



# sommerfeltia

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G. Mathiassen

Corticolous and lignicolous Pyrenomycetes s.lat.  
(Ascomycetes) on *Salix* along a  
mid-Scandinavian transect

1993



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This thesis is dedicated to Lennart Holm, Ola Skifte and Finn-Egil Eckblad, three septuagenarian, Nordic mycologists, who have all contributed significantly to its completion.

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The pyrenomycete flora on *Salix* is examined along a mid-Scandinavian transect. A restricted number of *Salix* species and a fixed number of host individuals are examined in each of the vegetation regions in central Norway, and in two vegetation regions in north-central Sweden. This investigation addressed the unsolved problems listed in my previous study (Mathiassen 1989) and the same 29 taxa are treated. The following new species are described: *Amphisphaerella erikssonii* G. Mathiassen, *Glyphium grisonense* G. Mathiassen, *Keissleriella holmiorum* G. Mathiassen, *Leptosphaeria tollens* G. Mathiassen, and *Saccardoella kanderana* G. Mathiassen. The type material has been examined for all 29 species mentioned in the study, except *Bertia moriformis* var. *moriformis*.

A dichotomous key is followed by reviews of the species in alphabetical order. A systematic survey of the investigated taxa is also given. In addition to comments on taxonomy, ecology and distribution for the different pyrenomycete species, substrate ecology and host specificity are discussed. Statistical treatment of spore measurement data form the basis for a discussion of geographical variation. Multivariate techniques (ordination) are used to investigate the relative importance of geographic (including climatic) factors and the substrate tree.

Keywords: Ascomycetes, Distribution, Ecology, Ordination, Pyrenomycetes, *Salix*, Scandinavia, Taxonomy.

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## INTRODUCTION

### THE PRESENT INVESTIGATION

It is, of course, impossible to cover all the Norwegian and Swedish pyrenomycetes in a single investigation, and a review of the pyrenomycete flora must therefore be restricted taxonomically or geographically. I agree with Eriksson (1967a) that an ecological study of groups of species is especially worthwhile. Mathiassen (1989) gave several reasons for restricting his investigation to *Salix*, and to a rather small geographical area. The present investigation deviates from the above mentioned investigation (Mathiassen 1989) in some important features: (1) only a restricted number of *Salix* species, and a fixed number of host individuals were examined in each of the vegetation regions, (2) the material was collected systematically, and thus suited for statistical testing, (3) the investigation area (see Fig. 1) was situated about 450-650 km further south, and included an additional vegetation region (southern boreal), and (4) the investigation area was considerably wider in the NW-SE direction, with a more pronounced variation in climatic oceanicity (cf. Figs 1, 9).

This investigation addresses the unsolved problems listed by Mathiassen (1989) and the same 29 taxa are treated. This restriction in number was a necessity for a meaningful comparison of the results from the two investigations. Among such problems were nomenclature, taxonomy, substrate ecology, host specificity, distribution and morphological (geographical) variation, with the latter as a very interesting problem. The spores in the material from Troms often turned out to be larger than those described in literature. This was especially the case for *Amphisphaerella* cf. *xylostei* (Pers. : Fr.) Munk, *Anthostomella melanotes* (Berk. & Br.) Martin, *Glyphium* cf. *schizosporum* (Maire) Zogg, *Keissleriella* cf. *cladophila* (Niessl) Corbaz, *Leptosphaeria hendersoniae* (Fuckel) Holm and *Melanomma fusciculatum* Sacc. The tendency of increasing spore sizes towards arctic areas (compared with temperate regions) was noticeable according to Savile (1963), with the temperature as the most important factor (see also Mathiassen 1989: 22). One aim of this study was to investigate a possible decrease in spore size from Troms to central Scandinavia. If the above mentioned differences were due to geographical variation, spore size should be constantly smaller in the southern boreal region (SB-Norway) than in Troms. Other aims of this study were to get a better understanding of the different species distribution and frequencies in Scandinavia, to examine the above mentioned "cf." species more carefully, to investigate whether other *Salix* species would replace *S. myrsinifolia* agg. as the main host in central Scandinavia, and to investigate whether the different trends on substrate ecology, and parasites and saprophytes were incidental or not. The investigation is thus restricted taxonomically, ecologically and geographically.

It is difficult to determine which are the most important parameters affecting pyrenomycete distribution. Mathiassen (1989) assumed that the most important variables influencing the local and regional distribution of *Salix*-inhabiting pyrenomycetes were (1) the climatic variation from low to high altitudes, correlated with vegetation regions, temperatures, etc, (2) the climatic variation in oceanicity, from oceanic, coastal areas to more continental, inland areas, and (3) the substrate *Salix* species. In addition to the problems listed above, the aim of this study was also to investigate the relative importance of different climatic gradients (temperature, oceanicity) and substrate tree by use of ordination. Previous investigations of

fungus ecology and distribution in Scandinavia using ordination are, e.g. Høiland (1986), Hansen (1988), Bendiksen (1989), and Gulden et al. (1990).

Most of my attention has been paid to the ecology and distribution of the different pyrenomycete species, especially in relation to the vegetation regions, the different *Salix* species, and the oceanic-continent gradient. However, it must be emphasized that the nomenclature and taxonomic problems turned out to be considerably more extensive and time-consuming than anticipated.

## HISTORY

Nannfeldt (1960) pointed out that the pyrenomycetes had been a rather neglected group in Norway. Although several works and sporadic notes on pyrenomycetes in Norway are published (see Mathiassen 1989: 6), our knowledge of the Norwegian pyrenomycete flora is still very limited. No one has actually been working with this group in Norway for several years, and the major contributions the last few years are those of Holm & Holm (1988), Eckblad & Torkelsen (1989), and Granmo et al. (1989). Minor contributions include Hawksworth (1985a, 1985b), Petrini & Müller (1986), Rappaz (1987), Petrini et al. (1989), and Barr (1990a, 1990b). No fieldwork has been undertaken by the latter authors in Norway, but Norwegian material has been included in their publications. Thus, much remains to be done, particularly in North Norway.

The pyrenomycete flora is much better known in Sweden. Especially owing to the contributions by Elias Fries, Sweden was once the part of the world best known floristically. The pyrenomycetes were one of the young Fries' favourite groups and already in 1816-19 he published his "Uppställning af de i Sverige funne Vårtsvampar (Scleromyci)". In 1819 (Fries 1819-34) he started distributing his Exsiccatum "Scleromyceti Sueciae". The three volumes of the "Systema mycologicum" (Fries 1821, 1822-23, 1829-32) remain important works. His "Summa Vegetabilium Scandinaviae 2" (Fries 1849), was a complete enumeration of the Swedish fungus flora. Another important contemporary botanist/mycologist was G. Wahlenberg (1812, 1820, 1826).

Numerous contributions to the Swedish pyrenomycete flora have been published since Fries wrote his classical works. A "complete" list of the contributions up to 1991 was given by O. Eriksson (Eriksson 1992), and some of the most important are mentioned below.

Romell (1885, 1889, 1890-1895, 1892, 1895) collected a lot of pyrenomycetes, and his large collections are, according to Nannfeldt (1959), most interesting and important. Other important contributions are those of Eliasson (1895, 1896, 1897, 1915, 1928, 1929a, 1929b, 1933), Starbäck (1887, 1889a, 1889b, 1890, 1894, 1896, 1898), and Vestergren (1896, 1897a, 1897b, 1897c, 1899a-1916, 1899b, 1899c, 1900b, 1902b, 1914). Particularly interesting are Vleugel's (1908, 1911, 1917) detailed studies of the pyrenomycete flora in the areas around Umeå and Luleå. The first mycologist of our time to be mentioned is Lennart Holm. He has been an important contributor for more than 40 years (Holm 1948, 1952, 1953, 1957, 1961, 1967, 1975a, 1975b, 1979, 1986), partly in collaboration with his wife Kerstin Holm (K. Holm & L. Holm 1977, L. Holm & K. Holm 1976, 1977, 1978, 1979, 1980, 1981a, 1981b, 1987, 1988). Other important contributions are those of Eriksson (1964, 1966a, 1966b, 1967a, 1967b, 1967c, 1967d, 1981, 1982a, 1982b, 1986, 1988), and Lundqvist (1964a, 1964b, 1964c, 1967, 1969a, 1969b, 1972, 1973, 1974, 1980, 1981, 1987). The most famous Swedish mycologist

in our century, J.A. Nannfeldt, dedicated most of his scientific research to the discomycetes, but he also published some papers on pyrenomycetes (Nannfeldt 1969, 1972, 1975a, 1975b).

According to K. & L. Holm (in litt. 1991), there are no actual localities in Sweden where the pyrenomycete flora can be considered as well known, but some regions are better investigated than others, e.g. the areas around Abisko (TL), Umeå (Vb), Luleå (Nb), Gävle (Gstr), Uppsala (Upl), Stockholm (Sdm, Upl) and Femsjö (Sm). The area around "Jerusalem" (near Uppsala) is, according to K. & L. Holm (in litt. 1991), probably the best investigated place in Sweden, but new, rare and interesting finds, even undescribed species, may still be expected to appear.

A similar investigation, in addition to those listed in Mathiassen (1989: 6), that should be mentioned here is Chlebicki's (1989) nice work from the Babia Góra massif in Poland. There are many similarities between his investigation and the present, e.g. in the classification of substrates, the focus on comparative studies of selected trees, and the vertical ranges of fungi. However, Chlebicki's studies were carried out on trees belonging to different genera, viz., *Acer pseudoplatanus*, *Fagus sylvatica* and *Sorbus aucuparia* ssp. *glabrata*. He showed that the fungi were associated not only with the particular species of plants, but also with plant communities. Worth mentioning are also the works on *Alnus viridis* (Padlahová 1973), pine (Minter 1979), and Sycamore wood and bark (Bevan & Greenhalgh 1983).

## THE INVESTIGATION AREA

### SITUATION AND EXTENT

In Norway, the investigation area included Helgeland, i.e. the southern part of Nordland county (No), from the municipalities Saltdal, Rana and Nesna in the north (north of the Arctic

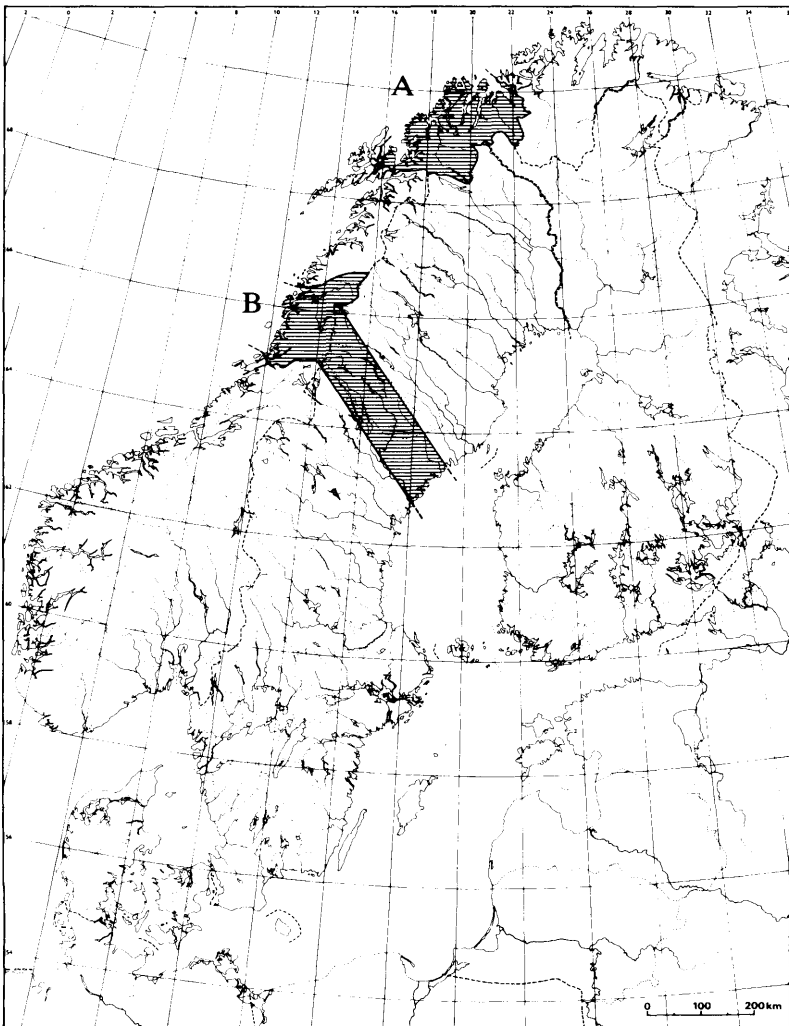


Fig. 1. Location of the two areas within Fennoscandia where pyrenomycetes s. lat. on *Salix* spp. have been investigated. A. Troms county (Mathiassen 1989). B. The present investigation.

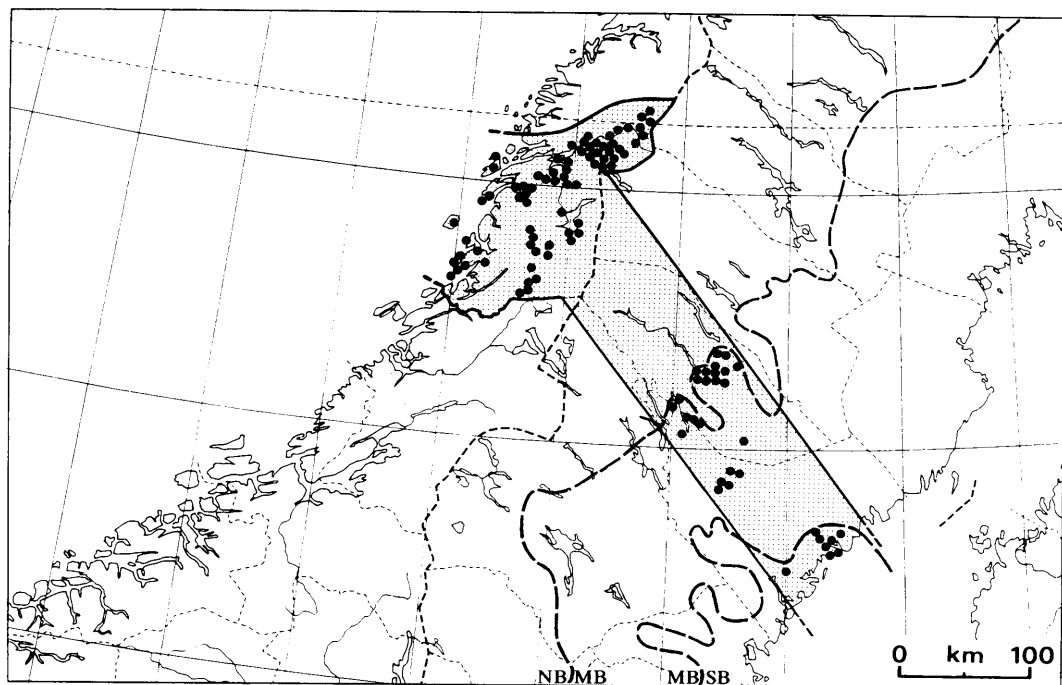


Fig. 2. Distribution of investigated localities within the transect.

Circle) southwards to the border onto Nord-Trøndelag county (NT). In Sweden, the investigation covered two areas in the provinces of Åsele Lappmark (ÅsL) and Ångermanland (Ång) in the north-central part of the country; the Vilhelmina-Junsele area in the interior of the country, and the Örnsköldsvik area at the Bothnian Coast (Fig. 2). Although geographically separated by gaps of about 80-120 km, I have considered them as constituting one continuous transect. The transect runs almost perpendicular to the longitudinal axis of the Scandinavian peninsula, i.e. in a NW-SE direction, and is over 400 km long. In the S-N direction its length is ca. 200 km in Norway, and ca. 100 km in Sweden (see Figs 1-2).

The altitudinal differences along the transect, i.e. in the NW-SE direction, are pronounced. The land rises quickly from the Norwegian west coast to the Swedish border, but then falls off gently to the Swedish east coast. The local topography (height differences) along the transect shows the same tendency, with greatest variation in the west (see Figs 3-4).

## CLIMATE

A comprehensive description of the physiography and climate within the transect is beyond the scope of the present work. Thus only an outline of climatological features is given.

The climatological data (for Figs 6-8) have been supplied by Sveriges meteorologiska

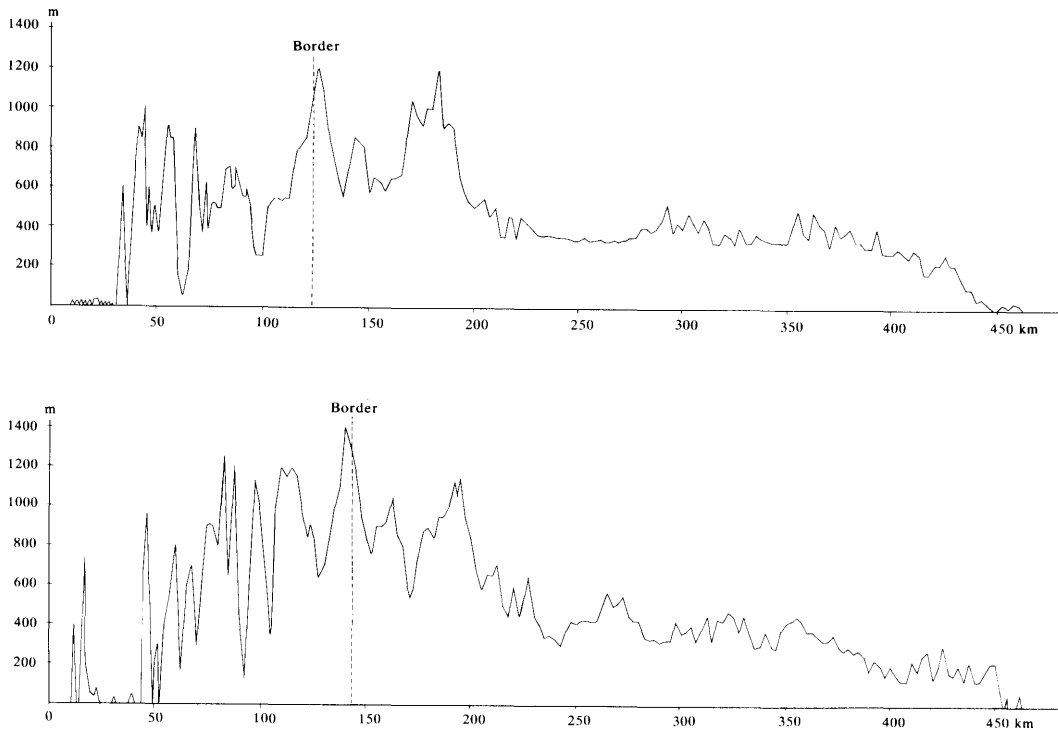


Fig. 3. Landform reliefs along the transect (along the double lines in Fig. 4). The distance between the two reliefs is approximately 30 km.

och hydrologiska institut, Klimatsektionen, and Det norske meteorologiske institutt, Klimaavdelingen.

Papers by Sjörs (1965), Wallén (1968) and Strid (1975) may be consulted for more information about the climate within the investigated area.

*Oceanicity.* The climate varies considerably in the W-E direction, but not so noticeably in the S-N direction (Fig. 5, cf. Wallén 1968). A pronounced gradient from more oceanic to more continental is also evident from Fig. 6, using Kotilainen's (1933) index, applicable over areas not too extensive in the N-S direction (cf. Tuhkanen 1980). The oceanic influence is very strong along the Norwegian west coast with a variation in mean monthly temperatures of 14°C (Skålvær). This influence decreases towards the east; continentality increases to a maximum in the interior of Sweden (the temperature amplitude is 26.5°C at Laxbäcken). It decreases slightly towards the Swedish east coast.

