister) Meyl.**

(Syn.: *Trichia botrytis* var. *munda* Lister)

Fig. 58 A-F.

The species has not previously been reported from Norway. In our region it is known from Sweden (R. E. Fries 1912, as *T. botrytis* var. *munda*), Iceland (Gøtzsche 1990), Greenland (Gøtzsche 1989), Estonia (Adamonyte and Kastanje 2011), and Lithuania (Adamonyte et al. 2013).

Two specimens have not been examined by the authors and they are presented here by

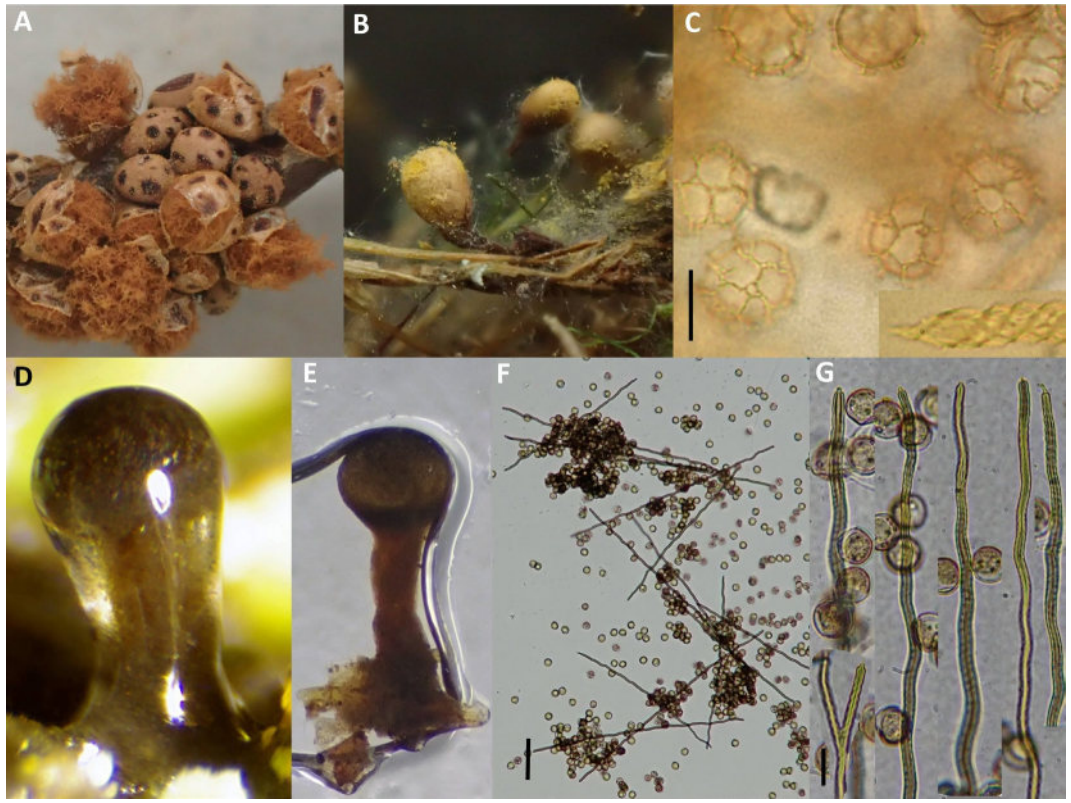


Figure 59. A; *Trichia sordida* (EJ 128-18), sporocarps. B, C; *Trichia verrucosa* (OOL-16.57). B; sporocarps. C; spores and tip of elater. D-G; *Trichioides iridescens* (D; PV-S469. E-G; OOL 19.102). D, E; sporocarps. F, G; capillitium and spores. Photo: A-C – Edvin Johannesen. D – Per Vetlesen. E-G – Oddvar Olsen. Scale bars 10 µm (C, G), 50 µm (F).

permission of the collector, Martin Gotink. The elaters are consistent with those depicted in Schirmer et al. (2015). See also comments under *T. flavicoma* above.

Material examined:
MØRE OG ROMSDAL: Aure, Todalen, SHLM, ØF, SS, ÅH, OO, 11 Oct 2018, on *Alnus incana*, (MC). Skodje, Ørnakken, OO, 17 Oct 2018, in pine forest, on wood and mosses and lichens growing on dead branches of *Taxus baccata* on the ground, (MC), OOL-19.8 (O).
OSLO: Bygdøy, Dronningberget, MG, 27 Oct 2015, on dead bark of *Tilia*, (MC). Bygdøy, Dronningberget, MG, 1 Feb 2016, on dead bark of *Tilia*, (MC). (Not examined by the authors.)
Both collections conf. H. van Hooff and deposited in van Hooffs private collection.

***Trichia sordida* Johannesen**
Fig. 59 A.

The species was formally described by Johannesen (1984b), based on the type collection from Norway (Akershus). Kuhnt (pers. comm.) has collected *T. sordida* from Norway in several locations. Apart from the Norwegian collections, the species is not reported from the Nordic/Baltic region. Outside Europe, it is known only from one location in USA (Montana).

Apart from *T. alpina* and *T. nivicola*, this is the only strictly nivicolous *Trichia* species. It is easily recognised in the field by the

crowded, ochraceous sporocarps with brown spots or streaks on the outer peridium, thus the epithet *sordida* (dirty).

Material examined:
AUST-AGDER: Bykle, Lislefjødd, IK, PV, SM, EWJ, 21 May 2018, subalpine birch forest in moist slope with *Betula*, *Juniperus*, *Salix*, grasses and tall herbs, on thin twigs and leaves of *Betula*, on grass and *Vaccinium myrtillus*, EJ 124-18 (O), PV-S783 (O). Bykle, Lundane, IK, PV, SM, EWJ, 22 May 2018, subalpine birch forest, near rivulet and snowbanks, on thin twig of *Betula*, EJ 128-18 (O), PV-S792, PV-S793. Bykle, Hovdenuten, IK, PV, SM, EWJ, 22 May 2018, subalpine birch forest with *Juniperus*, *Empetrum, Vaccinium*, and *Lycopodium*, on thin twig of *Betula.* Bykle, Hovdenutkollen, IK, PV, SM, EWJ, 23 May 2018, subalpine birch forest, on *Vaccinium myrtillus*, PV-S788 (MM- 40146).
OPPLAND: Vang, Tyin, IK, PV, RB, EWJ, 8 Jun 2017, snowbank edge, on *Athyrium* and *Vaccinium myrtillus*, EJ 9-17 (O).
TELEMARK: Vinje, Roi, IK, PV, SM, EWJ, 23 May 2018, subalpine birch forest, on *Salix*, PV-S821 (O).

***Trichia verrucosa* Berk.**
Fig. 59 B, C.

Two collections from Hordaland, Norway, were reported by Kalstø (1985). It has also been reported from Denmark (Albertsen and Gøtzsche 1993) and Finland (Ohenoja and Saari 1988). There are many reports from rest of Europe, but apparently this is a rather rare species in our region.

T. verrucosa is easily identified by the short-cylindric or pear-shaped sporocysts, born in groups on a common stalk, and the banded-reticulate spores.

Material examined:
HEDMARK: Elverum, Fjeldslia, PV, 27 Oct 2014, on *Pinus sylvestris*, PV-S370 (O).
MØRE OG ROMSDAL: Volda, Vassbotn, OO, 27 Oct 2017, on *Pinus sylvestris*.
SOGN OG FJORDANE: Naustdal, Buanes, OO, TAR, 25 Oct 2016, on mosses growing on old, hollow *Quercus robur*, OOL-16.57 (O).

***Trichioides iridescens* Novozh., Hooff & Jagers**
Fig. 59 D-G.

These are the only known specimens worldwide, apart from those cited from Russia in the original description by Novozhilov et al. (2015) and one later collection from Kamchatka (Novozhilov pers. comm.). Dr. Novozhilov and Mr. van Hooff have both kindly confirmed the identification based on provided photos.

The taxonomic position of this recently described, monotypic genus (Novozhilov et al. op. cit.), is uncertain. Leontyev et al. (2019a) points out that features of spores, peridium and capillitium indicate a relationship with the dark-spored myxomycetes (Columellomycetidae). However, the type of ornamentation, branching and orientation of the capillitium resembles what is seen in *Prototrichia*, and the spores have certain features seen in *Licea*. They tentatively place the genus within the pale-spored clade, as Lucisporomycetidae Incertae sedis.

In *T. iridescens,* sporocarps are described as normally being stalked and enclosed in a thick transparent gelatinous layer that disappears only after the final stage of sporogenesis. The capillitium consists of tubular, slightly curved, bristle-like, non-birefringent threads (elaters) loosely attached to the base of the sporocysts and sometimes to the inner surface of the peridium. These elaters are ornamented with 2-3 poorly or well-defined spiral bands (thus the name *Trichioides*).

Specimen OOL-20.28 deviates from the current description of *T. iridescens* in being sessile. However, the persistent gelatinous sheath was present during development, ending up as a dried rim around the base, containing amorphous, residual matter (like in the stalks of stalked specimens). The rather few elaters appear to be free, but they radiate from the sporocyst basis like in *T. iridescens*.

Figure 60. A-D; *Tubifera montana* (PV2190). A; pseudoaethalium. B, C; surface of pseudoaethalium. D; inner surface of peridium. E, F; *Willkommlangea reticulata* (OOL-18.39). E; plasmodiocarp. F; spores and capillitium. Photo: A-C – Per Vetlesen. D, E – Edvin Johannesen. F – Oddvar Olsen. Scale bars 10 µm.

They have 1-2 very distinct spiral bands, tightly wound towards their centre and more stretched out towards the ends. Otherwise, the specimen is typical in having an iridescent peridium, ornamented with irregular warts on the inside, and smooth spores, paler on one side. Although one might expect to find sessile sporocarps within *T. iridescens*, especially in moist chambers where the stalks may not develop properly, this specimen may represent a second, sessile species of *Trichioides* with more prominent sprirals on the elaters.

Material examined:
HEDMARK: Stange, Ryahagan, PV, 19 Oct 2015, edge of cultivated field, on bark of dead *Juniperus communis*, (MC), PV-S469.
MØRE OG ROMSDAL: Volda, Kalvatsvik, OOL, 23 Nov 2019, on bark and on *Frullania dilatata* and *Hypnum* sp. growing on living *Ulmus glabra*, (MC), OOL-20.28 (O).
NORDLAND: Rana, Skatarumphaugen, OO, 9 Jun 2019, in spruce forest with *Betula pubescens*, on mossy bark of *Betula*(?), (MC), OOL-19.102 (O).

***Tubifera montana* Leontyev, Schnittler & S.L. Stephenson**
Fig. 60 A-D.

This species has previously only been reported from Ukraine, Russia, Germany and USA (Leontyev et al. 2015; Prylutskyi, 2017). *T. montana* was recently described (Leontyev et al. op. cit.) and it has undoubtedly been confused with *T. ferruginosa*, to which it is closely related.

T. montana never displays the free, hemispherical or conical sporothecal tips characteristic of *T. ferruginosa*. In *T. montana*, the tips of the sporothecae vary in size, are tightly accreted to each other, and appear ovoid, worm-like to rounded when seen from above, lenticular-convex in lateral view. Furthermore, the spores are considerably larger on average. *T. montana* also seems to be confined to decayed, mossy coniferous wood, while *T. ferruginosa* may be found on both coniferous and deciduous wood, according to Leontyev et al. (op. cit.).

It should be noted that we have observed in the stereo microscope what appears to be capillitial threads with adhering spores. This phenomenon was discussed in detail by Leontyev et al. (op. cit.), who were able to show, using SEM, that these structures were septate fungal hyphae. Indeed, we have observed septa in these structures in transmitted light.

Material examined:
HEDMARK: Stange, Jønsbergkoia, PV, 16 Aug 2019, mixed coniferous forest, on decaying wooden bench (*Pinus sylvestris*), PV2190 (O). Ringsaker, Nydal, PV, 16 Sep 2019, old timber heap, on *Picea abies* log, PV2211.