*Temperature.* The mean annual and monthly temperatures at eight meteorological stations (see Fig. 6) along the transect are shown in Fig. 7. The temperature differences between the coastal and inland areas are pronounced, especially during the winter. Due to the effect of the North Atlantic Drift, the highest mean annual temperature was found on the Norwegian west coast (Skålvær). Mean annual temperatures decrease rapidly to the east and is lowest in the interior of Sweden (Klimpfjäll and Laxbäcken). Further to the east, the mean annual temperature slowly increases, but it is lower on the Swedish east coast than on the

Norwegian west coast.

*Precipitation.* The annual precipitation at the eight meteorological stations along the transect is shown in Fig. 6. It is much higher in the Norwegian part of the investigated area than in the Swedish part, but the precipitation is more uniformly distributed over the area east of the Scandes. The amount of precipitation is closely dependent upon height above sea level and distance from the sea (cf. Wallén 1968). The distribution of precipitation during the year is also different in oceanic and continental areas (Fig. 8). Precipitation maxima are reached in autumn and winter in the oceanic areas, in summer in the continental areas.

## VEGETATION REGIONS

Several scientific papers on zonal classification of the vegetation of the Nordic countries have been published (e.g. Hustich 1960, Sjörs 1963, 1967, Ahti et al. 1968, Abrahamsen et al. 1977, 1984). In the Swedish part of the transect, I have followed the zonal classification of Abrahamsen et al. (1984). Due to the complex topography, the regional and zonal subdivision of Norway is complicated. Several, in part widely different, classifications have been proposed (cf. Moen 1987). The most recent and thorough system is that by Dahl et al. (1986), which is taken as a basis for delimitation of vegetation regions within the transect in Norway, except

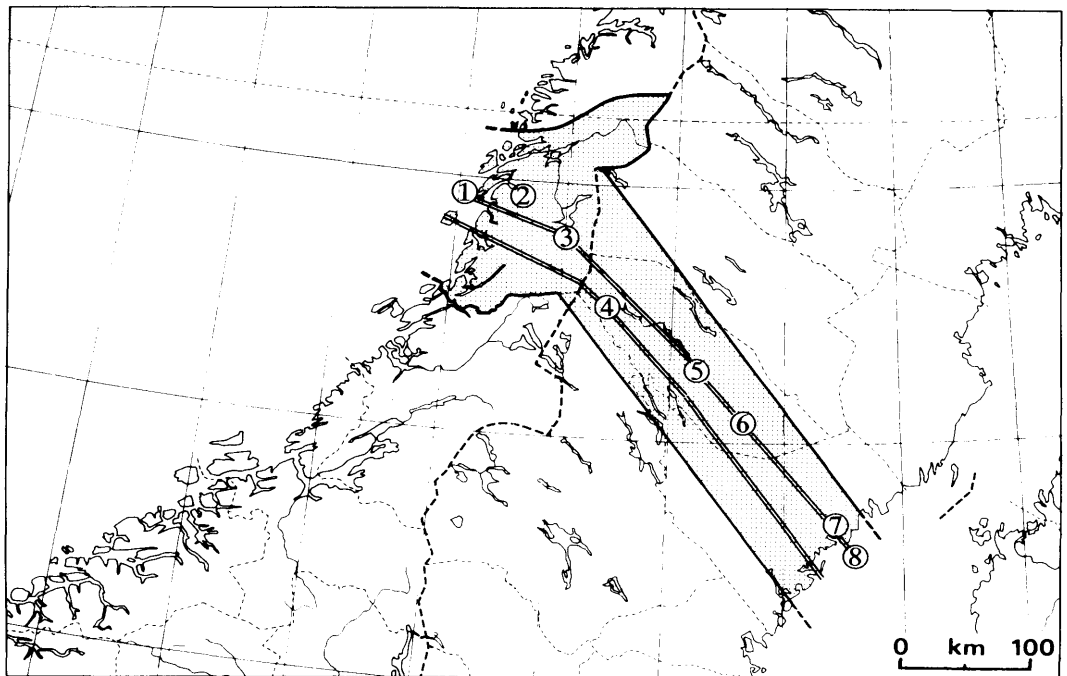


Fig. 4. Eight meteorological stations along the transect. Names and altitudes of the stations are given in Fig. 7. The double lines along the transect indicate the two reliefs (see Fig. 3).

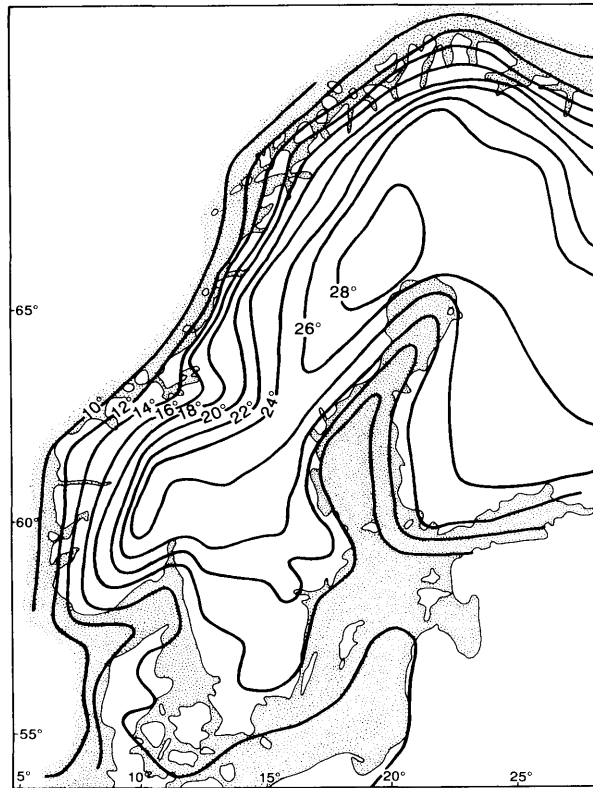


Fig. 5. Continentality of the climate in Norden (Adapted from Wallén 1968: 54).

for some expansion of the southern boreal region on the expense of the middle boreal region as proposed by R. Elven (pers. comm. 1988).

The following vegetation regions have been investigated in the Norwegian part of the transect: southern boreal region (SB) (in this paper also including the coastal section), middle boreal region (MB), northern boreal region (NB), and low alpine region (LA). Two vegetation regions have been investigated in Sweden: the southern boreal region in the Örnsköldsvik area, and the middle boreal region in the Vilhelmina-Junsele area.



## MATERIALS AND METHODS

### MATERIALS

The present work is based on material collected by the author in 1986-1990, and on the material from Troms (Mathiassen 1989). A majority of the material from Troms was re-examined for macro- and microscopical details, new spore drawings, and for additional asci and spore measurements. Most of this material has not previously been published, and it is therefore listed in Appendix I.

Material from several herbaria (B, BG, C, FH, G, H, K, L, LD, M, NY, O, OULU, PAD, RO, S, TRH, TROM, TUR, UME, UPS, W, ZT) has been examined, mostly as an aid for delimiting and identifying some of my specimens, and for additional information on species distribution. The material available in the herbaria was of limited value, as the present investigation was primarily devoted to the pyrenomycetes collected from a fixed number of

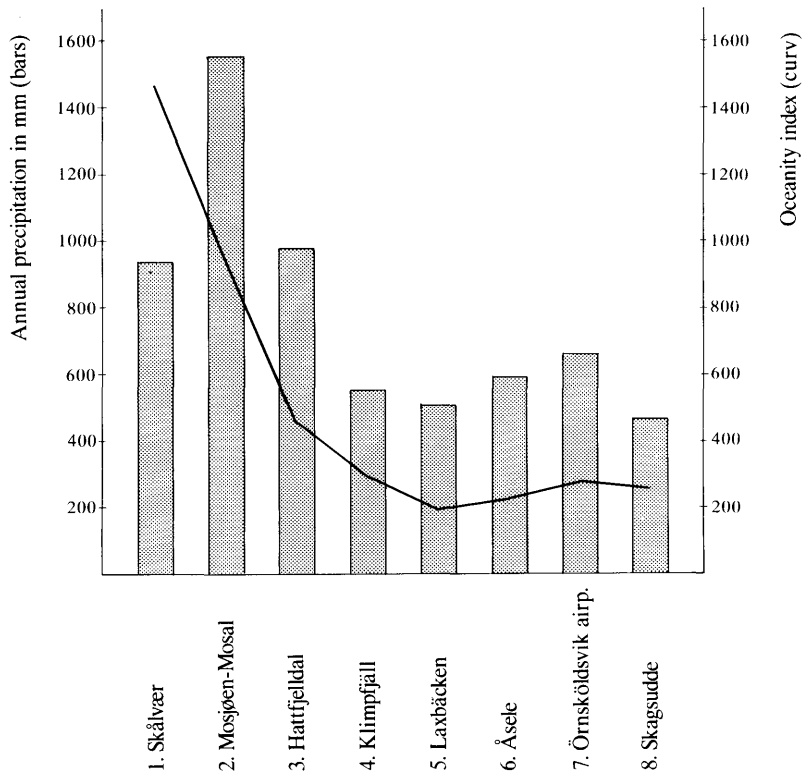


Fig. 6. Mean annual precipitation (in mm) and Kotilainen's index of oceanicity at the eight meteorological stations along the transect. Station altitudes are given in Fig. 7.

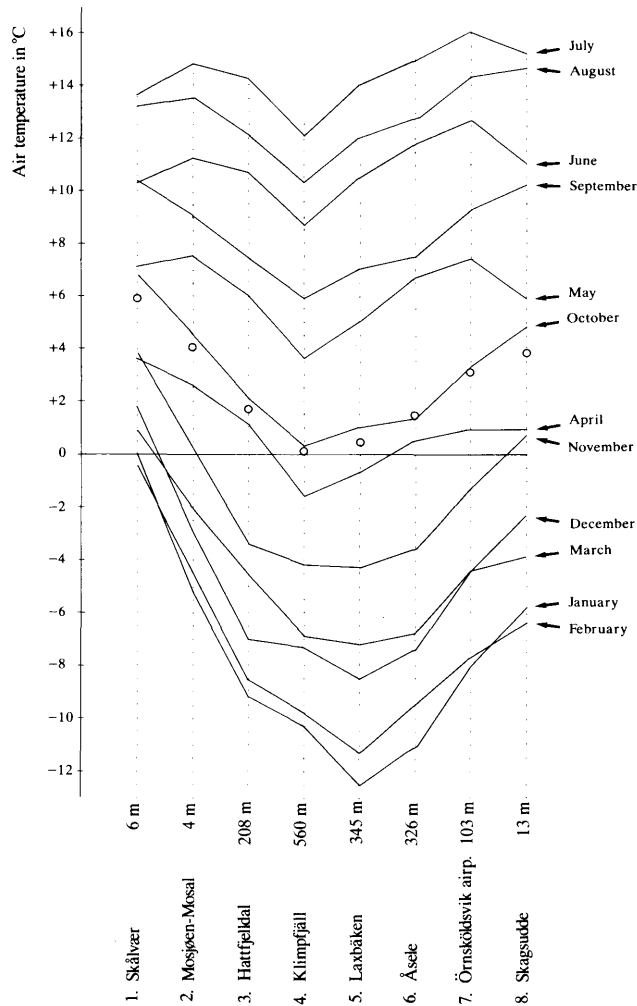


Fig. 7. Mean annual (open circles) and monthly (curves) temperatures at eight meteorological stations along the transect. Station altitudes are also given.

*Salix* species. Furthermore, information on ecology accompanying the herbarium collections on *Salix* is mostly poor or absent.

I have examined all the Norwegian and Swedish samples which are deposited in Danish and Finnish herbaria of the species treated in this paper. Comments on species distribution and frequencies in Finland were based mainly on information from Finnish samples preserved in the different Finnish herbaria. From Swedish herbaria, I have examined all samples from the provinces north of Hälsingland and Härjedalen. In addition, the curators at the Swedish herbaria supplied me with information on the number of samples of each species found south of the above mentioned provinces. The majority of these southern samples were not examined by me. From the Norwegian herbaria, I have, apart from a few samples, only examined

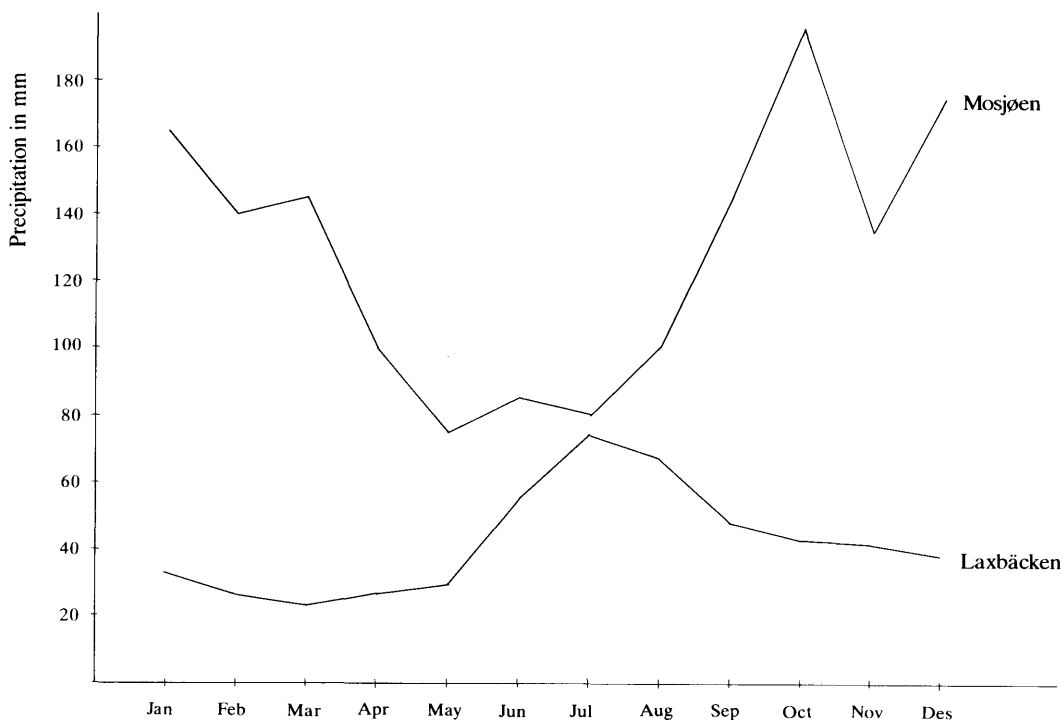


Fig. 8. Mean annual precipitation (in mm) at the meteorological stations Mosjøen-Mosal (oceanic site) and Laxbäcken (continental site).

material not previously seen by me.

A complete list of the material examined, besides types and exsiccatae, is given for each species. I have also included the material from Troms (Mathiassen 1989) for the new species: *Amphisphaerella erikssonii*, *Glyphium grisonense*, *Keissleriella holmiorum*, *Leptosphaeria tollens* and *Saccardoella kanderana*. Except for *Amphisphaerella erikssonii*, distribution maps are only given for the transect area, and the surrounding counties and provinces. All species are mapped. My material is deposited in TROM. Duplicate collections of the more frequent species will gradually be transferred to the above mentioned herbaria. The abbreviations of herbaria follow Holmgren et al. (1990).

Names of Norwegian counties are abbreviated as in Mathiassen (1989). The names of the Swedish provinces mentioned in this paper are abbreviated as follows: Blekinge (Bl), Småland (Sm), Västergötland (Vg), Södermanland (Sdm), Uppland (Upl), Hälsingland (Hls), Medelpad (Mpd), Ångermanland (Ång), Härjedalen (Hrj), Jämtland (Jmt), Västerbotten (Vb), Norrbotten (Nb), Åsele Lappmark (ÅsL), Lycksele Lappmark (LyL), Lule Lappmark (LL), Torne Lappmark (TL).

METHODS

*Choice of Salix species*

To limit the extent of this investigation, primarily on account of the time factor, the number of *Salix* species had to be restricted to a few taxa. Factors important in the selection of the *Salix* species have, among others, been that they were common in two or three of the vegetation regions (see Fig. 9), and that the selected set of species included variation in species richness of the pyrenomycetous flora.

The following taxa of *Salix* were investigated: *S. caprea* L. ssp. *caprea*, and ssp. *sericea* (N.J. Andersson) Flod., *S. glauca* L. ssp. *glauca*, *S. lapponum* L., *S. myrsinifolia* Salisb. ssp. *borealis* (Fr.) Hylander, and ssp. *myrsinifolia*, and *S. pentandra* L.

*Ecology and distribution of the investigated Salix species*

Many authors have described the ecology and/or distribution of *Salix* spp. in Fennoscandia (see e.g. Kallio et al. 1969, and Kallio & Mäkinen 1975). However, a synthesis of published data is necessary for a correct picture of both the ecology and the distribution of *Salix* spp. within the investigation area. This is given in Tab. 2, which is mainly based on data from Hylander (1966), Hultén (1971), Kallio & Mäkinen (1975), and Mathiassen (1989), and supplemented with own field observations.

	I Zonation				II Distribution			III Nutrients			IV Hydrology		
	SB	MB	NB	LA	He	Vi-Ju	Övik	Poor	Inter- mediate	Rich	Wet	Moist	Dry
<i>Salix glauca</i> ssp. <i>glauca</i>	---	---	---	---	---	---	---	---	---	---	---	---	---
<i>S. lapponum</i>	---	---	---	---	---	---	---	---	---	---	---	---	---
<i>S. myrsinifolia</i> ssp. <i>borealis</i>	---	---	---	---	---	---	---	---	---	---	---	---	---
<i>S. myrsinifolia</i> ssp. <i>nigricans</i>	---	---	---	---	---	---	---	---	---	---	---	---	---
<i>S. caprea</i> ssp. <i>caprea</i>	---	---	---	---	---	---	---	---	---	---	---	---	---
<i>S. caprea</i> ssp. <i>sericea</i>	---	---	---	---	---	---	---	---	---	---	---	---	---
<i>S. pentandra</i>	---	---	---	---	---	---	---	---	---	---	---	---	---

Fig. 9. Schematic distribution of *Salix* species along four environmental gradients: I - Vegetation zonation (regional temperature gradient), II - Geographical distribution along the sectional gradient (oceanic - continental), III - The nutrient gradient from nutrient-poor to nutrient-rich sites, IV - The soil moisture gradient from wet to dry. Double line indicates common occurrence, single continuous line indicates less common occurrence, and dotted line indicates infrequent occurrence. Abbreviations: He - Helgeland, Vi-Ju - Vilhelmina - Junsele, Övik - Örnsköldsvik.

### *Classification of substrates*

In my previous study (Mathiassen 1989), the pyrenomycetes clearly preferred different substrate types, and often seemed to occupy specific microhabitats. However, observations on ecology were unfortunately not systematically noted in the field, and the substrate was classified into too few categories to be relevant at this point.

For a better understanding of the substrate ecology and preferences of the different species, I found it necessary to increase the exactness of the field observations in the present investigation. Each collection was therefore accompanied by notes on ecology, viz., *Salix* species, whether collected on stem or twig/branch, and state of substratum (living, injured, dead, decayed). Conditions not always registered in the field were substrate moisture and collecting near ground level.

The collections were also thoroughly studied in the laboratory, using a stereomicroscope. The substrate was classified in different categories, and observations on substrate preferences were noted: W - ascomata growing on wood only, Wb - growing mainly on wood, but some ascomata observed on bark, wb - just as frequent on wood as on bark, Bw - mainly on bark, but some ascomata observed on wood, and B - on bark only.

### *Classification of parasites and saprophytes*

Classification of species into parasites and saprophytes with subgroups is in accordance with definition in Mathiassen (1989: 14), with the addition of hypersaprophytes (sporulating on other fungi or previously colonized substrates).

### *Field methods*

The fieldwork was carried out by the author in 1986-1990, mainly during July and August. A total of 1813 specimens were collected from the 104 investigated localities (see Fig. 2), and the number of samples from each locality varied from 2 to 111. The material was collected from near ground level and up to approximately 2.5 m above the ground, and each collection was accompanied by notes on ecology. Random bark samples from each tree were not collected systematically. As correct identification of the substrate to species (and subspecies) was important, unidentifiable substrates like rotten stems or stumps, and dead, fallen twigs were excluded. Two to five hours were spent at each locality.

Not all the selected *Salix* species were present in all vegetation regions. Their distribution in relation to the different vegetation regions are given in Fig. 9.

To be able to carry out the fieldwork as efficiently as possible, it was necessary to treat the subspecies *Salix caprea* ssp. *caprea*, and ssp. *sericea*, and *S. myrsinifolia* ssp. *borealis*, and ssp. *myrsinifolia* collectively as *S. caprea* agg. and *S. myrsinifolia* agg. Ten different trees of each *Salix* species or aggregate were investigated in each of the different vegetation regions in Norway, and in the two regions in Sweden. The trees were selected subjectively in order to reduce within and between region variability in tree shape, size and age as much as possible. As a rule, only trees with a lot of low branches, preferably also with some dead twigs, were investigated.

Usually only a few trees were examined at each locality. The localities were distributed as evenly as possible throughout each of the vegetation regions. Some of the localities were

near the border area between two adjacent vegetation regions. Due to the relatively fine scale (1:1.5 million) of the map in Dahl et al. (1986), regional classification in the transitional areas was often difficult. Field observations and the topographic maps (scale 1:50 000 and 1:100 000) were used in such cases. I have also discussed the location of most of my localities in Norway and Sweden with R. Elven, and in the two Swedish areas with J. Mascher (Örnsköldsvik). Due to shortage of time, the NB and LA regions in Sweden were not investigated.

#### *Data sets*

The material consisted of a total of 27 species occurring on 217 trees, including a total of 851 observations, that is an average of 3.92 species per tree. A reduced data set was derived by excluding trees with 1 or 2 pyrenomycete species only. This reduced data set included all 27 species, 169 trees, 732 observations; an average of 4.33 species per tree.

#### *Laboratory methods and techniques*

In most cases the laboratory work was performed according to the methods described by Mathiassen (1989). However, in the present work the material was examined using a Zeiss Standard compound microscope with phase contrast equipment, and the material was also, in addition to water, mounted in lactic acid for microscopic examination. Sodium hypochlorite (NaClO) has now turned out to be a valuable agent in studies of ascospore morphology (Eriksson 1989), and according to him, NaClO deserves a place among Melzer's reagent, cotton blue, Congo red, KOH, etc. on the microscope desk of every ascomycologist. Unfortunately, I became aware of this new technique too late to make use of it in the present investigation.

An "illusory" accuracy of 0.1  $\mu\text{m}$  was used in measuring spore and ascus widths. Ascus length was measured to the nearest 1  $\mu\text{m}$ . Spore and ascus measurements are given with the 95% confidence limits. The minimum and maximum values are given in parentheses. The mean values are also given, but the mean Q values are given for the spores only. All values were calculated from the individual measurements of the whole material.

The overall spore sizes from Troms (Mathiassen 1989) and the present investigation are compared with each other. For some species, comparisons of spore sizes have also been carried out between Troms and SB in Norway, and between the regions SB and LA in Norway, and MB in Sweden (see below).

Mostly due to scanty and poor material, *Kirschsteiniothelia aethiops* and *Lophiostoma macrostomoides* were not satisfactorily illustrated by Mathiassen (1989). Drawings of both asci and spores are therefore given here. The new species are thoroughly described and illustrated. Shorter and simpler descriptions, with new measurements of asci and spores, are given for the other species. The natural variation in spore size and shape was depicted by selection of several spores from different regions. The species are described in alphabetical order, but a systematic survey of the investigated taxa is given on pp. 154-156. The term saprophyte was frequently used by Mathiassen (1989), and is therefore also used here, despite saprobe being preferable to saprophyte (cf. Hawksworth et al. 1983: 337). The morphological terms follow Hawksworth et al. (1983) and Snell & Dick (1971).

The hamathecium (cf. Eriksson 1981, and Hawksworth et al. 1983) was carefully studied

for all species, and among the bitunicates, I have distinguished between paraphysoids (trabecular pseudoparaphyses) and pseudoparaphyses (cellular pseudoparaphyses). The determination of the hamathecium was always based on its uniform structure above the asci. The term "pseudoparaphyses" is more appropriate than "cellular pseudoparaphyses", because the trabecular pseudoparaphyses are actually also cellular, while the lumen is often extremely narrow (cf. Eriksson & Hawksworth 1987b). Chesters (1938: 142) described the filaments in the ostiolar canal of *Melanomma fuscidulum* as a network of trabecular filaments, and pointed out that it was never lined with periphyses. I have not distinguished between different types of hyphae or filaments in the ostiolar canal, and always named them periphyses.

The photographs were taken using a Zeiss Standard compound microscope equipped with a Zeiss MC 63 photomicroscopic camera unit and Kodak Ektachrome 50 and 64 Professional film (EPY-50 & EPY-64T). Only the examined types have been photographed.

Positions of the investigated localities are given by reference to the UTM reference grid (to the nearest 1000 meters) using topographic maps (scale in Norway, 1:50 000; in Sweden, 1:50 000 and 1:100 000). Altitudes were estimated using the contour-lines on the topographic maps, and measured in the field using a Thommen 2000 Altimeter. The methods for giving standard UTM references are different in Norway and Sweden, and I have followed the methods as indicated on the Norwegian and Swedish topographic maps, respectively.

### *Statistical methods*

#### Relationships between tree number and number of pyrenomycete species

In order to investigate the number of trees necessary to yield a sufficient representation of the pyrenomycete flora on *Salix* for each section/region/tree taxon combination, a set of twenty trees of *S. myrsinifolia* agg. from the SB region at Helgeland, Norway was selected. Ten sequences of the trees were obtained by random permutations. For each sequence, the total number of species were determined for the  $n$  first trees,  $n = 1, \dots, 20$ . For each value of  $n$ , the mean number of species as well as the minimum and maximum values over the ten sequences, were noted.

#### Variation in spore and ascus characteristics

For each species, frequency diagrams for the measured spore lengths, widths and quotients (the ratio length/width) were drawn using SPSS/PC Graphics (Anonymous 1986). For the pairwise comparisons of different subsamples (the groups A-E of Tab. 9), with respect to geographical variation in spore and ascus measurements, data sets were first tested for normality using the SPSS/PC procedure NPAR TEST (Norusis 1984). As most data were not normally distributed, pairwise comparisons were made using the non-parametric Mann-Whitney test (Conover 1980).

For each species, the minimum, maximum, mean, standard deviation, 2.5-percentile and 97.5-percentile are reported, based on all the material included in this study. The only exception is *Melanomma pulvis-pyrius*, in which the spores from MB-Sweden were judged to be too young for proper treatment. The statistics for each species, as well as the mean and standard deviation for each geographical group, were calculated using the SPSS/PC procedure FREQUENCIES (Norusis 1984).

### *Ordination*

Indirect gradient analysis or ordination was performed by detrended correspondence analysis, DCA (Hill 1979, Hill & Gauch 1980, ter Braak & Prentice 1988), in order to elucidate the floristic gradient relationships of the data set.

The reduced data set was ordinated by CANOCO, version 2.1 (ter Braak 1987), using standard options except that detrending by segments was used as recommended by Knox (1989) and Eilertsen (1991). Downweighting of rare species (Hill 1979) was used. The 40 trees each with 2 species and 9 trees each with one species were passively included in the ordination, thus they were placed in the ordination by weighted averaging of scores for the species they contain, as were the other trees, but without influencing the ordination axes.

### *Explanatory variables*

Ideally, the explanatory, independent variables used for interpretation of indirect gradient analysis results should be measurements of environmental (including climatic) parameters, made in connection with each object (here tree). This has not been practically possible. Instead the climatic variables are represented by explanatory variables as follows:

(1) Section (S) was scored on a two-point scale; 0 - oceanic (Norway), 1 - continental (Sweden).

(2) Region (R) was scored on a four-point scale; 0 - SB (southern boreal), 1 - MB (middle boreal), 2 - NB (northern boreal), 3 - LA (low-alpine).

(3) Substrate taxon (T) was recorded as one of five dummy variables, in the following referred to as C, G, L, M, and P respectively, according to the first letters in the specific epithets of the salices.

### *Interpretation*

For each of the 22 combinations of section (S), region (R) and *Salix* taxon (T), hereon referred to as SRT combinations, the mean, standard deviation, maximum and minimum score along each of the first four DCA axes were calculated. Furthermore, mean scores for each *Salix* taxon was calculated.

Correlations between explanatory variables and axes were calculated as product-moment correlation coefficients (Sokal & Rohlf 1981). The directions of maximum change for these variables in the ordination diagrams were depicted as vectors from the centroid, based on the biplot scores (cf. ter Braak 1987).

### *Systematic classification*

Much has been done on the classification of ascomycetes during the last ten years. The most important contributions have been those of Barr (1983, 1987, 1990a, 1990b, 1990c), Eriksson (1981, 1982c, 1982d, 1983, 1984) and Eriksson & Hawksworth (1985, 1986a, 1986b, 1986c, 1987a, 1987b, 1987c, 1987d, 1988a, 1988b, 1989, 1990a, 1990b, 1990c, 1990d).

Barr's (Barr 1983, 1987, 1990a, 1990b, 1990c) supraordinal classification is accepted by many mycologists, but not by others. The most important criteria for the classification of pyrenomycetes in higher taxa are those of the centrum, the absence or presence of a hamathecium, and the types of hamathecial tissues (cf. Barr 1987). No supraordinal taxa are



accepted in the "Systema Ascomycetum"-classification of Eriksson and Eriksson & Hawksworth. Although there are different views concerning the arrangement of families and orders, the most important difference between these two classifications is that mentioned above.

Classification of ascomycetes at supraordinal levels is extremely difficult, but new techniques (molecular and DNA studies) may provide us with new and interesting data of vital importance for the classification of ascomycetes in higher taxa.

The present paper is, however, not devoted to classification, but rather focusing on the species. The hamathecium was studied for all species, but as my microscopical observations, particularly of the Lophiostomataceae, agreed best with the "Systema Ascomycetum"-classification, I have followed Eriksson & Hawksworth (1990d) for classification at suprageneric rank.

Nannfeldt (1932) and Luttrell's (1951) impressive review on classification and taxonomy has provided a firm basis for the studies and development of these two classification systems (cf. Eriksson 1984, Barr 1990c).

### *Nomenclature*

The nomenclature of the vascular plants follows Lid (1985) and Tutin et al. (1964, 1968), except for the following subspecies: *Salix caprea* ssp. *caprea*, and ssp. *sericea*, *S. glauca* ssp. *glauca*, *S. hastata* ssp. *hastata*, *S. lanata* ssp. *lanata*, and ssp. *glandulifera*, *S. myrsinifolia* ssp. *borealis*, and ssp. *myrsinifolia* (cf. also p. 18). The nomenclature of the above mentioned subspecies follows that which, for the time being, seems to be accepted in Flora Nordica (in prep.).

The nomenclature of the fungi follows the principles, rules and recommendations in the latest edition of the Code (Greuter 1988). Works published after 1992 have not influenced the taxonomic treatment of the fungi.

### *Abbreviations and legends*

The following abbreviations have been used, in addition to those used for the herbaria, counties and provinces:

a.s.l.	= above sea level
GM	= Geir Mathiassen
in litt.	= in litteris; in letter
in sched.	= in schedula; on the label
M. r.	= Melzer's reagent
n. v.	= non vidi; not seen
pr.	= prope; near by
s. dat.	= sine dato; no date
s. loc.	= sine loco; no locality
s. l.	= sensu lato; in the broad sense
s. nom. coll.	= sine nomine collectoris; no collectors name
ssp.	= subspecies
v. v.	= vidi vivam; seen alive

Legends used on the distribution maps

- Locality investigated by me but with no record of species of current interest
- Locality in which the species is recorded in the present investigation
- ★ Herbarium collection; examined by me
- Literature reference

## RESULTS

### RELATIONSHIPS BETWEEN TREE NUMBER AND NUMBER OF PYRENOAMYCETE SPECIES

Twenty-three pyrenomycete species were found on the 20 *Salix myrsinifolia* agg. trees, at an average number of 5.9 species per tree. Fig. 10 shows the total species number as a function of number of trees. The curve is relatively smooth, flattening from about 13 trees. For 10 trees, the average number of species is 19.7, ranging from 15 to 23.

### SUBSTRATE ECOLOGY AND HOST SPECIFICITY

#### *Distribution of substrates*

The pyrenomycetes preferred particular vegetation regions and hosts, but they also showed a marked preference for different substrate types (see below). The relationships between ecological substrate-variables and vegetation regions are given in Tab. 1, while Tab. 2 shows

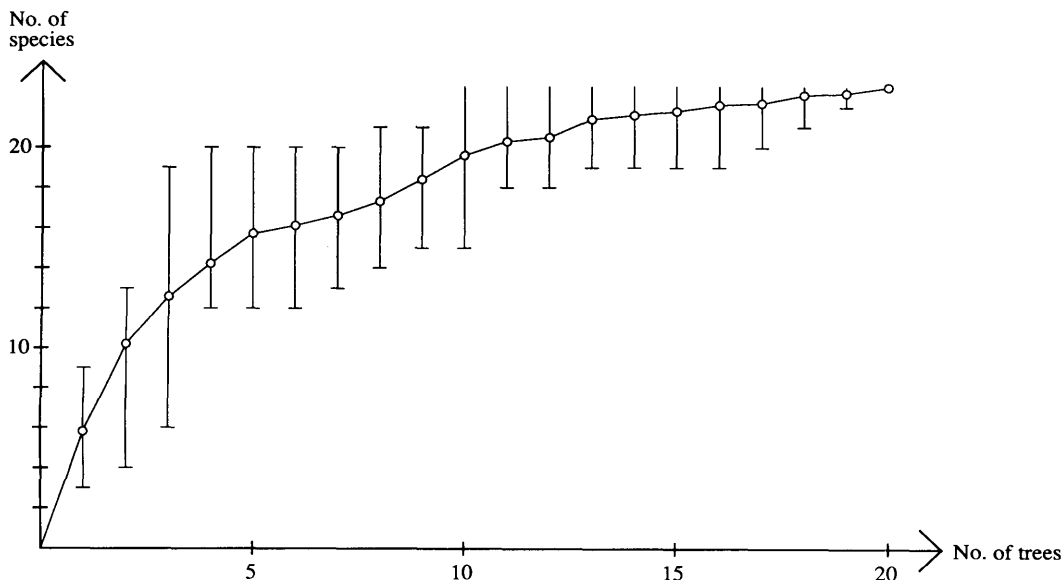


Fig. 10. Number of pyrenomycete species as a function of number of trees, based on 20 *Salix myrsinifolia* agg. trees from SB, Helgeland. Dots indicate the average of ten randomly selected subsets of the size given. Vertical bars indicate range (minimum and maximum).

Tab. 1. Distribution of ecological substrate-variables on the different vegetation regions in Norway and Sweden. Special substrates refers to conditions not always registered in the field. Frequencies are calculated as percentage of the total number of collections for each substrate (Frequency I) and as percentage of the total number of collections for each vegetation region (Frequency II). The five categories along the wood (W) - bark (B) gradient are defined on p. 19.

Substrate category		n	Frequency I				Frequency II							
			Norway		Sweden		Norway		Sweden					
			SB	MB	NB	LA	SB	MB	SB	MB	NB	LA	SB	MB
Twig/branch	W	674	21.5	29.7	14.4	5.3	8.0	21.1	38.3	43.5	34.0	29.5	23.9	41.5
	Wb	231	22.1	32.5	14.3	1.7	10.8	18.6	13.5	16.3	11.6	3.3	11.1	12.6
	wb	157	42.1	20.4	7.0	3.8	8.9	17.8	17.5	7.0	3.8	4.9	6.2	8.2
	Bw	31	51.6	3.2	6.5	.	22.6	16.1	4.2	0.2	0.7	.	3.1	1.5
	B	420	17.6	23.6	17.6	12.1	17.9	11.2	19.6	21.5	25.9	41.8	33.6	13.7
Stem	W	134	14.2	19.4	21.6	6.0	14.2	24.6	5.0	5.7	10.2	6.6	8.4	9.6
	Wb	64	6.2	14.1	28.1	14.1	10.9	26.6	.	2.0	6.3	7.4	3.1	5.0
	wb	8	12.5	37.5	12.5	12.5	12.5	12.5	0.3	0.6	0.4	0.8	0.4	0.4
	Bw	3	.	33.3	33.3	.	33.3	.	1.1	0.2	0.4	.	0.4	.
	B	91	2.1	15.4	20.9	7.7	25.3	28.6	0.5	3.0	6.7	5.7	9.8	7.6
Substrate age	New	76	10.5	30.3	28.9	21.1	2.6	6.6	2.1	5.0	7.7	13.1	0.9	1.5
	Old	1546	22.3	25.1	15.1	6.4	12.8	18.3	91.3	84.3	82.1	80.3	87.6	82.7
	Decayed	191	13.1	25.6	15.2	4.2	13.6	28.3	6.6	10.7	10.2	6.6	11.5	15.8
Substrate status	Living	54	3.7	37.0	22.2	27.8	.	9.3	0.5	4.3	4.2	12.3	.	1.5
	Dead	1759	21.4	25.0	15.5	6.1	12.8	19.2	99.5	95.7	95.8	87.7	100.0	98.5
Special substrates	Very dry	63	12.7	36.5	34.9	1.6	4.8	9.5	2.1	5.0	7.7	0.8	1.3	1.8
	Near ground	226	18.2	29.7	20.8	11.9	3.5	15.9	10.8	13.7	16.5	22.1	3.5	10.5
n									378	460	285	122	226	342

the relationships between ecological substrate-variables and the different *Salix* species.

There were clear correlations between the distribution of ecological substrate-variables and the distribution of pyrenomycetes on hosts and in regions. Such information is very useful for a thorough understanding of the different factors affecting species distributions.

#### *Distribution of pyrenomycetes on hosts*

The treated pyrenomycete species were found on all the examined *Salix* species, and on 217 of the 220 examined trees. *Salix caprea* agg. and *S. myrsinifolia* agg. were the preferred hosts, with the latter as the quantitatively most important host. Considerably fewer samples were found on *S. glauca* ssp. *glauca*, *S. lapponum* and *S. pentandra*, but the number of samples on

Tab. 2. Distribution of ecological substrate-variables on the different *Salix* species: myrs - *Salix myrsinifolia* ssp. *borealis* & ssp. *myrsinifolia*, capr - *S. caprea* ssp. *caprea* & ssp. *sericea*, pent = *S. pentandra*, lapp - *S. lapponum*, glau - *S. glauca* ssp. *glauca*. Special substrates refers to conditions not always registered in the field. Frequencies are calculated as percentage of the total number of collections for each substrate (Frequency I) and as percentage of the total number of collections for each *Salix* species (Frequency II). The five categories along the wood (W) - bark (B) gradient are defined on p. 19.

Substrate category	n	Frequency I					Frequency II					
		myrs	capr	pent	lapp	glau	myrs	capr	pent	lapp	glau	
Twig/branch	W	674	26.6	30.7	26.1	6.7	9.9	33.1	45.7	59.7	17.1	25.7
	Wb	231	32.5	24.7	11.7	18.6	12.5	13.8	12.6	9.2	16.4	11.1
	wb	157	37.6	37.6	11.4	5.1	8.3	10.9	13.0	6.1	3.0	5.0
	Bw	31	29.1	61.3	3.2	3.2	3.2	1.7	4.2	0.3	0.4	0.4
	B	420	26.9	19.5	7.9	25.5	20.2	20.9	18.1	11.2	40.7	32.5
Stem	W	134	44.0	15.7	17.9	8.2	14.2	10.9	4.7	8.1	4.2	7.3
	Wb	64	32.8	3.1	4.7	31.3	28.1	3.9	0.4	1.0	7.6	6.9
	wb	8	37.5	.	12.5	.	50.0	0.5	.	0.3	.	1.5
	Bw	3	33.3	33.3	.	.	33.3	0.2	0.2	.	.	0.4
	B	91	24.2	5.5	13.2	30.7	26.4	4.1	1.1	4.1	10.6	9.2
Substrate age	New	76	10.6	2.6	1.3	51.3	34.2	1.5	0.4	0.3	14.8	10.0
	Old	1546	29.3	25.1	18.1	13.8	13.7	83.7	85.7	94.6	81.4	81.2
	Decayed	191	41.9	33.0	7.9	5.2	12.0	14.8	13.9	5.1	3.8	8.8
Substrate status	Living	54	1.9	1.9	1.9	53.6	40.7	0.2	0.2	0.3	11.0	8.4
	Dead	1759	30.7	25.7	16.7	13.3	13.6	99.8	99.8	99.7	89.0	91.6
Special substrates	Very dry	63	25.4	52.4	1.6	4.7	15.9	2.9	7.3	0.3	1.1	3.8
	Near ground	226	25.2	23.4	12.4	16.4	22.6	10.5	11.7	9.5	14.1	19.5
n								541	453	295	263	261

each of these species were similar (Tab. 3).