***Willkommlangea reticulata* (Alb. & Schwein.) Kuntze**
Fig. 60 E, F.

This is the first report of *W. reticulata* from the Nordic/Baltic region. The species is frequently reported from many countries around the world.

In its mature form, *W. reticulata* can hardly be confused with any other myxomycete species.

Material examined:
MØRE OG ROMSDAL: Ålesund, Verpingsvika, TCM, OO, 20 Jan 2018, on *Acer pseudoplatanus* in graveyard, (MC), OOL-18.39 (O).

Varieties new to Norway

The following varieties have not previously been reported from Norway:

***Badhamiopsis ainoae* var. *macrospora* Y. Yamam.**

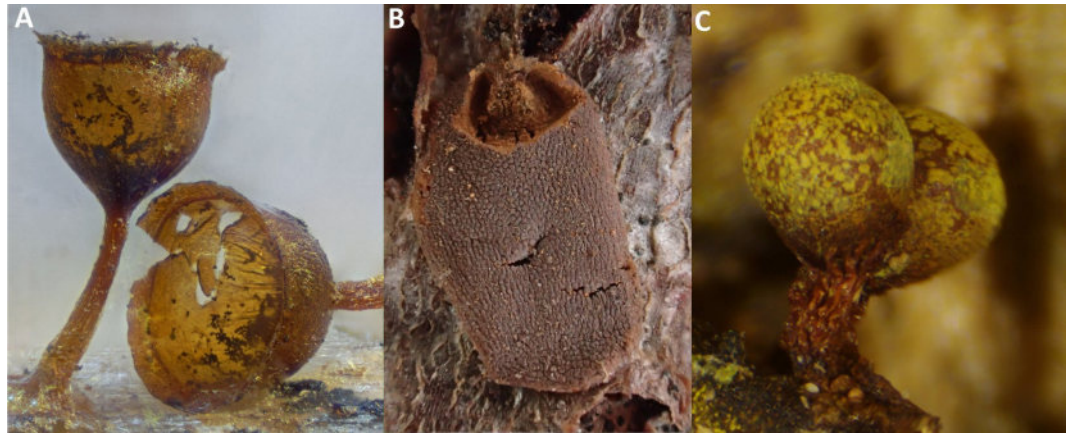
Characterised by the larger (13-15 µm), spinulose spores. The variety is also mentioned under *B. ainoae* above.

Material examined:
MØRE OG ROMSDAL: Volda, Osdalen, OO, 6 Feb 2019, calciphilous deciduous forest, on *Antitrichia curtipendula* growing on living *Ulmus glabra*, (MC), OOL-19.60 (O).

***Calomyxa metallica* var. *megaspora* Y. Yamam. & Nann.-Bremek.**

Characterised by its larger (13-14 µm) and sometimes ovoid (14 x 13 µm) spores.

Material examined:
MØRE OG ROMSDAL: Ålesund, Apalviksætra, TAR, OO, 24 Aug 2019, mixed forest with *Taxus baccata*, on *T. baccata* branches on the ground, (MC).



Figur 61. A; *Craterium minutum* var. *brunneum* (HG 12.053), sporocarps. B; *Dictydiaethalium plumbeum* var. *ferrugineum* (PV-S228), pseudoaethalium. C; *Trichia botrytis* var. *cerifera* (BA-081), sporocarp. Photo: A – Helge Gundersen. B – Edvin Johannesen. C – Per Vetlesen.

***Comatricha elegans* var. *microspora* H. Marx**

Characterised by the smaller spores (< 8 µm).

Material examined:
HEDMARK: Elverum, Fjeldslia, PV, 27 Oct 2014, in coniferous forest, on *Pinus sylvestris* stump, PV-S367.

***Craterium minutum* var. *brunneum* (Nann.-Bremek.) L.G. Kriegelst.**

Fig. 61 A.

Characterised by the smaller, glossy dark brown (not lime-impregnated), long-stalked sporocarps, the numerous small lime nodes, the flat, sunken lid, and the slightly larger spores.

Material examined:
TELEMARK: Drangedal, Østre Straume/Bråten, 12 Apr 2012, HGG, on dead wood of *Picea abies* (?), HG 12.053.

***Dictydiaethalium plumbeum* var. *ferrugineum* (Nann.-Bremek.) L.G. Krieglst.**

Fig. 61 B.

Described by Nannenga-Bremekamp as a distinct species and treated as such by Poulain et. (2011). We have chosen to follow Lado (2005-2020), who does not accept this as a species. The variety is distinguished by the reddish brown, rust-coloured or ferruginous colour of the spore mass.

Material examined:
HEDMARK: Stange, Jønsbergvegen 305, PV, 23 Aug 2013, in garden, on *Cotoneaster lucidus* branches on the ground, PV-S228 (O).

***Paradiacheopsis fimbriata* var. *penicillata* (Nann.-Bremek. & Y. Yamam.) Y. Yamam.**

Characterised by the distinctly smaller spores (7-8.5 µm) and the gradually tapering top of the columella.

Material examined:
ØSTFOLD: Moss, Rødsåsen, EWH, RB, IK, 18 May 2014, in small mire, on *Juncus effusus* (O).

***Stemonitopsis hyperopta* var. *landewaldii* Bossel**

Characterised by the significantly taller (7-9 mm) and more slender sporocarps, the darker brown colour, and the somewhat larger spores (6-9 µm).

Material examined:
AKERSHUS: Bærum, Urdsdalen, EWJ, 25 Aug 2017, in tall fern dominated spruce forest, on *Picea abies* stump (O).

***Trichia botrytis* var. *cerifera* G. Lister**

Fig. 61 C.

Characterised by the notable pale yellowish or greenish yellow waxy deposits on the peridium.

Material examined:
ØSTFOLD: Aremark, Metartjernshøyda, BEA, 4 Jun 2017, in spruce forest, on log of *Picea abies,* BA-072 (O). Aremark, Metartjernhøyda, BEA, 29 Oct 2017, in coniferous forest, on log of *Pinus Sylvestris,* BA-081 (O).