*Cryptosphaeria subcutanea* and *Rhynchostoma minutum* were restricted to *Salix myrsinifolia* agg., while *Enchnoa infernalis*, *Melanomma fuscidulum* and *Melanopsamma pomiformis* also showed a marked preference for this *Salix* group. Only *Lophiotrema nucula* preferred *S. caprea* agg., while *Kirschsteiniothelia aethiops* was restricted to this group.

The same tendencies of host preferences were not particularly pronounced among the other *Salix* species. *Glyphium grisonense* and *Lophiostoma compressum* were frequent on *S. pentandra*, while *Arthopyrenia lapponina* was very frequent on both *S. glauca* ssp. *glauca* and *S. lapponum*. *Amphisphaerella erikssonii* was not found in the present investigation, but it does

Tab. 3. Distribution of pyrenomycetes on the different *Salix* species: myrs - *Salix myrsinifolia* ssp. *borealis* & ssp. *myrsinifolia*, capr - *S. caprea* ssp. *caprea* & ssp. *sericea*, pent = *S. pentandra*, lapp - *S. lapponum*, glau - *S. glauca* ssp. *glauca*. Frequencies are calculated as percentage of the total number of collections for each pyrenomycete species (Frequency I) and as percentage of the total number of collections for each *Salix* species (Frequency II).

Substrate category	n	Frequency I					Frequency II				
		myrs	capr	pent	lapp	glau	myrs	capr	pent	lapp	glau
<i>Cryptosphaeria subcutanea</i>	6	100.0	.	.	.	.	1.1	.	.	.	.
<i>Rhynchostoma minutum</i>	1	100.0	.	.	.	.	0.2	.	.	.	.
<i>Kirschsteiniothelia aethiops</i>	2	100.0	.	.	.	.	0.4	.	.	.	.
<i>Bertia moriformis</i> var. <i>moriformis</i>	5	60.0	40.0	.	.	.	0.7	0.7	.	.	.
<i>Diatrype bullata</i>	57	50.8	21.1	28.1	.	.	5.3	2.6	5.4	.	.
<i>Hypoxyylon mammatum</i>	31	41.9	19.4	38.7	.	.	2.4	1.3	4.1	.	.
<i>Glyphium grisonense</i>	38	28.9	23.7	47.4	.	.	2.0	2.0	6.1	.	.
<i>Hysterographium elongatum</i>	73	16.4	42.5	41.1	.	.	2.2	6.9	10.1	.	.
<i>Enchnoa infernalis</i>	10	60.0	20.0	.	20.0	.	1.1	0.4	.	0.8	.
<i>Melanomma fusciculatum</i>	16	56.2	12.5	25.0	6.3	.	1.7	0.4	1.4	0.4	.
<i>Lophiotrema nucula</i>	91	20.9	65.9	12.1	.	1.1	3.5	13.3	3.7	.	0.4
<i>Keisslerella holmiorum</i>	127	46.5	33.0	17.3	0.8	2.4	10.9	9.3	7.5	0.4	1.2
<i>Leptosphaeria tollens</i>	46	45.7	10.9	21.7	4.3	17.4	3.9	1.1	3.4	0.8	3.1
<i>Lophiostoma curtum</i>	104	43.3	11.5	22.1	12.5	10.6	8.3	2.6	7.8	4.9	4.2
<i>Lophiostoma macrostomoides</i>	31	48.4	3.2	16.1	25.8	6.5	2.8	0.2	1.7	3.0	0.8
<i>Lophiostoma quadrinucleatum</i>	57	36.9	19.3	10.5	10.5	22.8	3.9	2.4	2.0	2.3	4.9
<i>Rebentischia massalongii</i>	135	31.1	32.6	6.7	14.1	15.5	7.8	9.7	3.1	7.2	8.1
<i>Anthostomella melanotes</i>	252	25.4	37.7	13.9	8.3	14.7	11.8	21.0	11.9	8.0	14.1
<i>Cryptodiaporthe salicella</i>	20	35.0	15.0	10.0	35.0	5.0	1.3	0.7	0.7	2.7	0.4
<i>Capronia collapsa</i>	109	18.3	47.7	20.2	3.7	10.1	3.7	11.5	7.5	1.5	4.2
<i>Melanomma pulvis-pyrus</i>	157	32.5	10.2	4.5	33.7	19.1	9.4	3.5	2.3	20.1	11.4
<i>Lophiostoma compressum</i>	147	21.1	28.6	39.4	3.4	7.5	5.7	9.3	19.6	1.9	4.2
<i>Saccardoella kanderana</i>	17	17.6	17.6	17.6	11.8	35.4	0.6	0.7	1.0	0.8	2.3
<i>Hypoxyylon macrosporum</i>	63	44.5	.	.	22.2	33.3	5.2	.	.	5.3	8.1
<i>Arthopyrenia lapponina</i>	202	6.9	.	.	52.0	41.1	2.6	.	.	39.9	31.8
<i>Melanopsamma pomiformis</i>	13	92.3	.	.	.	7.7	2.2	.	.	.	0.4
<i>Lophiotrema boreale</i>	3	66.7	.	.	.	33.3	0.4	.	.	.	0.4
n							541	453	295	263	261

show preference for *S. lanata* ssp. *lanata* (cf. p. 65).

The other pyrenomycete species did not show any particular preferences for host *Salix* species, but *Diatrype bullata*, *Leptosphaeria tollens*, *Lophiostoma curtum* and *L. quadrinucleatum* were frequent on *S. myrsinifolia* agg., while *Capronia collapsa* was frequent on *S. caprea* agg. The following species were rare within the transect area; *Bertia moriformis* var. *moriformis*, *Cryptosphaeria subcutanea*, *Kirschsteiniothelia aethiops*, *Lophiotrema boreale* and *Rhynchostoma minutum*.

A few species seemed to have preferences for large trees, namely *Bertia moriformis* var.

*moriformis*, *Diatrype bullata*, *Hypoxylon mammatum* and *Hysterographium elongatum*.

There were no evident differences in main hosts, except perhaps for *Lophiotrema nucula*, between Troms (Mathiassen 1989) and central Scandinavia, but several species were found to be considerably more frequent on *Salix caprea* agg. and on *S. pentandra* in central Scandinavia than in Troms (Mathiassen 1989). This was the case for *Anthostomella melanotes*, *Capronia collapsa*, *Diatrype bullata*, *Glyphium grisonense*, *Hypoxylon mammatum*, *Hysterographium elongatum*, *Keissleriella holmiorum*, *Lophiostoma compressum*, *L. curtum*, *Lophiotrema nucula* and *Rebentischia massalongii*.

*Amphisphaerella erikssonii*, *Cryptodiaporthe salicella*, *Cryptosphaeria subcutanea*, *Keissleriella holmiorum*, *Leptosphaeria tollens* and *Saccardoella kanderana* seemed to be restricted to *Salix* only.

#### *Distribution of pyrenomycetes on substrates*

The examined pyrenomycete species clearly preferred different substrate types, and often occupied specific microhabitats (Tabs 4-5).

Lignicolous species were *Kirschsteiniothelia aethiops* and *Rhynchostoma minutum*. Predominantly lignicolous species were *Bertia moriformis* var. *moriformis*, *Capronia collapsa*, *Glyphium grisonense*, *Hypoxylon macrosporum*, *Hysterographium elongatum*, *Lophiotrema boreale*, *L. nucula* and *Melanopsamma pomiformis*.

Some species preferred naked wood, but they were also often found on other substrate categories. This was the case for *Amphisphaerella erikssonii*, *Anthostomella melanotes*, *Keissleriella holmiorum*, *Leptosphaeria tollens*, *Lophiostoma compressum*, *L. curtum*, *L. macrostomoides*, *L. quadrinucleatum*, *Melanomma fuscidulum*, *M. pulvis-pyrius* and *Saccardoella kanderana*.

Corticulous species were *Arthopyrenia lapponina*, *Cryptodiaporthe salicella*, *Cryptosphaeria subcutanea*, *Diatrype bullata*, *Enchnoa infernalis*, *Hypoxylon mammatum* and *Rebentischia massalongii*.

None of the treated species were found sporulating on ascomata or stromata of other pyrenomycetes. *Capronia nigerrima* is typically saprophytic on stromata of other pyrenomycetes, but it was not found in the present investigation.

*Cryptodiaporthe salicella*, *Enchnoa infernalis* and *Rhynchostoma minutum* were exclusively found on twigs. Some species were mainly, or most frequently, found on twigs. This was the case for, e.g. *Anthostomella melanotes*, *Glyphium grisonense*, *Hysterographium elongatum*, *Lophiostoma quadrinucleatum* and *Melanopsamma pomiformis*.

Some species, including, e.g. *Lophiostoma curtum*, *Melanomma fuscidulum* and *M. pulvis-pyrius* grew on both twigs and trunks, and showed an equal preference for both substrates. No species were exclusively found on stems, but *Hypoxylon mammatum* occurred most frequently on this substrate.

Several species were frequently found near ground level, e.g. *Bertia moriformis* var. *moriformis*, *Kirschsteiniothelia aethiops*, *Hypoxylon macrosporum*, *Lophiostoma macrostomoides* and *Saccardoella kanderana*, thus indicating a preference for moist conditions. On the other hand, a few species, including *Cryptodiaporthe salicella*, *Diatrype bullata* and *H. mammatum* often occurred relatively high above the ground.

*Bertia moriformis* var. *moriformis*, *Diatrype bullata*, *Hypoxylon mammatum* and *Hysterographium elongatum* were most frequently found on large trees and thick twigs, and the diameter of the substrate (stem, twig) seemed to be important for these species only.

Tab. 4. Distribution of pyrenomycetes on ecological substrate-variables. Frequencies are calculated as percentage of the total number of collections for each pyrenomycete species. The three sets of substrate categories: Main set - the five categories along the wood (W) - bark (B) gradient (defined on p. 19), for each of twig/branch and stem. SA - substrate age; N - new, O - old, D - decayed. SSt - substrate status; L - living, D - dead. SpS refers to special substrates (conditions not always registered in the field); LS - living stem or twig/branch, VD - very dry, NG - near the ground.

	n	Main set										SA			SSt		SpS		
		Twig/branch					Stem					N	O	D	L	D	LS	VD	NG
		W	Wb	wb	Bw	B	W	Wb	wb	Bw	B								
<i>Rhynchostoma minutum</i>	1	100.0	.	.	.	.	.	.	.	.	.	.	.	100.0	.	100.0	.	.	.
<i>Kirschsteiniothelia aethiops</i>	2	50.0	.	.	.	.	50.0	.	.	.	.	.	.	100.0	.	100.0	.	.	100.0
<i>Melanopsamma pomiformis</i>	13	84.6	7.7	.	.	.	7.7	.	.	.	.	.	69.2	30.8	.	100.0	7.7	.	.
<i>Hypoxylon macrosporium</i>	63	55.6	9.5	.	.	.	22.2	11.1	1.6	.	.	.	84.1	15.9	.	100.0	1.6	9.5	34.9
<i>Bertia moriformis</i> var. <i>moriformis</i>	5	40.0	20.0	.	.	.	40.0	.	.	.	.	.	80.0	20.0	.	100.0	.	.	100.0
<i>Lophiotrema boreale</i>	3	.	.	33.3	.	.	66.7	.	.	.	.	.	.	100.0	.	100.0	.	.	.
<i>Hysterographium elongatum</i>	73	89.0	2.1	1.4	.	.	5.5	.	.	.	.	.	97.3	2.7	.	100.0	.	17.8	5.5
<i>Capronia collapsa</i>	109	75.2	5.5	9.2	.	0.9	8.3	0.9	.	.	.	.	82.6	17.4	.	100.0	1.8	0.9	18.3
<i>Glyphium grisonense</i>	38	71.1	7.9	15.8	.	.	5.2	.	.	.	.	.	97.4	2.6	.	100.0	2.6	.	10.5
<i>Lophiotrema nucula</i>	91	54.9	22.0	12.1	.	.	7.7	2.2	.	.	1.1	.	68.1	31.9	.	100.0	.	5.5	20.9
<i>Saccardoella kanderana</i>	17	41.3	17.6	5.9	.	17.6	17.6	.	.	.	.	.	76.5	23.5	.	100.0	5.9	.	35.3
<i>Lophiostoma macrostomoides</i>	31	29.0	25.8	19.4	.	.	19.4	6.4	.	.	.	.	77.4	22.6	.	100.0	3.2	.	38.7
<i>Melanomma fuscidulum</i>	16	25.0	12.5	18.8	.	12.5	31.2	.	.	.	.	6.3	81.2	12.5	.	100.0	18.8	.	.
<i>Lophiostoma curtum</i>	104	15.4	25.0	7.7	1.0	.	28.8	17.3	1.9	2.9	.	.	73.1	26.9	.	100.0	11.5	1.0	16.3
<i>Anthostomella melanotes</i>	252	75.8	13.5	2.0	0.4	1.2	7.1	.	.	.	.	0.4	88.9	10.7	.	100.0	6.7	7.1	7.9
<i>Lophiostoma quadrinucleatum</i>	57	49.1	21.0	17.5	1.8	5.3	5.3	.	.	.	.	1.8	91.2	7.0	.	100.0	7.0	1.8	7.0
<i>Keisslerella holmiorum</i>	127	44.9	17.3	18.1	3.9	10.2	4.0	0.8	.	.	0.8	0.8	96.1	3.1	.	100.0	6.3	3.1	3.1
<i>Lophiostoma compressum</i>	147	38.1	17.7	26.5	10.2	2.7	2.7	1.4	0.7	.	.	0.7	94.5	4.8	.	100.0	4.8	0.7	8.8
<i>Melanomma pulvis-pyrius</i>	157	13.4	33.8	15.3	1.3	3.8	10.8	19.1	2.5	.	.	3.8	87.3	8.9	.	100.0	16.6	.	20.4
<i>Leptosphaeria tollens</i>	46	23.9	10.9	17.4	4.3	39.1	2.2	2.2	.	.	.	2.2	97.8	.	2.2	97.8	8.7	2.2	2.2
<i>Rebentischia massalongii</i>	135	.	.	0.7	.	83.0	.	.	.	16.3	.	3.7	91.1	5.2	0.7	99.3	11.1	3.7	10.4
<i>Diatrype bullata</i>	57	.	.	.	5.3	87.7	.	.	7.0	.	.	.	86.0	14.0	.	100.0	1.8	1.8	3.5
<i>Enchnoa infernalis</i>	10	.	.	.	10.0	90.0	.	.	.	.	.	.	90.0	10.0	.	100.0	.	.	100.0
<i>Hypoxylon mammatum</i>	31	.	.	.	.	45.2	.	.	.	54.8	.	.	87.1	12.9	.	100.0	12.9	.	3.2
<i>Cryptosphaeria subcutanea</i>	6	.	.	.	.	66.7	.	.	.	33.3	.	.	83.3	16.7	.	100.0	.	.	16.7
<i>Arthopyrenia lapponina</i>	202	.	.	.	.	78.2	.	.	.	21.8	.	27.7	71.8	0.5	25.7	74.3	27.7	2.5	8.9
<i>Cryptodiaporthe salicella</i>	20	.	.	.	.	100.0	.	.	.	.	.	15.0	85.0	.	.	100.0	5.0	.	.
n		674	231	157	31	420	134	64	8	3	91	76	1546	191	54	1759	165	63	226



Tab. 5. Distribution of pyrenomycetes on ecological substrate-variables. Frequencies are calculated as percentage of the total number of collections for each substrate. The three sets of substrate categories: Main set - the five categories along the wood (W) - bark (B) gradient (defined on p. 19), for each of twig/branch and stem. SA - substrate age; N - new, O - old, D - decayed. SSt - substrate status; L - living, D - dead. SpS refers to special substrates (conditions not always registered in the field); LS - living stem or twig/branch, VD -very dry, NG - near the ground.

	n	Main set										SA			SSt		SpS			
		Twig/branch					Stem					N	O	D	L	D	LS	VD	NG	
		W	Wb	wb	Bw	B	W	Wb	wb	Bw	B									
<i>Rhynchostoma minutum</i>	1	0.1	.	.	.	.	.	.	.	.	.	.	.	0.5	.	0.1	.	.	.	
<i>Kirschsteiniothelia aethiops</i>	2	0.1	.	.	.	.	0.7	.	.	.	.	.	.	1.0	.	0.1	.	.	0.9	
<i>Melanopsamma pomiformis</i>	13	1.6	0.4	.	.	.	0.7	.	.	.	.	.	0.6	2.1	.	0.7	0.6	.	.	
<i>Hypoxylon macrosporum</i>	63	5.2	2.6	.	.	.	10.5	10.9	12.5	.	.	.	3.3	5.2	.	3.6	0.6	9.5	9.7	
<i>Bertia moriformis</i> var. <i>moriformis</i>	5	0.3	0.4	.	.	.	1.5	.	.	.	.	.	0.3	0.5	.	0.3	.	.	2.2	
<i>Lophiotrema boreale</i>	3	.	.	0.6	.	.	1.5	.	.	.	.	.	.	1.6	.	0.2	.	.	.	
<i>Hysterographium elongatum</i>	73	9.6	1.3	0.6	.	.	3.0	.	.	.	.	.	4.6	1.1	.	4.2	.	20.6	1.8	
<i>Capronia collapsa</i>	109	12.3	2.6	6.5	.	0.2	6.8	1.6	.	.	.	.	5.8	9.9	.	6.2	1.2	1.6	9.3	
<i>Glyphium grisonense</i>	38	4.0	1.3	3.8	.	.	1.5	.	.	.	.	.	2.4	0.5	.	2.2	0.6	.	1.8	
<i>Lophiotrema nucula</i>	91	7.4	8.7	7.0	.	.	5.2	3.1	.	1.1	.	.	4.0	15.2	.	5.1	.	7.9	8.8	
<i>Saccardoella kanderana</i>	17	1.0	1.3	0.6	.	0.7	2.2	.	.	.	.	.	0.8	2.1	.	1.0	0.6	.	2.7	
<i>Lophiostoma macrostomoides</i>	31	1.3	3.5	3.8	.	.	4.5	3.1	.	.	.	.	1.6	3.7	.	1.8	0.6	.	5.3	
<i>Melanomma fuscidulum</i>	16	0.6	0.8	1.9	.	0.5	3.7	.	.	.	.	.	1.3	0.8	1.0	.	0.9	1.8	.	
<i>Lophiostoma curtum</i>	104	2.4	11.3	5.1	3.2	.	22.5	28.1	25.0	100.0	.	.	4.9	14.7	.	5.9	7.3	1.6	7.5	
<i>Anthostomella melanotes</i>	252	28.4	14.7	3.2	3.2	0.7	13.4	.	.	.	.	.	1.3	14.4	14.1	.	14.3	10.3	28.6	9.3
<i>Lophiostoma quadrinucleatum</i>	57	4.2	5.2	6.4	3.2	0.7	2.2	.	.	.	.	.	1.3	3.4	2.1	.	3.2	2.4	1.6	1.8
<i>Keisslerella holmiorum</i>	127	8.5	9.5	14.6	16.1	3.1	3.7	1.6	.	1.1	.	.	1.3	7.9	2.1	.	7.2	4.9	6.4	2.2
<i>Lophiostoma compressum</i>	147	8.3	11.3	24.9	48.4	1.0	3.0	3.1	12.5	.	.	.	1.3	9.0	3.7	.	8.4	4.3	1.6	5.8
<i>Melanomma pulvis-pyrius</i>	157	3.1	22.9	15.3	6.5	1.4	12.7	46.9	50.0	.	.	.	7.9	8.9	7.3	.	8.9	15.8	.	14.2
<i>Leptosphaeria tollens</i>	46	1.6	2.2	5.1	6.5	4.3	0.7	1.6	.	.	.	.	1.3	2.9	.	1.9	2.6	2.4	1.6	0.4
<i>Rebentischia massalongii</i>	135	.	.	0.6	.	26.7	.	.	.	24.2	.	.	6.7	8.0	3.7	1.9	7.6	9.1	7.9	6.2
<i>Diatrype bullata</i>	57	.	.	.	9.7	11.9	.	.	.	4.4	.	.	.	3.2	4.3	.	3.2	0.6	3.2	0.9
<i>Enchnoa infernalis</i>	10	.	.	.	3.2	2.1	.	.	.	.	.	.	.	0.6	0.5	.	0.6	.	.	0.4
<i>Hypoxylon mammatum</i>	31	.	.	.	.	3.3	.	.	.	18.7	.	.	.	1.7	2.1	.	1.8	2.4	.	0.4
<i>Cryptosphaeria subcutanea</i>	6	.	.	.	.	1.0	.	.	.	2.2	.	.	.	0.3	0.5	.	0.3	.	.	0.4
<i>Arthopyrenia lapponica</i>	202	.	.	.	.	37.6	.	.	.	48.3	.	.	73.7	9.4	0.5	96.2	8.5	33.9	7.9	8.0
<i>Cryptodiaporthe salicella</i>	20	.	.	.	.	4.8	.	.	.	.	.	.	3.9	1.1	.	.	1.1	0.6	.	.
n		674	231	157	31	420	134	64	8	3	91		76	1546	191	54	1759	165	63	226

### *Parasites and saprophytes*

The species listed below could, with some confidence, be included in the following groups:

(1) *Partly parasitic*. *Arthopyrenia lapponina*, *Cryptodiaporthe salicella* and *Cryptosphaeria subcutanea*.