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APPENDIX I

A complete list of myxomycete species reported from Norway.
(Taxa marked by ● are reported from Norway for the first time in this paper.)

Amaurochaete atra (Alb. & Schwein.) Rostaf.
Amaurochaete tubulina (Alb. & Schwein.) T. Macbr.
Arcyodes incarnata (Alb. & Schwein.) O.F. Cook
●***Arcyria affinis*** Rostaf.
Arcyria cinerea (Bull.) Pers.
Arcyria denudata (L.) Wettst.
Arcyria ferruginea Saut.
●***Arcyria globosa*** Schwein.
●***Arcyria helvetica*** (Meyl.) H. Neubert, Nowotny & K. Baumann
Arcyria incarnata (Pers. ex J.F. Gmel.) Pers.
●***Arcyria insignis*** Kalchbr. & Cooke
Arcyria major (G. Lister) Ing
Arcyria minuta Buchet
Arcyria obvelata (Oeder) Onsberg
Arcyria oerstedtii Rostaf.
Arcyria pomiformis (Leers) Rostaf.
Badhamia affinis Rostaf.
Badhamia capsulifera (Bull.) Berk.
●***Badhamia flavoglauca*** Kuhnt
Badhamia foliicola Lister
Badhamia goniospora Meyl.
Badhamia lilacina (Fr.) Rostaf.
●***Badhamia macrocarpa*** (Ces.) Rostaf.
●***Badhamia melanospora*** Speg.
Badhamia nitens Berk.
Badhamia nitens Berk. **var.** ***reticulata*** (Berk. & Broome ex Massee) G. Lister
Badhamia panicea (Fr.) Rostaf.
Badhamia populina Lister & G. Lister
Badhamia utricularis (Bull.) Berk.
●***Badhamia versicolor*** Lister
●***Badhamiopsis ainoae*** (Yamash.) T.E. Brooks & H.W. Keller
●***Badhamiopsis ainoae*** (Yamash.) T.E. Brooks & H.W. Keller **var.** ***macrospora*** Y. Yamam.
Badhamiopsis cavifera Nann.-Brem & Y. Yamam.
Barbeyella minutissima Meyl.
Brefeldia maxima (Fr.) Rostaf.
Calomyxa metallica (Berk.) Nieuwl.
●***Calomyxa metallica*** (Berk.) Nieuwl. **var.** ***megaspora*** Y. Yamam. & Nann.-Bremek.
●***Calonema cornuvioides*** Chassain & Nann.-Bremek.
Ceratiomyxa fruticulosa (O.F. Müll.) T. Macbr.
Ceratiomyxa fruticulosa (O.F. Müll.) T. Macbr. **var.** ***porioides*** (Alb. & Schwein.) Lister
Clastoderma debaryanum A. Blytt
●***Clastoderma microcarpum*** (Meyl.) Kowalski
Collaria arcyrionema (Rostaf.) Nann.-Bremek. ex Lado
Collaria rubens (Lister) Nann.-Bremek.
Colloderma oculatum (C. Lippert) G. Lister
●***Colloderma robustum*** Meyl.
Comatricha alta Preuss
Comatricha anomala Rammeloo
●***Comatricha brachypus*** (Meyl.) Meyl.
Comatricha elegans (Racib.) G. Lister
●***Comatricha elegans*** (Racib.) G. Lister **var.** ***microspora*** H. Marx
Comatricha ellae Härk.
●***Comatricha filamentosa*** Meyl.
●***Comatricha fragilis*** Meyl.
Comatricha laxa Rostaf.
●***Comatricha longipila*** Nann.-Bremek.
●***Comatricha meandrispora*** A. Castillo, G. Moreno & Illana
Comatricha nigra (Pers. ex J.F. Gmel.) J. Schröt.
●***Comatricha nigricapillitia (***Nann.-Bremek. & Bozonnet) A. Castillo, G. Moreno & Illana
Comatricha pulchella (C. Bab.) Rostaf.
Comatricha pulchella (C. Bab.) Rostaf. **var.** ***fusca*** (Lister) G. Lister
Comatricha rigidireta Nann.-Bremek.
Comatricha tenerrima (M.A. Curtis) G. Lister
●***Craterium aureonucleatum*** Nann.-Bremek.
Craterium dictyosporum (Rostaf.) H. Neubert, Nowotny & K. Baumann