(2) *Primary saprophytes*. *Anthostomella melanotes*, *Enchnoa infernalis*, *Glyphium grisonense*, *Hypoxylon macrosporium*, *Hysterographium elongatum*, *Lophiostoma compressum*, *L. quadrinucleatum*, *Melanomma fuscidulum* and *Saccardoella kanderana*.

(3) *Secondary saprophytes*. *Bertia moriformis* var. *moriformis*, *Kirschsteiniothelia aethiops*, *Lophiotrema boreale* and *Rhynchostoma minutum*.

(4) *Hypersaprophytes*. *Capronia collapsa* and *Rebentischia massalongii*.

### DISTRIBUTION

The treated pyrenomycete species were found in all the vegetation regions, but they had different distributions and frequencies along the transect. Several, more or less distinct distributional patterns were observed. Tab. 6 lists the species in relation to sectional preferences, (1) species with preferences for section N, (2) species with preferences for section S, and (3) species without any particular sectional preferences.

The species could also be grouped in relation to their preferences for the different vegetation regions.

*Group 1*. Several species were restricted to the SB and MB regions, namely *Bertia moriformis* var. *moriformis*, *Diatrype bullata*, *Enchnoa infernalis*, *Glyphium grisonense*, *Hypoxylon mammatum*, *Lophiostoma macrostomoides* and *Melanomma fuscidulum*.

*Group 2*. The species in this group were found in all the vegetation regions, except LA. This was the case for *Cryptodiaporthe salicella*, *Cryptosphaeria subcutanea*, *Hysterographium elongatum*, *Keissleriella holmiorum*, *Leptosphaeria tollens*, *Lophiotrema nucula*, *Melanopsamma pomiformis* and *Rebentischia massalongii*.

*Group 3*. Several species were found in all of the different vegetation regions, but only *Anthostomella melanotes*, *Lophiostoma curtum*, *L. quadrinucleatum* and *Melanomma pulvis-pyrius* were found in all regions throughout the transect area. The other species in this group were *Arthopyrenia lapponina*, *Capronia collapsa*, *Hypoxylon macrosporium* and *L. compressum*.

*Group 4*. *Amphisphaerella erikssonii* (NB & LA) and *Saccardoella kanderana* (MB, NB & LA) fit well in the same group.

*Group 5*. *Kirschsteiniothelia aethiops* was only found in SB, while *Rhynchostoma minutum* only was found in MB. Both species were infrequent.

*Diatrype bullata*, *Hysterographium elongatum*, *Melanomma pulvis-pyrius* and *Melanopsamma pomiformis* tended towards being oceanic, while *Amphisphaerella erikssonii*, *Anthostomella melanotes*, *Hypoxylon macrosporium*, *H. mammatum*, *Lophiostoma curtum*, *Lophiotrema boreale* and *Saccardoella kanderana* seemed to be slightly continental in their distribution.

Tab. 6. Distribution of pyrenomycetes on the different vegetation regions in Norway and Sweden. Frequencies are calculated as percentage of the total number of collections for each pyrenomycete species (Frequency I) and as percentage of the total number of collections for each vegetation region (Frequency II). Three species groups are indicated: preference for section N (Norway), above; preference for section S (Sweden), middle; indifferent, below.

Species	n	Frequency I				Frequency II							
		Norway		Sweden		Norway		Sweden					
		SB	MB	NB	LA	SB	MB	NB	LA	SB	MB		
Kirschsteinothelia aethiops	2	100.0	.	.	.	.	0.5	.	.	.	.	.	.
Rhynchostoma minutum	1	100.0	.	.	.	.	.	0.2	.	.	.	.	.
Bertia moriformis var. moriformis	5	40.0	60.0	.	.	.	.	0.5	0.7	.	.	.	.
Glyphium grisonense	38	5.3	94.7	.	.	.	.	0.7	7.8	.	.	.	.
Melanopsamma pomiformis	13	76.9	15.4	7.7	.	.	.	2.6	0.4	0.4	.	.	.
Lophiostoma compressum	147	88.4	0.7	2.0	8.9	.	.	34.4	0.2	1.1	10.7	.	.
Saccardoella kanderana	17	.	52.9	29.4	17.7	.	.	.	2.0	1.8	2.5	.	.
Hysterographium elongatum	73	41.1	39.7	17.8	.	1.4	.	7.9	6.3	4.6	.	.	0.3
Hypoxyton macrosporium	63	11.1	15.8	42.9	28.6	.	1.6	1.9	2.2	9.4	14.8	.	0.3
Capronia collapsa	109	22.0	43.1	21.1	4.6	.	9.2	6.3	10.2	8.0	4.1	.	2.9
Melanomma pulvis-pyrius	157	18.4	41.4	18.5	7.0	8.3	6.4	7.7	14.2	10.2	9.0	.	5.8
Rebentischia massalongii	135	29.7	25.9	20.0	.	9.6	14.8	10.6	7.6	9.4	.	.	5.8
Anthostomella melanotes	252	7.5	24.2	13.1	4.0	15.1	36.1	5.0	13.3	11.6	8.2	16.8	26.6
Lophiostoma curtum	104	1.9	6.7	11.6	1.9	30.8	47.1	0.5	1.5	4.2	1.6	14.2	14.3
Leptosphaeria tollens	46	17.4	6.5	10.9	.	21.7	43.5	2.1	0.7	1.7	.	4.4	5.9
Keisslerella holmiorum	127	9.4	23.6	11.8	.	28.4	26.8	3.2	6.5	5.3	.	15.9	9.9
Diatrype bullata	57	17.5	8.8	.	.	73.7	.	2.6	1.1	.	.	18.5	.
Hypoxyton mammatum	31	.	.	.	.	74.2	25.8	.	.	.	.	10.2	2.3
Lophiostoma quadrinucleatum	57	35.1	3.5	36.9	3.5	7.0	14.0	5.3	0.4	7.4	1.6	1.8	2.3
Arthopyrenia lapponina	202	0.5	29.2	27.7	28.7	.	13.9	0.3	12.8	19.6	47.5	.	8.2
Cryptodiaporthe salicella	20	25.0	20.0	30.0	.	20.0	5.0	1.3	0.9	2.1	.	1.8	0.3
Cryptosphaeria subcutanea	6	33.2	16.7	16.7	.	16.7	16.7	0.5	0.2	0.4	.	0.4	0.3
Lophiotrema nucula	91	8.8	39.5	6.6	.	5.5	39.6	2.1	7.8	2.1	.	2.2	10.6
Enchnoa infernalis	10	40.0	20.0	.	.	20.0	20.0	1.1	0.4	.	.	0.9	0.6
Lophiostoma macrostomoides	31	16.1	38.7	.	.	.	45.2	1.3	2.6	.	.	.	4.1
Melanomma fuscidulum	16	37.5	.	.	.	18.8	43.7	1.6	.	.	.	1.3	2.1
Lophiotrema boreale	3	.	.	66.7	.	.	33.3	.	.	0.7	.	.	0.3
								378	460	285	122	342	226

## ORDINATION

### *Ordination of trees*

The eigenvalues and gradient lengths in the DCA ordination decreased slightly (with no obvious steps) from axis 1 to axis 4 (Tab. 7).

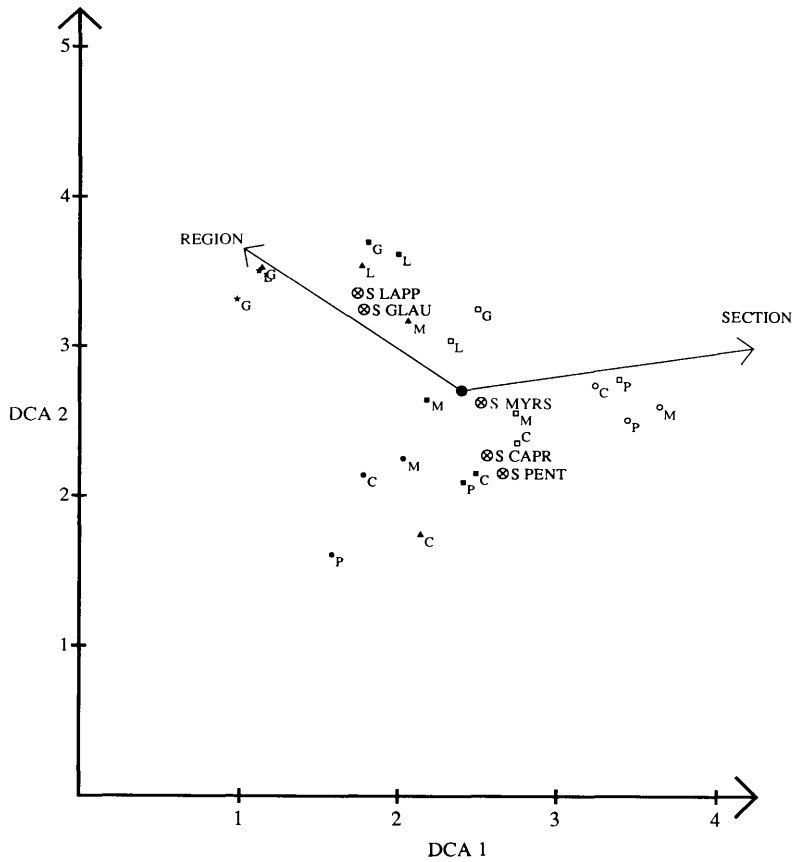


Fig. 11. DCA ordination of trees, with points indicating means for each section/region/host taxon combination. Norway (more oceanic section) is indicated by filled symbols, Sweden (more continental section) by open symbols. Region is indicated as follows: Asterisk - LA, triangle - NB, square - MB, dot - SB. Host *Salix* species are indicated by the first letter of their specific name: C - *S. caprea* ssp. *caprea*, and ssp. *sericea*, G - *S. glauca* ssp. *glauca*, L - *S. lapponum*, M - *S. myrsinifolia* ssp. *borealis*, and ssp. *myrsinifolia*, and P - *S. pentandra*. Axes are scaled in standard deviation (S.D.) units. Arrows indicate directions of maximum change for the explanatory variables region and section. Overall means for the five host species are indicated as ringed crosses.

The positions of SRT combinations with respect to ordination axes 1 and 2 are shown in Fig. 11. SRT combinations segregated along axis 1 according to section; Swedish, more continental ones obtained DCA 1 scores at 2.33 S.D. or above, Norwegian (more oceanic) ones 2.41 S.D. or below, thus overlapping only slightly. The correlation between the S variable and DCA 1 was  $r = 0.679$  ( $P < 0.0001$ ), cf. Tab. 7. Within the Swedish SRT combinations, *Salix glauca* ssp. *glauca* and *S. lapponum* (only the MB region) had low DCA 1 scores, while *S. myrsinifolia* agg. and *S. caprea* agg. had lower DCA 1 scores for the MB than the SB region. For *S. pentandra*, there was only a minor difference between regions in

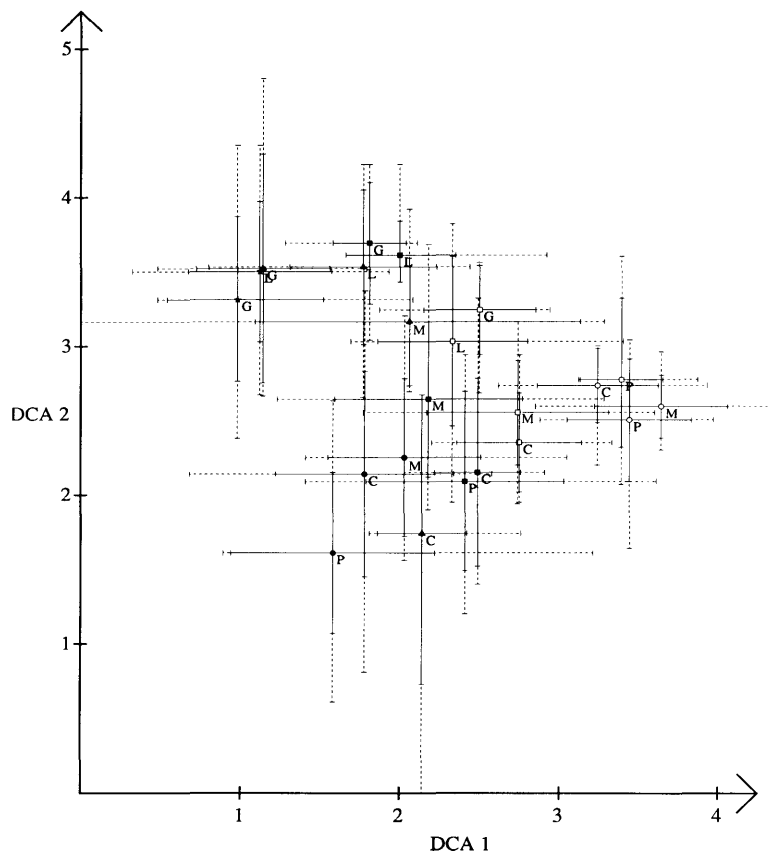


Fig. 12. Within section/region/taxon (SRT) combination-variation in DCA score of individual trees. For each SRT combination (see legend to Fig. 11 for explanation), maximum and minimum are indicated by dotted lines, mean  $\pm$  one standard deviation by single continuous lines. Axes are scaled in S.D. units.

Tab. 7. Summary of DCA ordination results: gradient length estimates, eigenvalues, and correlations between tree positions and explanatory variables (R - Region, S - section).

	DCA 1	DCA 2	DCA 3	DCA 4
Gradient length	4.04	3.31	3.03	3.00
Eigenvalue	0.4454	0.3563	0.2547	0.2201
Correlations: Region	-0.496	0.406	0.367	-0.022
Correlations: Section	0.679	0.079	0.044	0.048

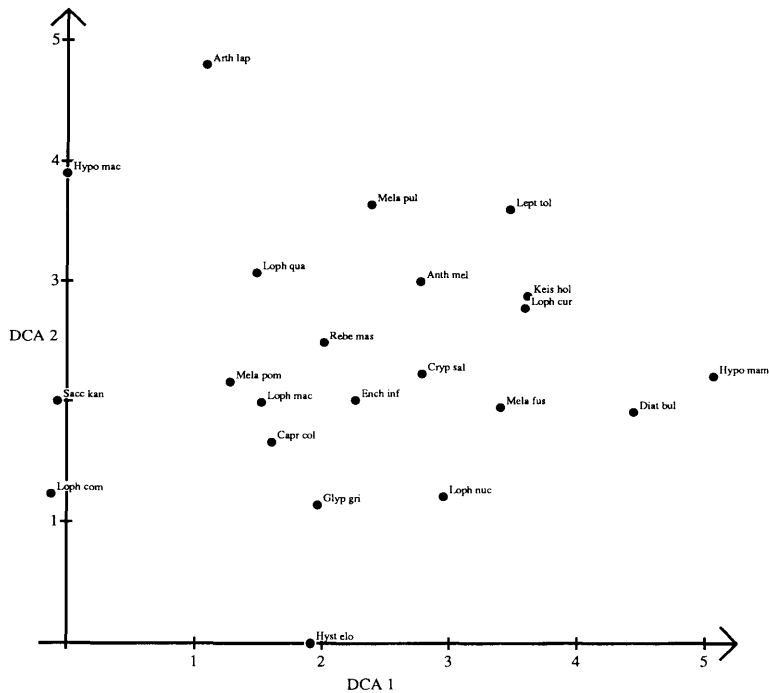


Fig. 13. DCA ordination of pyrenomycete species, axes 1 and 2. Only the more frequent species (occurring on 7 or more trees) are included. Names abbreviated to the first four letters in generic and the first three letters in specific names, see Tab. 8. Axes are scaled in S.D. units.

the S section. Within the N section, there was some segregation along the first two DCA axes (Fig. 11). *Salix glauca* ssp. *glauca* and *S. lapponum* both had low values along DCA 1 and high values along DCA 2, with progressively lower DCA 1 scores for regions MB, NB, and LA. *Salix caprea* agg. and *S. pentandra* both had intermediate scores along DCA 1 and low scores along DCA 2; trends apparently not being related to region (lowest DCA 1 values for the SB region). The correlation between region and the two first DCA axes was moderate (cf. Tab. 7). The positions of *Salix* species in Fig. 11 show that the species form two clearly separated groups; one consisting of the boreal-alpine species *S. glauca* ssp. *glauca* and *S. lapponum* and one containing the boreal *S. caprea* agg., *S. myrsinifolia* agg. and *S. pentandra*.

Fig. 12 shows the range of variation in scores of individual trees within the SRT groups. There was a considerable variation, although the major groupings of SRT combinations referred to above overlapped to minor extents only. The Swedish SB trees and the Swedish MB *S. pentandra* trees overlapped only slightly with other SRT combinations, the same was true for the Norwegian *S. glauca* ssp. *glauca* and *S. lapponum* trees. The Norwegian SB trees were connected with the Swedish SB trees through overlaps between the corresponding MB SRT combinations.

The regional variable was correlated with both DCA 1 and DCA 2 ( $r = -0.496$  and  $r = 0.406$ , respectively), both correlations significant at the  $P < 0.0001$  level but only moderately

Tab. 8. Data matrix structured in order of increasing species and section/region/substrate score along the first DCA axis. Sample plot scores are averages for 10 (exceptionally 8 or 9) trees. Matrix elements are number of trees on which the species has been recorded. S - "section": N - Norway (more oceanic), S - Sweden (more continental); R - region: S - southern boreal, M - middle boreal, N - northern boreal, L - low-alpine; T - taxon: C - *Salix caprea* agg., G - *Salix glauca* ssp. *glauca*, L - *Salix lapponum*, M - *Salix myrsinifolia* agg., P - *Salix pentandra*; n - total number of occurrences.

Species	n	DCA1	N	N	N	N	N	N	N	N	N	N	N	N	S	N	N	S	S	S	S	S	S	S	
			L	L	N	S	N	S	M	M	S	N	N	M	M	M	M	M	M	M	M	S	M	S	S
			G	L	G	P	L	C	G	L	M	M	C	M	L	P	C	G	M	C	C	C	P	P	M
<i>Lophiostoma compressum</i>	34	-0.12	5	4	2	9	0	8	0	0	5	0	0	0	0	1	0	0	0	0	0	0	0	0	
<i>Saccardoella kanderana</i>	15	-0.07	2	1	3	0	1	0	1	0	0	1	0	2	0	3	2	0	0	0	0	0	0	0	
<i>Hypoxylon macrosporum</i>	30	0.00	6	5	6	0	1	0	0	0	2	5	0	4	1	0	0	0	0	0	0	0	0	0	
<i>Arthopyrenia lapponina</i>	73	1.08	9	10	9	0	8	0	10	9	1	3	0	3	4	0	0	7	0	0	0	0	0	0	
<i>Melanopsamma pomiformis</i>	9	1.27	0	0	0	0	0	0	1	0	6	1	0	1	0	0	0	0	0	0	0	0	0	0	
<i>Lophiotrema boreale</i>	3	1.47	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	
<i>Lophiostoma quadrinucleatum</i>	33	1.48	2	0	4	3	1	3	0	0	3	5	2	0	1	1	0	2	0	2	2	0	1	1	
<i>Lophiostoma macrostomoides</i>	24	1.52	2	1	0	0	1	0	1	1	2	1	1	2	3	2	0	0	5	1	0	1	0	0	
<i>Capronia collapsa</i>	53	1.60	2	2	4	3	2	4	0	0	4	5	5	5	0	6	5	2	0	4	0	0	0	0	
<i>Rhynchostoma minutum</i>	1	1.84	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	
<i>Hysterographium elongatum</i>	28	1.91	0	0	0	5	0	3	0	0	4	0	4	2	4	5	0	0	1	0	0	0	0	0	
<i>Glyphium grisonense</i>	14	1.96	0	0	0	1	0	0	0	0	0	0	0	5	0	6	2	0	0	0	0	0	0	0	
<i>Rebentischia massalongii</i>	83	2.01	0	0	5	5	3	7	5	6	8	3	6	6	3	0	6	4	3	3	5	0	3	2	
<i>Enchnoa infemalis</i>	8	2.26	0	0	0	0	0	1	0	0	2	0	0	1	2	0	0	0	0	1	0	0	0	1	
<i>Bertia moriformis</i> var. <i>moriformis</i>	5	2.38	0	0	0	1	0	1	0	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0	
<i>Melanomma pulvis-pyrius</i>	79	2.38	3	4	0	0	7	4	10	7	7	4	1	5	3	2	4	5	1	1	2	0	4	5	
<i>Kirschsteiniotelia aethiops</i>	1	2.74	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Anthostomella melanotes</i>	99	2.77	4	2	5	0	1	2	2	3	2	6	4	7	3	5	9	7	6	9	8	7	5	2	
<i>Cryptodiaporthe salicella</i>	16	2.78	0	0	0	1	3	0	0	1	4	1	0	0	0	1	1	0	0	1	0	1	0	1	2
<i>Lophiotrema nucula</i>	39	2.95	0	0	0	1	0	2	1	0	4	0	1	3	0	3	6	0	3	7	1	3	2	2	
<i>Cryptosphaeria subcutanea</i>	6	3.00	0	0	0	0	0	0	0	0	2	1	0	1	0	0	0	1	0	0	0	0	0	1	
<i>Melanomma fuscidulum</i>	9	3.40	0	0	0	0	0	0	0	0	2	0	0	0	1	0	0	0	0	2	0	3	0	1	
<i>Leptosphaeria tollens</i>	29	3.47	0	0	0	1	1	1	0	1	3	3	0	2	0	0	0	4	2	1	2	3	1	4	
<i>Lophiostoma curtum</i>	52	3.59	0	1	1	0	1	0	0	0	1	5	2	2	4	1	2	6	6	2	3	5	4	6	
<i>Keissleriella holmiorum</i>	58	3.61	0	0	0	1	0	3	0	1	2	6	1	4	0	5	3	3	5	4	9	4	3	4	
<i>Diatrype bullata</i>	31	4.44	0	0	0	2	0	1	0	0	2	0	0	1	0	0	2	0	0	0	6	0	8	9	
<i>Hypoxylon mammatum</i>	19	5.06	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	4	3	4	6		





Tab. 9 (continued).

Species	Character	A: SB-Norway	B: Troms	C: Transect	D: LA-Norway	E: MB-Sweden	A-BA-D-A-E-B-C
Kirschsteinothelia aethiops	spore length		27.3 ± 1.9 (26)	28.0 ± 2.3 (61)			-
	spore width		9.6 ± 1.0	10.6 ± 1.1			xxx
	spore quotient		2.9 ± 0.3	2.7 ± 0.3			xx
	ascus length		107.2 ± 11.4 (5)	108.6 ± 13.9 (27)			-
	ascus width		16.5 ± 2.1	19.1 ± 1.4			x
Leptosphaeria tollens	spore length	22.5 ± 1.4(100)	24.4 ± 2.0(120)	22.6 ± 1.9(200)		23.8 ± 1.8(200)	xxx xxx xxx
	spore width	7.8 ± 0.5	7.9 ± 0.7	7.8 ± 0.5		7.5 ± 0.6	- xxx -
	spore quotient	2.9 ± 0.3	3.1 ± 0.3	2.9 ± 0.3		3.2 ± 0.3	xxx xxx xxx
	ascus length		114.4 ± 6.4 (16)	116.0 ± 8.5 (56)			-
	ascus width		12.8 ± 0.8	12.6 ± 0.9			-
Lophiostoma compressum	spore length	26.0 ± 2.9(100)	23.6 ± 2.9(130)	24.9 ± 2.7(160)	22.8 ± 1.9(100)		xxx xxx xxx
	spore width	9.2 ± 0.8	9.7 ± 0.9	9.2 ± 0.7	8.6 ± 0.4		xxx xxx xxx
	spore quotient	2.8 ± 0.3	2.4 ± 0.3	2.7 ± 0.2	2.7 ± 0.2		xxx xxx xxx
	ascus length		126.3 ± 10.0 (13)	154.2 ± 14.1 (65)			xxx
	ascus width		14.8 ± 1.5	15.0 ± 1.1			-
Lophiostoma curtum	spore length		18.0 ± 1.8(152)	17.7 ± 1.7(200)			-
	spore width		6.7 ± 0.7	6.6 ± 0.6			-
	spore quotient		2.7 ± 0.3	2.7 ± 0.2			-
	ascus length		120.5 ± 7.9 (35)	125.6 ± 10.0 (67)			x
	ascus width		10.0 ± 0.6	9.8 ± 0.6			-
Lophiostoma macrostomoides	spore length		32.2 ± 3.7 (40)	32.0 ± 3.9(120)			-
	spore width		7.8 ± 0.6	8.3 ± 0.8			xxx
	spore quotient		4.1 ± 0.5	3.9 ± 0.5			xx
	ascus length		123.3 ± 6.1 (6)	140.6 ± 12.9 (39)			xxx
	ascus width		16.7 ± 1.1	16.5 ± 1.2			-
Lophiostoma quadrinucleatum	spore length	24.9 ± 1.7(100)	24.9 ± 2.7 (80)	24.5 ± 2.0(200)		23.6 ± 2.0(100)	- xxx -
	spore width	8.7 ± 0.6	8.4 ± 1.0	8.3 ± 0.7		7.9 ± 0.5	xxx xxx -
	spore quotient	2.9 ± 0.3	3.0 ± 0.3	3.0 ± 0.3		3.0 ± 0.3	xx -
	ascus length		126.5 ± 13.6 (14)	138.6 ± 12.0 (42)			xx
	ascus width		15.7 ± 1.3	16.4 ± 1.2			-
Lophiotrema boreale	spore length		14.7 ± 1.0 (40)	13.9 ± 1.1 (70)			xxx
	spore width		4.0 ± 0.5	3.9 ± 0.3			-
	spore quotient		3.7 ± 0.4	3.6 ± 0.3			-
	ascus length		80.4 ± 6.4 (20)	81.8 ± 6.6 (48)			-
	ascus width		6.1 ± 0.5	6.1 ± 0.5			-
Lophiotrema nucla	spore length		20.7 ± 1.7 (60)	20.8 ± 1.8(160)			-
	spore width		6.2 ± 0.5	6.2 ± 0.4			-
	spore quotient		3.3 ± 0.4	3.4 ± 0.3			-
	ascus length		118.3 ± 11.1 (16)	137.7 ± 12.4 (60)			xxx
	ascus width		9.8 ± 0.6	10.4 ± 0.5			xxx
Melanomma fuscidulum	spore length		16.0 ± 1.4 (87)	15.5 ± 1.4(100)			xx
	spore width		5.5 ± 0.3	5.3 ± 0.5			xxx
	spore quotient		2.9 ± 0.2	2.9 ± 0.3			-
	ascus length		72.1 ± 8.6 (9)	81.8 ± 7.8 (38)			xx
	ascus width		11.3 ± 0.8	10.9 ± 0.8			-
Melanomma pulvis-pyrus	spore length	17.2 ± 1.3(100)	17.4 ± 1.6(120)	17.5 ± 1.3(200)	17.6 ± 1.1(100)	14.3 ± 0.8(100)	- - xxx -
	spore width	6.3 ± 0.4	6.3 ± 0.5	6.2 ± 0.5	6.3 ± 0.4	5.0 ± 0.5	- - xxx -
	spore quotient	2.7 ± 0.2	2.8 ± 0.2	2.8 ± 0.2	2.8 ± 0.2	2.9 ± 0.2	- - xx x
	ascus length		115.9 ± 13.1 (17)	111.2 ± 17.8 (64)			-
	ascus width		8.9 ± 0.6	8.9 ± 1.1			-
Melanopsaruma pomiformis	spore length	14.2 ± 1.3(100)	13.5 ± 1.3(120)	13.9 ± 1.3(100)			xxx -
	spore width	5.6 ± 0.4	5.5 ± 0.5	5.7 ± 0.5			- x
	spore quotient	2.5 ± 0.3	2.5 ± 0.3	2.5 ± 0.3			-
	ascus length		77.5 ± 9.7 (22)	83.3 ± 8.6 (24)			x
	ascus width		12.5 ± 1.8	12.6 ± 0.9			-
Rebentischia massalongii	spore length	23.6 ± 2.3(100)	23.8 ± 2.4 (80)	24.0 ± 2.3(200)		23.7 ± 2.3	- -
	spore width	8.4 ± 0.5	8.4 ± 0.6	8.5 ± 0.7		8.1 ± 0.6	- xxx -
	spore quotient	2.8 ± 0.3	2.8 ± 0.3	2.8 ± 0.3		2.9 ± 0.3	- x -
	ascus length		117.3 ± 13.8 (7)	112.2 ± 8.4 (38)			-
	ascus width		17.6 ± 3.4	19.5 ± 1.3			-
Rynchospora minutum	spore length		9.0 ± 0.8 (51)	9.8 ± 0.9 (59)			xxx
	spore width		4.0 ± 0.4	4.2 ± 0.5			-
	spore quotient		2.3 ± 0.2	2.4 ± 0.3			-
	ascus length		30.1 ± 2.6 (7)	24.2 ± 3.2 (21)			xxx
	ascus width		6.9 ± 1.1	7.4 ± 0.6			-
Saccardoella kanderana	spore length		48.9 ± 5.4 (60)	51.0 ± 4.4(100)			x
	spore width		8.9 ± 0.6	8.7 ± 0.6			-
	spore quotient		5.5 ± 0.6	5.9 ± 0.7			xxx
	ascus length		300.5 ± 14.3 (14)	319.0 ± 20.6 (27)			xx
	ascus width		11.9 ± 0.9	11.7 ± 0.8			-

higher than the correlation between the sectional and regional variables ( $r = -0.370$ ,  $P < 0.0001$ ).

### *The species ordination*

Fig. 13 shows the species ordination, i.e. species optima for the most frequent species relative to the first two DCA axes. The species were well spread throughout the diagram, and formed a cloud without distinct discontinuities, but slightly more sparse towards the margins. Low values along DCA 1 were obtained for *Lophiostoma compressum*, *Saccardoella kanderana* and *Hypoxylon macrosporum*, all being nearly restricted to trees from Norway; their increasing positions along DCA 2 reflecting indifference for section or preference for the SB, NB, or LA regions. The other end along DCA 1 was occupied by *Hypoxylon mammatum* and *Diatrype bullata*, the first being completely restricted to the Swedish material, the latter strongly preferring Sweden. Opposite ends along DCA 2 were occupied by *Hysterographium elongatum*, mostly occurring in the SB and MB regions, and *Arthopyrenia lapponina*, with strong preference for *Salix glauca* ssp. *glauca* and *S. lapponum*. Tab. 8 shows the frequency of observation for each species in each SRT combination, the species and SRT combinations ordered by DCA 1 scores.

## MORPHOLOGICAL VARIATION

The mean and standard deviation for each character in the different geographical groups of each species are shown in Tab. 9, along with the results of the pairwise comparisons using the Mann-Whitney tests (Conover 1980). The frequency distributions of values in each geographical group are shown in Figs 14-94.

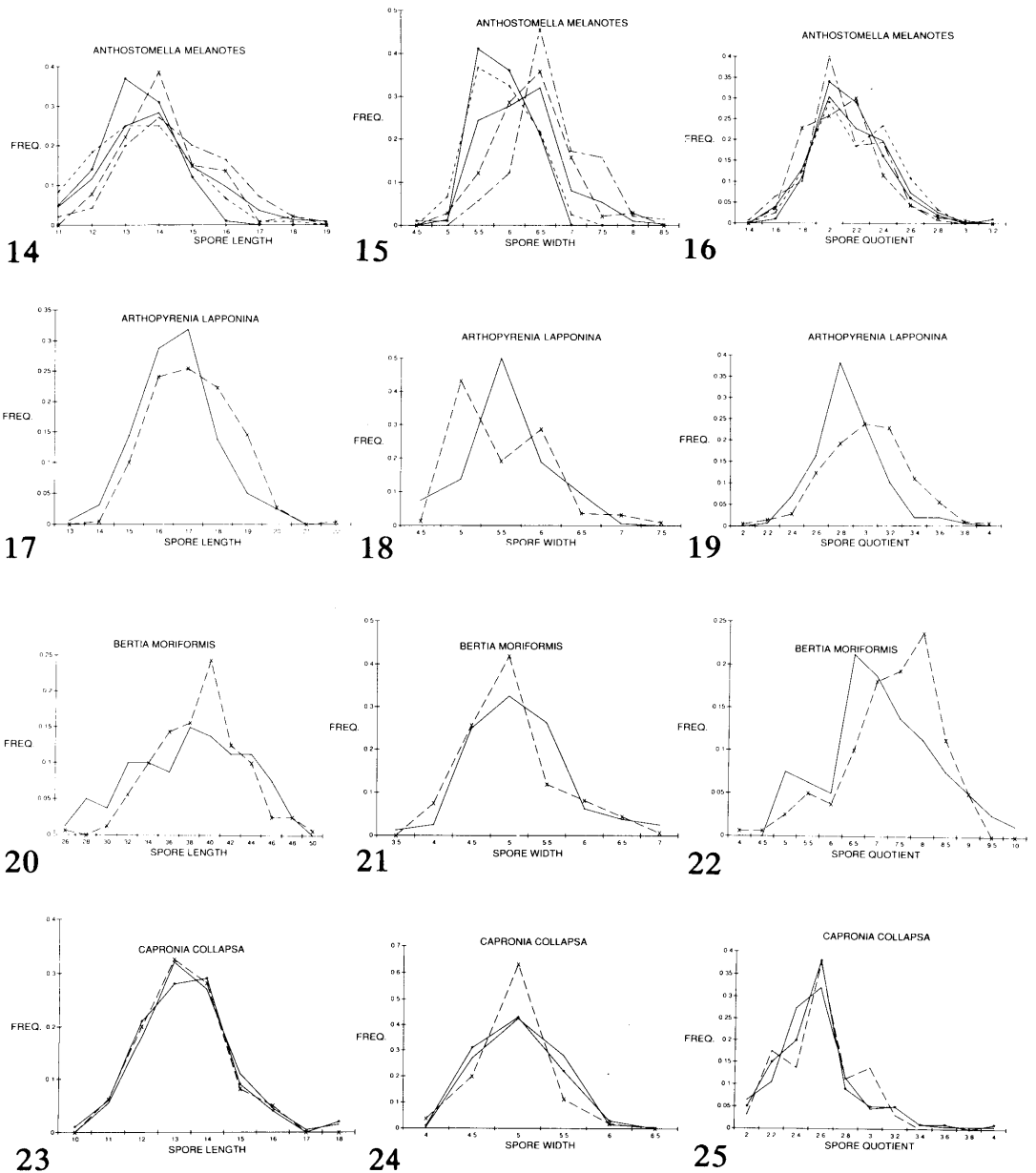
Many significant differences were found. This was to be expected, especially regarding the spore measurements. The number of measurements was relatively high, causing the tests to be rather sensitive. Some degree of variation was to be expected between samples taken from populations situated far apart. The significance tests per se did not determine whether there were general geographical patterns occurring in parallel in different species.

In the comparisons between A and B, six species (out of 11) showed significant differences in spore length, five in spore width and three in the spore quotient. As the differences were evenly distributed between A having larger values than B, and vice versa, no general hypothesis about spore variation from A to B was supported by the data.

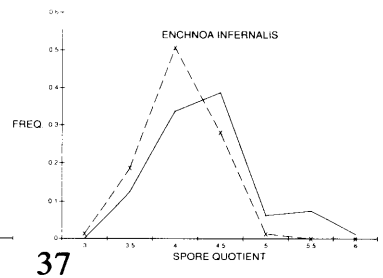
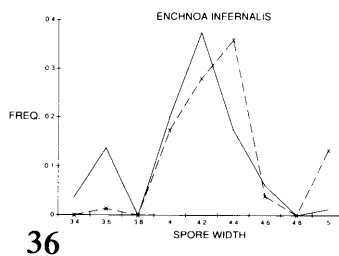
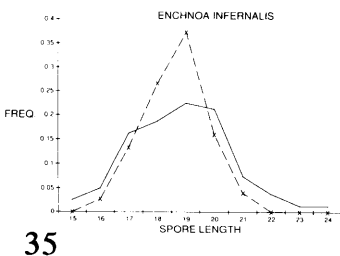
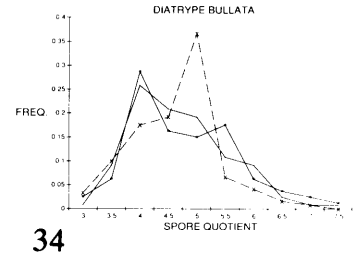
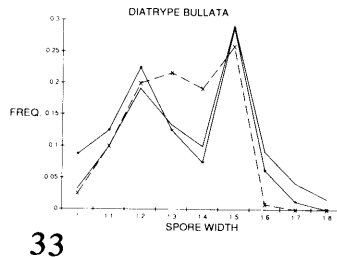
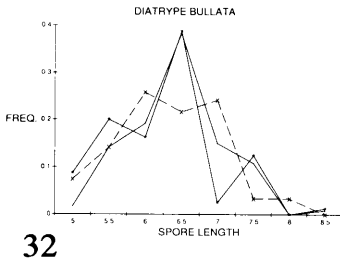
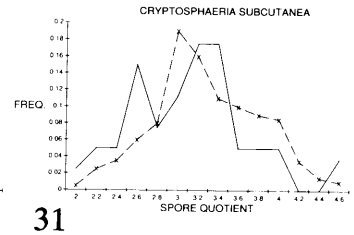
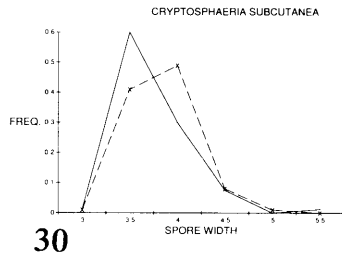
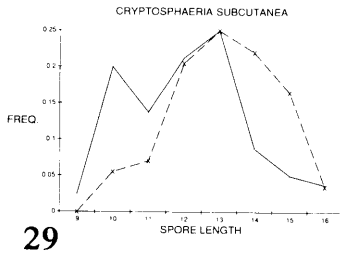
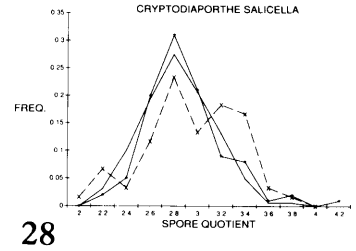
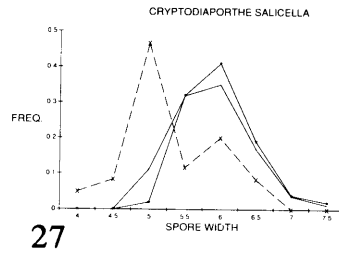
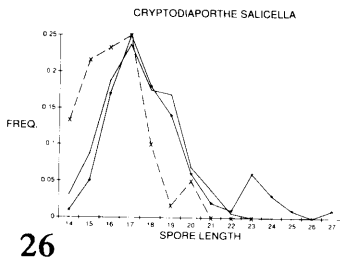
The same result was found in the comparison between A and D, but here only three species were compared.