Craterium leucocephalum (Pers. ex J.F. Gmel.) Ditmar
Craterium minutum (Leers) Fr.
●***Craterium minutum*** (Leers) Fr. **var.** ***brunneum*** (Nann.-Bremek.) L.G. Krieglst.
Craterium obovatum Peck
Cribraria argillacea (Pers. ex J.F. Gmel.) Pers.
Cribraria atrofusca G.W. Martin & Lovejoy
Cribraria aurantiaca Schrad.
Cribraria cancellata (Batsch) Nann.-Bremek.
Cribraria cancellata (Batsch) Nann.-Bremek. **var.** ***fusca*** (Lister) Nann.-Bremek.
●***Cribraria ferruginea*** Meyl.
Cribraria intricata Schrad.
●***Cribraria languescens*** Rex
●***Cribraria lepida*** Meyl.
Cribraria macrocarpa Schrad.
Cribraria microcarpa (Schrad.) Pers.
●***Cribraria minutissima*** Schwein.
Cribraria mirabilis (Rostaf.) Massee
Cribraria oregana H.C. Gilbert
Cribraria persoonii Nann.-Bremek.
Cribraria piriformis Schrad.
Cribraria purpurea Schrad.
Cribraria rufa (Roth) Rostaf.
Cribraria splendens (Schrad.) Pers.
●***Cribraria stellifera*** Nowotny & H. Neubert
●***Cribraria tenella*** Schrad.
Cribraria violacea Rex
Cribraria vulgaris Schrad.
Diachea leucopodia (Bull.) Rostaf.
●***Diacheopsis*** **cf.** ***effusa*** Kowalski
Diacheopsis insessa (G. Lister) Ing
●***Diacheopsis metallica*** Meyl.
●***Diacheopsis mitchellii*** Nann.-Bremek. & Y. Yamam.
Diacheopsis nannengae G. Moreno, Illana & Heykoop
●***Cf. Diacheopsis vermicularis*** Nann.-Bremek. & Y. Yamam.
Dianema corticatum Lister
●***Dianema depressum*** (Lister) Lister
●***Dianema harveyi*** Rex
●***Dianema nivale*** (Meyl.) G. Lister
Dictydiaethalium plumbeum (Schumach.) Rostaf.
●***Dictydiaethalium plumbeum*** (Schumach.) Rostaf. **var.** ***ferrugineum*** (Nann.-Bremek.) L.G. Krieglst.
Diderma alpinum (Meyl.) Meyl.
Diderma chondrioderma (de Bary & Rostaf.) G. Lister
Diderma crustaceum Peck
Diderma deplanatum Fr.
Diderma effusum (Schwein.) Morgan
Diderma europaeum (Buyck) Kuhnt
Diderma floriforme (Bull.) Pers.
Diderma globosum Pers.
Diderma hemisphaericum (Bull.) Hornem.
Diderma cf. lucidum Berk. & Broome
●***Diderma meyerae*** H. Singer, G. Moreno, Illana & A. Sánchez
●***Diderma microcarpum*** Meyl.
Diderma montanum (Meyl.) Meyl.
Diderma montanum (Meyl.) Meyl. **var.** ***album*** (Torrend) G. Lister
Diderma niveum (Rostaf.) T. Macbr.
Diderma ochraceum Hoffm.
Diderma radiatum (L.) Morgan
Diderma roanense (Rex.) T. Macbr.
●***Diderma sauteri*** (Rostaf.) T. Macbr.
●***Diderma sessile*** (Brândză) Mar. Mey. & Poulain
●***Diderma simplex*** (J. Schröt.) E. Sheld.
Diderma spumarioides (Fr.) Fr.
●***Diderma subasteroides*** M.L. Farr
Diderma umbilicatum Pers.
Didymium anellus Morgan
●***Didymium annulisporum*** H.W. Keller & Schokn.
Didymium bahiense Gottsb.
Didymium clavus (Alb. & Schwein.) Rabenh.
Didymium crustaceum Fr.
Didymium difforme (Pers.) Gray
Didymium dubium Rostaf.
Didymium iridis (Ditmar) Fr.
Didymium melanospermum (Pers.) T. Macbr.
Didymium minus (Lister) Morgan
Didymium nigripes (Link) Fr.
Didymium **cf.** ***nivicola*** Meyl.
Didymium ochroideum G. Lister
Didymium serpula Fr.
Didymium squamulosum (Alb. & Schwein.) Fr.

Didymium trachysporum G. Lister
●***Didymium tussilaginis*** (Berk. & Broome) Massee
●***Didymium vernum*** Kuhnt, K. Baumann & Nowotny
●***Echinostelium arboreum*** H.W. Keller & T.E. Brooks
●***Echinostelium brooksii*** K.D. Whitney
Echinostelium colliculosum K.D. Whitney & H.W. Keller
●***Echinostelium corynophorum*** K.D. Whitney
Echinostelium cribrarioides Alexop.
●***Echinostelium fragile*** Nann.-Bremek.
Echinostelium minutum de Bary
Elaeomyxa cerifera (G. Lister) Hagelst.
●***Enerthenema intermedium*** Nann.-Bremek. & R.L. Critchf.
Enerthenema papillatum (Pers.) Rostaf.
Fuligo intermedia T. Macbr.
Fuligo laevis Pers.
●***Fuligo leviderma*** H. Neubert, Nowotny & K. Baumann
●***Fuligo luteonitens*** L.G. Krieglst. & Nowotny
Fuligo muscorum Alb. & Schwein.
Fuligo septica (L.) F.H. Wigg.
Fuligo septica (L.) F.H. Wigg. **var.** ***candida*** (Pers.) R.E. Fr.
Fuligo septica (L.) F.H. Wigg. **var.** ***flava*** (Pers.) Lázaro Ibiza
Fuligo septica (L.) F.H. Wigg. **var.** ***rufa*** (Pers.) Lázaro Ibiza
Hemitrichia abietina (Wigand) G. Lister
●***Hemitrichia calyculata*** (Speg.) M.L. Farr
Hemitrichia clavata (Pers.) Rostaf.
●***Hemitrichia leiocarpa*** (Cooke) Lister
Hemitrichia leiotricha (Lister) G. Lister
●***Hemitrichia minor*** G. Lister
●***Hemitrichia*** **cf.** ***montana*** (Morgan) T. Macbr.
●***Hemitrichia pardina*** (Minakata) Ing
●***Hemitrichia serpula*** (Scop.) Rostaf. ex Lister
●***Hemitrichia sordivesiculosa*** Kuhnt
●***Lamproderma aeneum*** Mar. Mey. & Poulain
●***Lamproderma album*** H. Neubert, Nowotny & K. Baumann
Lamproderma arcyrioides (Sommerf.) Rostaf.
●***Lamproderma cf. argenteobrunneum*** A. Ronikier, Lado & Mar. Mey.
●***Lamproderma cacographicum*** Bozonnet, Mar. Mey. & Poulain
Lamproderma columbinum (Pers.) Rostaf.
●***Lamproderma cristatum*** Meyl.
Lamproderma debile (G. Lister & H.J. Howard) Ing
Lamproderma echinosporum Meyl.
Lamproderma gulielmae Meyl.
Lamproderma lycopodiicola Kuhnt
Lamproderma macrosporum (Mar. Mey. & Poulain) Kuhnt
Lamproderma maculatum Kowalski
●***Lamproderma nigrescens*** **(**Rostaf.) Rostaf.
Lamproderma nordica Kuhnt
●***Lamproderma ovoideoechinulatum*** Mar. Mey. & Poulain
●***Lamproderma ovoideoechinulatum*** Mar. Mey. & Poulain **var.** ***microsporum*** Mar. Mey. & Poulain
●***Lamproderma ovoideum*** Meyl.
●***Lamproderma piriforme*** (Meyl.) Mar. Mey. & Poulain
●***Lamproderma pseudomaculatum*** Mar. Mey. & Poulain
●***Lamproderma pulchellum*** Meyl.
●***Lamproderma pulveratum*** Mar. Mey. & Poulain
●***Lamproderma puncticulatum*** Härk.
Lamproderma sauteri Rostaf.
Lamproderma scintillans (Berk. & Broome) Morgan
●***Lamproderma spinulosporum*** Mar. Mey., Nowotny & Poulain
●***Lamproderma splendidissimum*** Mar. Mey., Bozonnet & Poulain
●***Lamproderma violaceum*** Fr. ex Rostaf.
●***Lamproderma zonatum*** Mar. Mey. & Poulain
Leocarpus fragilis (Dicks.) Rostaf.
●***Lepidoderma aggregatum*** Kowalski
●***Lepidoderma alpestroides*** Mar. Mey. & Poulain
Lepidoderma carestianum (Rabenh.) Rostaf.
●***Lepidoderma chailletii*** Rostaf**.**
Lepidoderma neoperforatum Kuhnt
Lepidoderma tigrinum (Schrad.) Rostaf.
Lepidoderma trevelyanii (Grev.) Poulain & Mar. Mey.