Between A and E, however, four species showed more or less the same pattern of spore width. All had wider spores in A than in E, three of them (*Leptosphaeria tollens*, *Lophiostoma quadrinucleatum*, *Rebentischia massalongii*) highly significantly so. Although the number of species was low, this pattern should be noted. This pattern was also reflected in the spore quotient, but not so clearly. There were two significant differences in spore length, but in opposite directions.

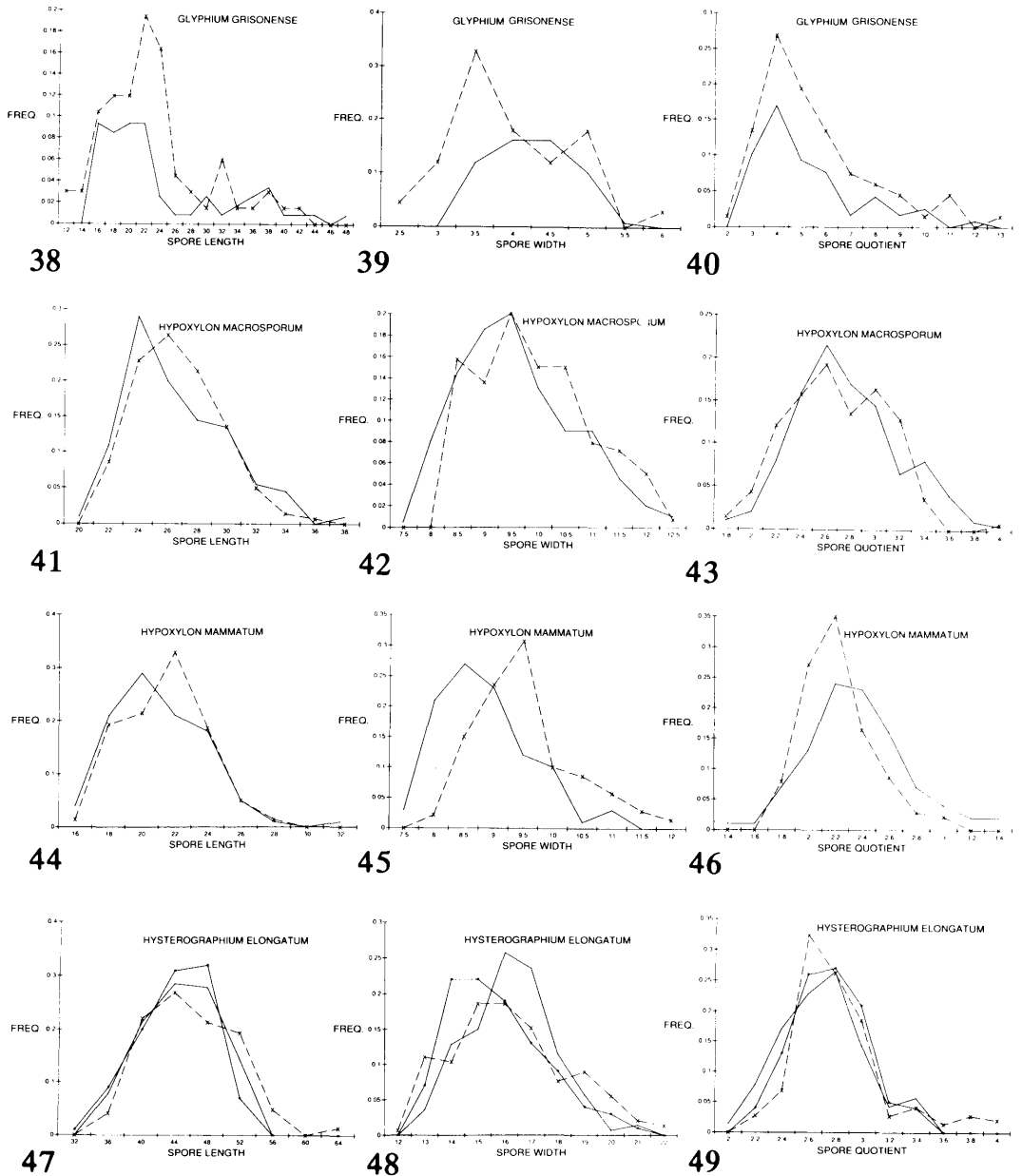
The most complete comparison was possible between B and C. There were 12 significant differences in spore length, six in each direction. Fifteen differences were signifi-



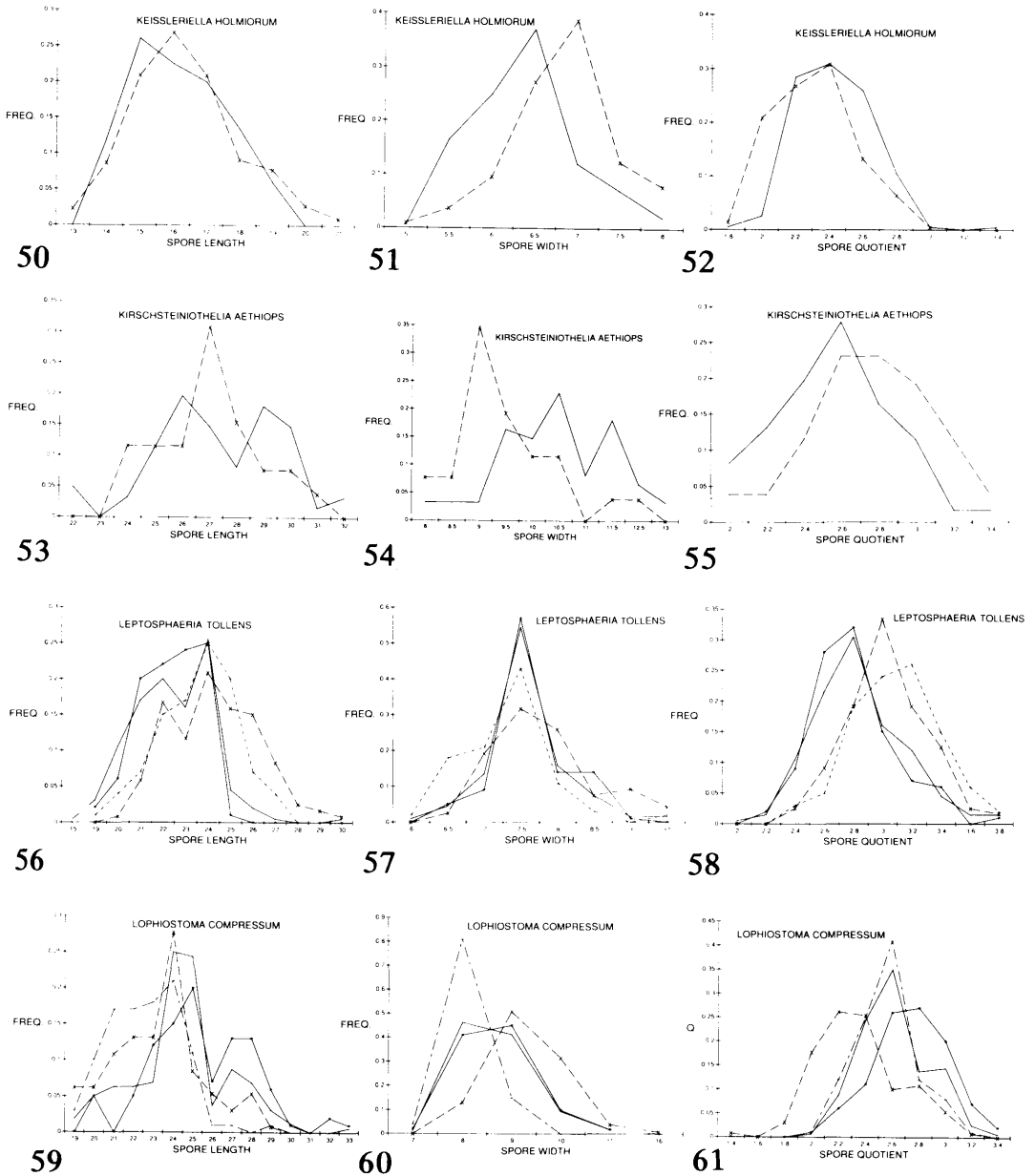
Figs 14-25. Frequency distribution of spore length, spore width and spore quotient for the treated species found within the transect area and in Troms (Mathiassen 1989). In each diagram the value of the variable is given along the x-axis, while the frequency of the material is given along the y-axis. The five geographically defined subsets A-E (cf. Tab. 9) are indicated as follows: A: SB-Norway - continuous line joining asterisks; B: Troms - discontinuous line (long dashes with x); C: Transect - continuous line without symbols; D: LA-Norway - discontinuous line (alternate long and short dashes); E: MB-Sweden - discontinuous line (short dashes).



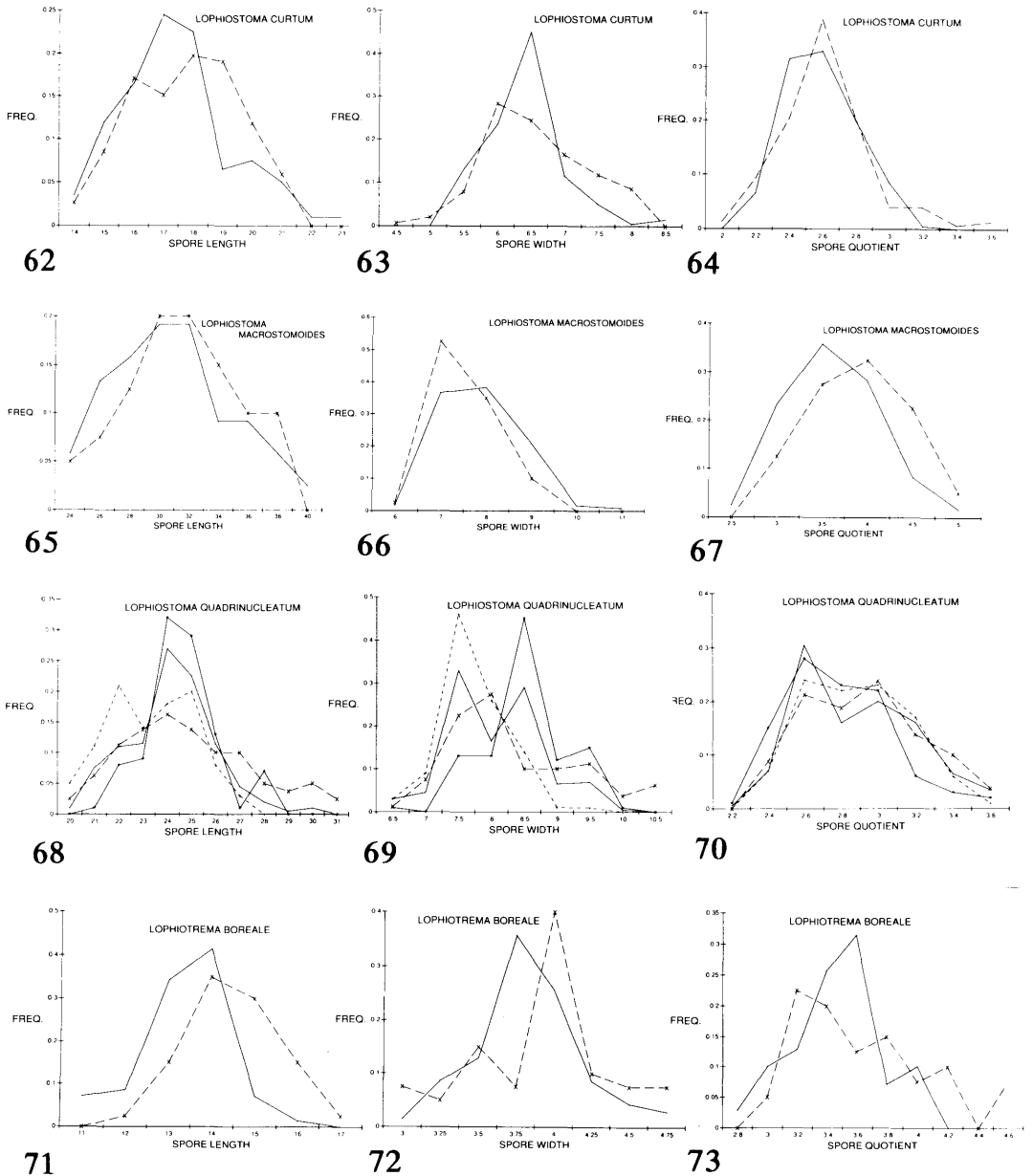
Figs 26-37. Frequency distribution of spore length, spore width and spore quotient for the treated species found within the transect area and in Troms (Mathiassen 1989). In each diagram the value of the variable is given along the x-axis, while the frequency of the material is given along the y-axis. The five geographically defined subsets A-E (cf. Tab. 9) are indicated as follows: A: SB-Norway - continuous line joining asterisks; B: Troms - discontinuous line (long dashes with x); C: Transect - continuous line without symbols; D: LA-Norway - discontinuous line (alternate long and short dashes); E: MB-Sweden - discontinuous line (short dashes).



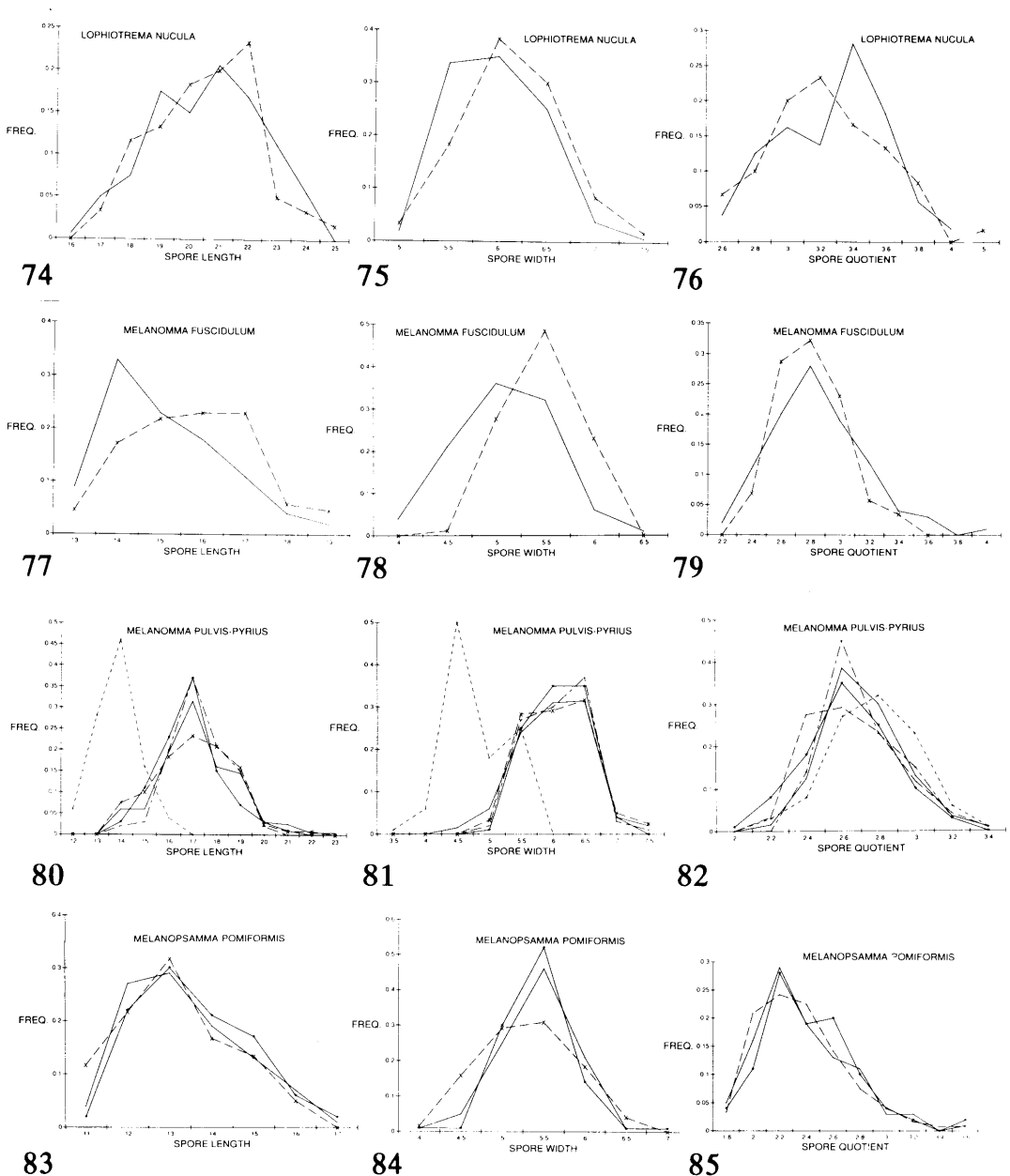
Figs 38-49. Frequency distribution of spore length, spore width and spore quotient for the treated species found within the transect area and in Troms (Mathiassen 1989). In each diagram the value of the variable is given along the x-axis, while the frequency of the material is given along the y-axis. The five geographically defined subsets A-E (cf. Tab. 9) are indicated as follows: A: SB-Norway - continuous line joining asterisks; B: Troms - discontinuous line (long dashes with x); C: Transect - continuous line without symbols; D: LA-Norway - discontinuous line (alternate long and short dashes); E: MB-Sweden - discontinuous line (short dashes).



Figs 50-61. Frequency distribution of spore length, spore width and spore quotient for the treated species found within the transect area and in Troms (Mathiassen 1989). In each diagram the value of the variable is given along the x-axis, while the frequency of the material is given along the y-axis. The five geographically defined subsets A-E (cf. Tab. 9) are indicated as follows: A: SB-Norway - continuous line joining asterisks; B: Troms - discontinuous line (long dashes with x); C: Transect - continuous line without symbols; D: LA-Norway - discontinuous line (alternate long and short dashes); E: MB-Sweden - discontinuous line (short dashes).