Leptoderma iridescens G. Lister
Licea belmontiana Nann.-Bremek.
Licea biforis Morgan
●***Licea bryophila*** Nann.-Bremek.
Licea castanea G. Lister
●***Licea clarkii*** Ing
●***Licea denudescens*** H.W. Keller & T.E. Brooks
●***Licea floriformis*** T.N. Lakh. & R.K. Chopra **var.** ***aureospora*** M.T.M. Willemse & Nann.-Bremek.
●***Licea gloeoderma*** Döbbeler & Nann.-Bremek.
Licea inconspicua T.E. Brooks & H.W. Keller
Licea kleistobolus G.W. Martin
●***Licea marginata*** Nann.-Bremek.
●***Licea microscopica*** D.W. Mitch.
Licea minima Fr.
●***Licea cf. nannengae*** Pando & Lado
Licea nivicola Kuhnt
Licea operculata (Wingate) G.W. Martin
Licea parasitica (Zukal) G.W. Martin
Licea **cf.** ***pedicellata*** (H.C. Gilbert) H.C. Gilbert
●***Licea pumila*** G.W. Martin & T.C. Allen
Licea pusilla Schrad.
●***Licea pygmaea*** (Meyl.) Ing
●***Licea sambucina*** D.W. Mitch.
●***Licea scyphoides*** T.E. Brooks & H.W. Keller
●***Licea synsporos*** Nann.-Bremek.
●***Licea tenera*** E. Jahn
Licea testudinacea Nann.-Bremek.
Licea variabilis Schrad.
Lindbladia tubulina Fr.
●***Listerella paradoxa*** E. Jahn
Lycogala confusum Nann.-Bremek. ex Ing
Lycogala conicum Pers.
Lycogala epidendrum (J.C. Buxb. ex L.) Fr.
Lycogala epidendrum (J.C. Buxb. ex L.) Fr. **var.** ***tesselatum*** (Lister) G. Lister
Lycogala exiguum *Morgan*
Lycogala flavofuscum (Ehrenb.) Rostaf.
●***Macbrideola argentea*** Nann.-Bremek. & Y. Yamam.
Macbrideola cornea (G. Lister & Cran) Alexop.
●***Macbrideola synsporos*** (Alexop.) Alexop.
●***Meriderma aggregatum*** ad. int.
Meriderma carestiae (Ces. & De Not.) Mar. Mey. & Poulain
Meriderma cribrarioides (Fr.) Mar. Mey. & Poulain
●***Meriderma echinulatum*** (Meyl.) Mar. Mey. & Poulain
●***Meriderma spinulosporum*** ad. int.
●***Meriderma verrucosporum*** ad. int.
Metatrichia floriformis (Schwein.) Nann.-Bremek.
●***Metatrichia horrida Ing***
Metatrichia vesparia (Batsch) Nann.-Bremek. ex G.W. Martin & Alexop.
Mucilago crustacea F.H. Wigg.
●***Oligonema aurantium*** Nann.-Bremek.
●***Oligonema fulvum*** Morgan
●***Oligonema schweinitzii*** (Berk.) G.W. Martin
Paradiacheopsis cribrata Nann.-Bremek.
Paradiacheopsis fimbriata (G. Lister & Cran) Hertel ex Nann.-Bremek.
●***Paradiacheopsis fimbriata*** (G. Lister & Cran) Hertel ex Nann.-Bremek**. var.** ***penicillata*** (Nann.-Bremek. & Y. Yamam.) Y. Yamam.
●***Paradiacheopsis rigida*** (Brândză) Nann.-Bremek**.**
Paradiacheopsis solitaria (Nann.-Bremek.) Nann.-Bremek.
Perichaena chrysosperma (Curr.) Lister
Perichaena corticalis (Batsch) Rostaf.
Perichaena depressa Lib.
●***Perichaena pedata*** (Lister & G. Lister) Lister ex E. Jahn
Perichaena vermicularis (Schwein.) Rostaf.
Physarum albescens Ellis ex T. Macbr.
Physarum album (Bull.) Chevall.
●***Physarum alpestre*** Mitchel, S.W. Chapm. & M.L. Farr
Physarum alpinum (Lister & G. Lister) G. Lister
Physarum auripigmentum G.W. Martin
Physarum auriscalpium Cooke
Physarum bitectum G. Lister
Physarum bivalve Pers.
●***Physarum bryocorticola*** Kuhnt
Physarum cinereum (Batsch) Pers.
Physarum citrinum Schumach.
Physarum compressum Alb. & Schwein.

Physarum confertum T. Macbr.
Physarum contextum (Pers.) Pers.
●***Physarum corticola*** Kuhnt
●***Physarum daamsii*** Nann.-Bremek.
Physarum decipiens M.A. Curtis
Physarum diderma Rostaf.
Physarum didermoides (Pers.) Rostaf.
Physarum famintzinii Rostaf.
●***Physarum flavicomum*** Berk.
●***Physarum flavidum*** (Peck) Peck
Physarum globuliferum (Bull.) Pers.
Physarum gyrosum Rostaf.
Physarum* cf. *lakhanpalii Nann.-Bremek. & Y. Yamam.
Physarum leucophaeum Fr.
Physarum leucopus Link
●***Physarum licheniforme*** (Schwein.) Lado
●***Physarum loratum*** Shuang L. Chen, Yu Li & H.Z. Li
Physarum murinum Lister
Physarum mutabile (Rostaf.) G. Lister
Physarum notabile T. Macbr.
Physarum nudum T. Macbr.
Physarum oblatum T. Macbr.
Physarum obscurum (Lister) Ing
Physarum ovisporum G. Lister
●***Physarum penetrale*** Rex
●***Physarum polycephalum*** Schwein.
●***Physarum pseudodiderma*** Nann.-Bremek. & Y. Yamam.
Physarum psittacinum Ditmar
Physarum pusillum (Berk. & M.A. Curtis) G. Lister
Physarum rubiginosum Fr.
Physarum serpula Morgan
Physarum* cf. *sessile Brândza
●***Physarum straminipes*** Lister
Physarum sulphureum Alb. & Schwein.
Physarum vernum Sommerf.
Physarum vernum Sommerf. ***var. iridescens*** G. Lister
Physarum virescens Ditmar
Physarum viride (Bull.) Pers.
Physarum viride (Bull.) Pers. **var.** ***aurantium*** (Bull.) Lister
Physarum viride (Bull.) Pers. **var.** ***incanum*** Lister
Prototrichia metallica (Berk.) Massee
Reticularia jurana Meyl.
Reticularia liceoides (Lister) Nann.-Bremek.
Reticularia lycoperdon Bull.
Reticularia olivacea (Ehrenb.) Fr.
Reticularia simulans (Rostaf.) D.W. Mitch.
Reticularia splendens Morgan
●***Siphoptychium reticulatum*** Leontyev, Schnittler & S. L. Stephenson
●***Siphoptychium violaceum*** Leontyev, Schnittler & S. L. Stephenson
Stemonaria irregularis (Rex) Nann.-Bremek., R. Sharma & Y. Yamam.
Stemonitis axifera (Bull.) T. Macbr.
Stemonitis axifera (Bull.) T. Macbr. **var.** ***smithii*** (T. Macbr.) Hagelst.
Stemonitis flavogenita E. Jahn
●***Stemonitis* cf. *foliicola*** Ing
Stemonitis fusca Roth
Stemonitis fusca Roth **var.** ***nigrescens*** (Rex) Torrend
Stemonitis fusca Roth **var.** ***rufescens*** Lister
Stemonitis herbatica Peck
●***Stemonitis* cf. *laxifila*** Nann.-Bremek. & Y. Yamam.
●***Stemonitis marjana*** Y. Yamam.
Stemonitis pallida Wingate
●***Stemonitis splendens*** Rostaf.
Stemonitis splendens Rostaf. **var.** ***webberi*** (Rex) Lister
Stemonitis virginiensis Rex
Stemonitopsis aequalis (Peck) Y. Yamam.
Stemonitopsis amoena (Nann.-Bremek.) Nann.-Bremek.
●***Stemonitopsis gracilis*** (G. Lister) Nann.-Bremek.
Stemonitopsis hyperopta (Meyl.) Nann.-Bremek.
●***Stemonitopsis hyperopta*** (Meyl.) Nann.-Bremek. **var.** ***landewaldii*** Bossel.
●***Stemonitopsis reticulata*** (H.C. Gilbert) Nann.-Bremek. & Y. Yamam.
Stemonitopsis subcaespitosa (Peck) Nann.-Bremek.
Stemonitopsis typhina (F.H. Wigg.) Nann.-Bremek.
Stemonitopsis typhina (F.H. Wigg.) Nann.-Bremek. **var.** ***similis*** (G. Lister) Nann.-Bremek. & Y. Yamam.

Symphytocarpus amaurochaetoides Nann.-Bremek.
●***Symphytocarpus confluens*** (Cooke & Ellis) Ing & Nann.-Bremek.
Symphytocarpus flaccidus (Lister) Ing & Nann.-Bremek.
●***Trabrooksia applanata*** H.W. Keller
Trichia affinis de Bary
Trichia alpina (R.E. Fries) Meyl.
●***Trichia ambigua*** Schirmer, L.G. Krieglst. & Flatau
Trichia botrytis (J.F. Gmel.) Pers.
●***Trichia botrytis*** (J.F. Gmel.) Pers. **var.** ***cerifera*** G. Lister
Trichia brunnea J.J. Cox
Trichia contorta (Ditmar) Rostaf.
Trichia contorta (Ditmar) Rostaf. **var.** ***attenuata*** (Meyl.) Meyl.
Trichia contorta (Ditmar) Rostaf. **var.** ***iowensis*** (T. Macbr.) Torrend
Trichia contorta (Ditmar) Rostaf. **var.** ***karstenii*** (Rostaf.) Ing
●***Trichia crateriformis*** G.W. Martin
Trichia decipiens (Pers.) T. Macbr.
Trichia erecta Rex
Trichia favoginea (Batsch) Pers.
Trichia flavicoma (Lister) Ing
Trichia lutescens (Lister) Lister
●***Trichia munda*** (Lister) Meyl.
Trichia nivicola Kuhnt
Trichia persimilis P. Karst.
Trichia scabra Rostaf.
Trichia sordida Johannesen
Trichia subfusca Rex
Trichia varia (Pers. ex J.F. Gmel.) Pers.
Trichia verrucosa Berk.
●***Trichioides iridescens*** Novozh., H. Hooff & Jagers
Tubifera ferruginosa (Batsch) J.F. Gmel.
●***Tubifera montana*** Leontyev, Schnittler & S.L. Stephenson
●***Willkommlangea reticulata*** (Alb. & Schwein.) Kuntze

APPENDIX II

Abbreviations of collectors' names.

AB Anne Borander
AET Anna-Elise Torkelsen
AG Arne Garthe
AGJ Andrea Grundt Johns
AK Arnt Kvinnesland
AMDB Alf-Marius Dahl Bysveen
ArG Arnor Gullanger
BA Brit Aase
BEA Bård E. Andersen
BjN Björn Nordén
BK Brit Karlsen
BN Berit Nyrud
BO Bjørnar Olsen
BoA Borghild Elene Aspevik
DH Dag Holtan
DM Dagny Mandt
EB Edith Ramberg
EE Erik Evenrud
EH Edel Humstad
EW Eva Weme
EWH Even W. Hanssen
EWJ Edvin W. Johannesen
GB Gunvor Bollingmo
GF Geir Flatabø
GG Geir Gaarder
GH Gyrd Harstad
GhA Gunn-henny Aasen
GM Geir Mathiassen
GMJ Gaute Mohn Jenssen
GNG Guttorm Norberg Gundersen
GS Gjermund Steen
HA H. Andersen
HE Harald Eriksen
HGG Helge G. Gundersen
HH Håkon Holien
HK Hermod Karlsen
HLJ Helene Lind Jensen
HMB Hanne Marie Bjørnøy
HR Hermann Ramberg
HS Heidi Støen
HW Henrik Weibull
IB Ines Bråthen
IK Inger Kristoffersen
ILW Inger-Lise Walter
IM Ingunn Moslet
IMA Iogio Manavella
JMS J. M. Sussey
IR Ingvild Rokseth
JBJ John Bjarne Jordal
JE Jeanette Elden
JG Jan Gjestad
JGB John Gunnar Brynjulvsrud
JJ Jostein Jektnes
JOA Jon-Otto Aarnæs
JS John Simonsen
JT Jenny Torvolt
KAM Kirsti Anne Mandal
KB Kari Blikra
KH Kåre Homble
KIF Kjell Ivar Flatberg
KJG Karl Johan Grimstad
KMS Kjersti Marielle W Sæbø
KNT Kjersti Nerbråten Tjernshaugen
KrH Kristian Hassel
KW Kristin Wangen
MF Magne Flåten
MG Martin Gotink
MGW George Willard Martin
MaO Marte Olsen
MP Morten Pettersen
MS Martin Schnittler
NES Nils Edvard Stokke
NG Nils Gajic
NH Norman Hagen
NL Nils Lundqvist
OA Olav Aas
OO Oddvar Olsen
PF Per Fadnes
PGL Perry Gunnar Larsen
PM Per Marstad
PV Per Vetlesen
RB Reidun Braathen
RS Rune Solvang
RvK Rob van Kruining

RZ Rune Zakariassen
SA Steinar Aase
SG Sonja Gajic
SH Sieglinde Hansen
SHLL Solfrid Helene Lien Langmo
SM Siv Moen
SOD Svein Olav B. Drangeid
SS Sofia Sjøblom
TAR Tor-Amund Røsberg
TB Trine Brevig
TCM Tore Christian Michaelsen
TD Toril Deildok
TH Torbjørn Høitomt
THD Tove Hafnor Dahl
THH Tom Hellik Hofton
THM Tor Harald Melseth
TJ Tove Jacobsen
TL Thomas Læssøe
TMS Trond Magne Storstad
TNK Turid Nakling Kristiansen
TP Terhi Pousi
TrP Trine Parmer
TSN Terje Spolen Nilsen
WEJ Wenche Eli Johansen
WV Wenche Vetlesen
ZM Zdenek Moravec
ØF Øystein Folden
ÅB Åse Borge
ÅH Åshild Hasvik

APPENDIX III

Myxomycete species given official Norwegian names (‘common names’).

Scientific names	Common names
Amaurochaete atra	kokspute
Arcyria	sukkerspinnslim
Arcyria cinerea	grått sukkespinn
Arcyria denudata	skarlagen sukkerspinn
Arcyria incarnata	sukkerspinn
Arcyria obvelata	girlanderspinn
Badhamia utricularis	drueslim
Ceratiomyxa fruticulosa	slimhorn
Comatricha nigra	knappenålslim
Craterium leucocephalum	pokalslim
Cribraria	nettkuleslim
Cribraria argillacea	oker nettkule
Cribraria cancellata	lyktenettkule
Cribraria rufa	oransje nettkule
Diachea leucopodia	regnbueslim
Diderma radiatum	kalkrosett
Didymium melanospermum	stjernedryss
Fuligo	smørslim
Fuligo muscorum	mosesmør
Fuligo septica	trollsmør
Lamproderma columbinum	stålhagl
Leocarpus fragilis	sjokoladeegg
Lepidoderma tigrinum	mosaikkule
Lycogala	melkeslim
Lycogala epidendrum	ulvemelk
Lycogala flavofuscum	bjørnemelk
Metatrichia vesparia	bukettklubbe
Mucilago crustacea	heksespytt
Physarum	kalkknuteslim
Physarum album	hvit nikkelinse
Physarum vernum	vårslim
Physarum virescens	gul moseklase
Physarum viride	gul nikkelinse
Reticularia	eggeslim
Reticularia jurana	kanelegg
Reticularia lycoperdon	sotegg
Stemonitis	stiftslim
Stemonitis axifera	ruststift
Stemonitis fusca	sotstift
Stemonitopsis typhina	hinnestift
Symphytocarpus	gulpeslim
Symphytocarpus amaurochaetoides	svart stubbegulp
Symphytocarpus flaccidus	brunt stubbegulp
Trichia	ullslim
Trichia decipiens	ullklubbe
Trichia favoginea	klyngeullkule
Trichia scabra	safranullkule
Trichia varia	ullkule
Tubifera ferruginosa	bringebærslim

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