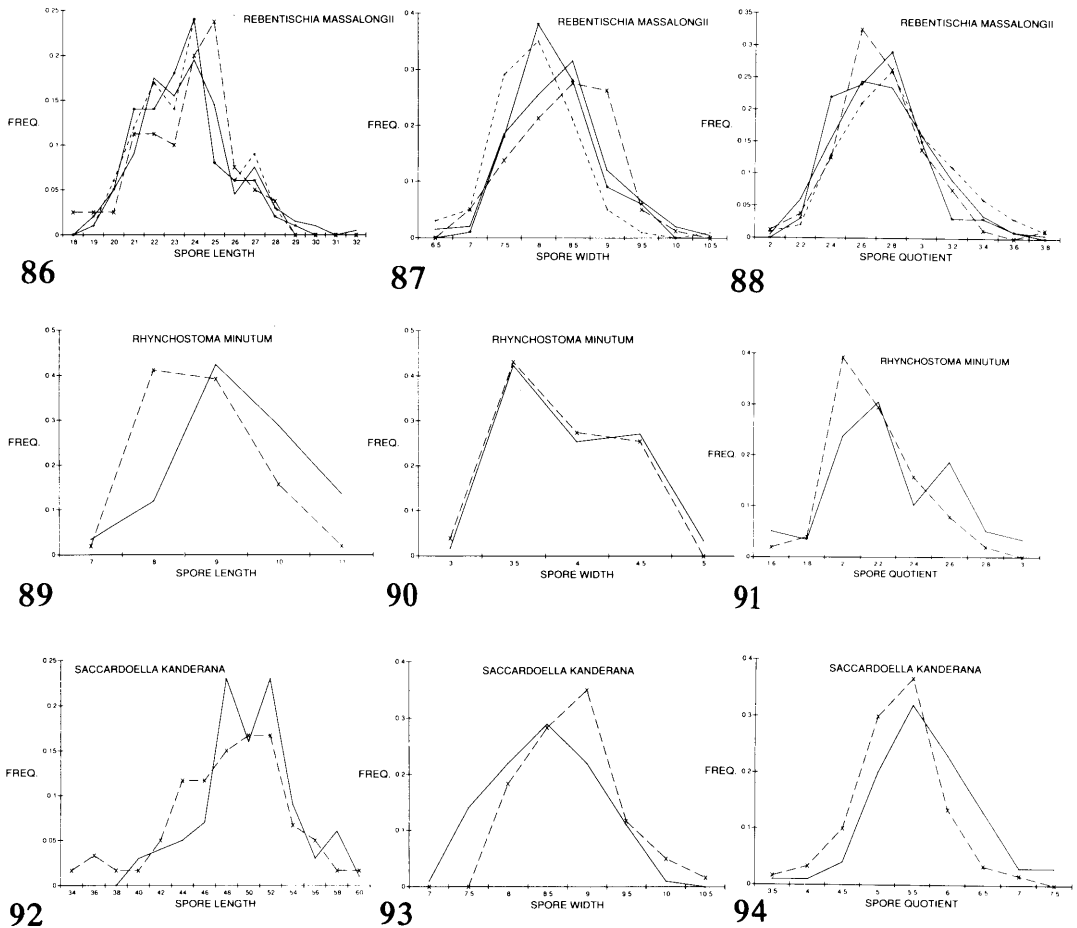


Figs 62-73. Frequency distribution of spore length, spore width and spore quotient for the treated species found within the transect area and in Troms (Mathiassen 1989). In each diagram the value of the variable is given along the x-axis, while the frequency of the material is given along the y-axis. The five geographically defined subsets A-E (cf. Tab. 9) are indicated as follows: A: SB-Norway - continuous line joining asterisks; B: Troms - discontinuous line (long dashes with x); C: Transect - continuous line without symbols; D: LA-Norway - discontinuous line (alternate long and short dashes); E: MB-Sweden - discontinuous line (short dashes).



Figs 74-85. Frequency distribution of spore length, spore width and spore quotient for the treated species found within the transect area and in Troms (Mathiassen 1989). In each diagram the value of the variable is given along the x-axis, while the frequency of the material is given along the y-axis. The five geographically defined subsets A-E (cf. Tab. 9) are indicated as follows: A: SB-Norway - continuous line joining asterisks; B: Troms - discontinuous line (long dashes with x); C: Transect - continuous line without symbols; D: LA-Norway - discontinuous line (alternate long and short dashes); E: MB-Sweden - discontinuous line (short dashes).





Figs 86-94. Frequency distribution of spore length, spore width and spore quotient for the treated species found within the transect area and in Troms (Mathiassen 1989). In each diagram the value of the variable is given along the x-axis, while the frequency of the material is given along the y-axis. The five geographically defined subsets A-E (cf. Tab. 9) are indicated as follows: A: SB-Norway - continuous line joining asterisks; B: Troms - discontinuous line (long dashes with x); C: Transect - continuous line without symbols; D: LA-Norway - discontinuous line (alternate long and short dashes); E: MB-Sweden - discontinuous line (short dashes).

cant regarding spore width. In six species B had the widest spores, while in nine species C had the widest spores. The spore quotient differed significantly in 14 species, eight having relatively longer spores in B, six in C.

For the spore data, no clear trends could be found, except that the spores in A were generally wider than in E.

The measurements of the asci showed different trends, especially because the number of measurements were considerably lower than for the spores. The ascus length differed

significantly in 16 species, 13 of which had longer asci in C than in B. The majority of the 11 species that did not differ significantly had the longest asci in C.

The picture was not so clear regarding ascus width. Here only seven differences were significant. Six species had wider asci in C, and in the 20 non-significant differences, 13 species had larger asci in C. Thus for a majority of species, the asci were larger in C than in B.

The size of the ascomata from the transect area fell within the ranges observed in the study at Troms (Mathiassen 1989).

## DISCUSSION

### RELATIONSHIPS BETWEEN TREE NUMBER AND NUMBER OF PYRENOAMYCETE SPECIES

For *Salix myrsinifolia* agg. in the SB region in Norway, a data-set of ten trees appears sufficient to give a good representation of the pyrenomycete flora. Although the data-set used for the test of representativity is not itself very representative for the total data-set being more species-rich than the average (5.9 species versus an overall average of 4.2 species), the results indicate that ten trees per section/region/taxon should give an acceptable representation of the fungal flora, and thereby be a good comprimize between representativity and time spent on field work (and laboratory identifications).

### SUBSTRATE ECOLOGY AND HOST SPECIFICITY

#### *Distribution of pyrenomycetes on hosts*

As in Troms (Mathiassen 1989), the highest number of samples were made on *Salix myrsinifolia* agg., but preferences for this group were considerably less pronounced in central Scandinavia than in Troms. Otherwise, the results of the present investigation are strikingly different from those of my previous study (Mathiassen 1989), as the pyrenomycetes also showed a marked preference for *S. caprea* agg., and were more evenly distributed on the other *Salix* species.

Due to the fact that the present fieldwork was carried out more systematically than in Troms, it is natural to think that the present data give a more reliable picture of the distributional pattern of the different species in Scandinavia, but it is impossible to draw further conclusions before a similar investigation has been undertaken in northern Fennoscandia. In general, fungi often have different main hosts in the marginal and central parts of their distribution area (Mathiassen 1989) and, until more data are available, I consider both investigations to give rough but realistic pictures of the distribution on the different *Salix* species.

When compared with the results of my previous investigation (Mathiassen 1989), it is also interesting to note that considerably fewer species appear to prefer *Salix myrsinifolia* agg. This is probably due to the pyrenomycetes being considerably more frequent, and more evenly distributed on the other *Salix* species than in Troms. The number of samples on *Salix myrsinifolia* agg. was slightly higher (ca. 40 coll.) in Troms (cf. Mathiassen 1989: Tab. 3). *Salix myrsinifolia* agg. was, in fact, examined in more localities in Troms than in the present investigation, and this is probably the reason for the difference in the number of samples.

The small group of species that were restricted to *Salix myrsinifolia* agg. and *S. caprea* agg. only (Tab. 3) were all represented by few samples, and the limited host range may therefore be incidental, at least for *Kirschsteiniothelia aethiops* and *Rhynchostoma minutum*. These two species were also rare in Troms (Mathiassen 1989: 18), but the situation is quite

different for *Cryptosphaeria subcutanea*. This species was found throughout the transect, and in all the vegetation regions, except LA (Tab. 6). If the results from my previous investigation (Mathiassen 1989) are also considered, the preference for *S. myrsinifolia* agg. seems to be a true distributional pattern for this species. The same tendency also seems to hold for *Melanopsamma pomiformis*, although one collection was found on *S. lanata* ssp. *lanata*.

*Enchnoa infernalis* and *Melanomma fuscidulum* showed a marked preference for *Salix myrsinifolia* agg., but they are both, in my opinion, too infrequent (cf. Tab. 3, Mathiassen 1989: Tab. 3), particularly in Troms, to justify a discussion on host preferences. The species that showed some preferences for *S. myrsinifolia* agg., namely *Diatrype bullata*, *Leptosphaeria tollens*, *Lophiostoma curtum* and *L. quadrinucleatum*, were all represented in many collections, and their preferences for *S. myrsinifolia* agg. are probably not incidental, particularly as they all showed the same preferences in Troms (cf. Mathiassen 1989: Tab. 3). As far as the material of the present investigation is considered, *Lophiostoma macrostomoides* appears to belong to the group of *S. myrsinifolia* preferentials. It was, however, not found on *S. myrsinifolia* agg. at all in Troms (cf. Mathiassen 1989: Tab. 3).

The high frequency of *Lophiotrema nucula* on *Salix caprea* agg. was surprising, particularly as it was mainly found on *S. myrsinifolia* agg. in Troms (Mathiassen 1989). The frequency of fungi on *S. caprea* agg. and on *S. pentandra* in Troms was low (cf. Mathiassen 1989: Tab. 3), but I have no good explanation as to why so many species (see above) were so frequent on these *Salix* species in central Scandinavia. However, I find this very interesting, and as pointed out above, one possible explanation is that these species actually have particular host preferences in marginal areas of their distribution. Further investigations are necessary, particularly in Finnmark, before more reliable conclusions can be drawn.

The high frequency of *Arthopyrenia lapponina* on *Salix glauca* ssp. *glauca* and *S. lapponum* agrees well with my previous investigation (Mathiassen 1989), but the preference for smooth bark seems to be more important for *A. lapponina* than preference for a particular *Salix* species.

The majority of the pyrenomycetes without preferences for one particular *Salix* species also have a wide range of hosts within and outside Scandinavia. They include *Anthostomella melanotes*, *Arthopyrenia lapponina*, *Bertia moriformis* var. *moriformis*, *Hypoxylon mammatum*, *Hysterographium elongatum*, *Lophiostoma compressum*, *L. macrostomoides*, *Melanomma pulvis-pyrius* and *Rebentischia massalongii*.

One important feature becomes evident when the results from the present and my previous investigations (Mathiassen 1989) are compared. Although the majority of the treated species are also found on other tree hosts, there are several species which are mainly, or very frequently found on *Salix*. With some confidence, I consider *Salix* as the main host for the following species in central and northern Scandinavia: *Anthostomella melanotes*, *Diatrype bullata*, *Enchnoa infernalis*, *Glyphium grisonense*, *Hypoxylon macrosporum*, *H. mammatum*, *Hysterographium elongatum*, *Lophiostoma curtum*, *L. macrostomoides* and *Lophiotrema boreale*. There is also much evidence that *Amphisphaerella erikssonii*, *Cryptodiaporthe salicella*, *Cryptosphaeria subcutanea*, *Keissleriella holmiorum*, *Leptosphaeria tollens* and *Saccardoella kanderana* are restricted to *Salix*. Although it is likely that at least some of these species will later be found on other tree genera, I am convinced that *Salix* still will remain their main host.

There are probably several reasons why some species are restricted to one particular host genus, among which the biochemical contents of the substrate is likely to be one of the most important. I have previously commented briefly on some features of host preference (Mathiassen 1989: 18-19), but laboratory experiments on the host/fungus preferences fall

beyond the scope of the present study. Future investigations of the pyrenomycete flora on *Salix* should include such experiments, and a thorough analysis of the biochemical contents of both bark and wood of the different *Salix* species.

#### *Distribution of pyrenomycetes on substrates*

It must be emphasized that the 220 investigated trees represent only a very small selection of all the trees in the transect but, as the selected trees appear to host a pyrenomycete flora representative for central Scandinavia (see below), the data on substrate preferences are probably reliable.

It is difficult to determine which ecological criterion is the most important for pyrenomycete substrate preference, but this study clearly shows that the species studied preferred different substrate types (Tab. 4). Chlebicki (1989) pointed out that the ascomata concentrations of several pyrenomycete species in Babiej Góry could be defined as communities or microcommunities within communities of higher plants, but no attempts at classifying the treated species in microcommunities were made in the present study.

*Kirschsteiniothelia aethiops* and *Rhynchostoma minutum* were rare in central Scandinavia, as they also were in Troms (Mathiassen 1989). I have seen too few samples of these species to be confident that they are lignicolous species, but I have always seen them reported as being found on wood (cf. Karsten 1873, Müller & Arx 1962, Sivanesan 1984, Hawksworth 1985a, Yue & Eriksson 1986). Earlier (Mathiassen 1989: 15), I considered *Anthostomella melanotes* and *Lophiostoma quadrinucleatum* as being lignicolous species, but these species had a broader ecological amplitude in central Scandinavia. However, the majority of the predominantly lignicolous species are the same as those mentioned from Troms (Mathiassen 1989: 15). They are all frequent, except *Bertia moriformis* var. *moriformis* and *Lophiotrema boreale*, and the apparent preference for wood may therefore be incidental for these two species.

All the species which did not show preference for any particular substrate type in Troms (cf. Mathiassen 1989: 15), showed the same tendency in the present investigation.

The corticolous species are the same as those mentioned earlier, except *Enchnoa infernalis* (cf. Mathiassen 1989: Tab. 2) which, in Troms, was found in one locality (one collection only). I therefore did not then (Mathiassen 1989) include it in this group. It is interesting to notice that the ascomata of the lignicolous species, or the species that show a marked preference for naked wood, are often also found on bark, while the corticolous species are more restricted to bark only. The same pattern was evident in Troms (cf. Mathiassen 1989: Tab. 2).

*Hypoxylon mammatum* is a corticolous species, but Granmo et al. (1989) describe it as lignicolous and erumpent through bark. For the majority of the corticolous species, the mycelium also spreads through wood, but this is often difficult to observe, particularly for stromatic species. The degree of stromatic development varies among stromatic pyrenomycetes (e.g. *Cryptosphaeria populina* (Pers. : Fr.) Sacc., *H. mammatum*, *Leucostoma niveum* (Hoffm. : Fr.) Höhnelt), but stromatic tissue is always visible, generally as a blackening of the host tissue, discrete or widespreading, restricted to bark, wood, or inhabiting both substrate types. In some corticolous species, the stroma or stromatic tissue is typically first visible in the bark only, but then gradually spreads into the wood. This is true for, e.g. *C. subcutanea*, *Diatrype bullata* and *H. mammatum*. The stromatic tissue is eventually always visible as black zones in bark, and in the underlying wood. It is therefore incorrect to consider

*H. mammatum* as a lignicolous species. The above mentioned species are all corticolous.

*Diatrype bullata* and *Hypoxylon mammatum* were often found high above ground level. Particularly in the Swedish SB area, these species grew close together on the same twigs or branches, but occupied different niches. The boundary between them was clearly visible, and *D. bullata* was always found above *H. mammatum*. I have no explanation to this zonation, but Chlebicki (1989) observed similar zonations among other pyrenomycete species.

The presence of a pyrenomycete species near the ground does not necessarily indicate a preference for moist conditions, as the microclimate near ground level also varies between localities. *Salix caprea* ssp. *sericea* normally grows in dry habitats, while *S. myrsinifolia* agg. grows in moist localities (cf. Fig. 9). Both *Bertia moriformis* var. *moriformis* and *Kirschsteiniothelia aethiops* are rare, and the observed pattern may be incidental, while *Arthopyrenia lapponina*, *Hypoxylon macrosporum* and *Saccardoella kanderana* were often found on *Salix glauca* ssp. *glauca* and *S. lapponum*, which are both rather low shrubs.

As a rule, the examined species occur in specific microhabitats, or show preferences for particular substrate types (see above), but the present study clearly illustrates that the majority of the species have a broader ecological amplitude than previously assumed (Mathiassen 1989).

### *Parasites and saprophytes*

Some of the primary saprophytic species showed parasitic preferences, while others showed preferences towards secondary saprophytism. Thus the following group assignments must be considered as tentative.

*Hypoxylon mammatum* and *Leptosphaeria tollens* seem to fit well among the primary saprophytes. However, as *H. mammatum* is probably an early invader, and *L. tollens* is able to sporulate on fresh, living substrate (Tab. 4), they are both probably parasitic in their first developmental stage, but then gradually become saprophytic. I earlier considered both species as primary saprophytes (Mathiassen 1989: 14). *Amphisphaerella erikssonii* is also a primary saprophyte, but has been found in wounds of living twigs, thus indicating a weak parasitic ability.

Among the primary saprophytes, *Lophiostoma curtum*, *Lophiotrema nucula* and *Melanomma pulvis-pyrius* have very wide ecological amplitudes, and show affinities towards other groups. *Lophiotrema nucula* has tendency towards secondary saprophytism, and the same tendency seems to be true for *Melanopsamma pomiformis*.

All the secondary saprophytes were infrequent, and the observed patterns may be incidental. However, *Kirschsteiniothelia aethiops* and *Rhynchostoma minutum* are, as far as I know, only reported from old wood (Karsten 1873, Müller & von Arx 1962, Sivanesan 1984, Hawksworth 1985a, Yue & Eriksson 1986), while *Bertia moriformis* var. *moriformis* is reported from decorticated wood (Munk 1957, Dennis 1978, Corlett & Krug 1984). Corlett & Krug (1984: 2561) described *B. moriformis* var. *moriformis* as growing most frequently on decorticated sound wood, but I consider decorticated twigs as being old and in the early process of deterioration.

I don't feel confident in considering *Capronia collapsa* and *Rebentischia massalongii* as hypersaprophytes, but an association with other fungi seems to be important. Hypersaprophytism is common in both the Herpotrichiellaceae and Tubeufiaceae.

## DISTRIBUTION

Morten Lange (cf. Korf 1982: 35) pointed out that comments on fungal distribution based on three to ten localities were at best sketchy, and that a species should not necessarily be considered as rare if it was found on one in ten, or even one in a thousand host plants. In this specialized field, the first problem is simply to find and identify the fungus. In addition, it is obvious that some distributional patterns, especially those of "rare" species, simply reflect where a mycologist has been (Korf 1982: 36).

In the present investigation, 104 localities were examined along the transect (Fig. 9). I therefore consider the investigation as giving a rough but fairly realistic picture of the distributional pattern for the majority of the treated species on *Salix* in central Scandinavia. However, the Swedish NB and LA regions were not investigated, and it was thus very difficult to group the species in relation to sectional preferences (Tab. 6). Some of the described distributional patterns may therefore prove to warrant revision.

As in Troms (Mathiassen 1989), the highest number of collections were made in the MB region, but the preferences for this region were considerably less pronounced than in Troms (Tab. 6, Mathiassen 1989: Tab. 4). In the present investigation, the species were more evenly distributed in the other vegetation regions, making it more difficult to assign them to any well defined and separated group.

When both investigations are considered, only the following species in group 1 seem to have a marked preference for the SB and MB regions; *Diatrype bullata*, *Enchnoa infernalis*, *Hypoxylon mammatum* and *Melanomma fuscidulum*.

The species in group 2 have different preferences for region and sections, but none of them were found in LA. However, in Troms, *Leptosphaeria tollens* and *Rebentischia massalongii* were found in LA (Mathiassen 1989: Tab. 4), and these species thus showing affinities to group 4 of Mathiassen (1989: 19). With the exception of *Cryptodiaporthe salicella*, the remaining species in this group fit well in group 2 in my previous study (Mathiassen 1989).

The species in group 3 are all frequent, but they have different regional and sectional preferences (Tab. 6). All except *Lophiostoma compressum* were placed in groups 2 and 3 in my previous study (Mathiassen 1989: Tab. 4). More localities in LA were examined in the present investigation than in Troms, and this may be the reason why these species were not found in true LA in Troms. *Lophiostoma compressum* s. lat. is included in group 3, but there are clear differences in regional preferences between the two "forms". If *L. compressum* was to be divided into two forms, the small-spored form should be included in group 4.

The species in group 4 are found in MB, NB and LA, and tend towards being continental and alpine in their distribution. The small-spored form of *Lophiostoma compressum* fits well in with this group, and *Lophiotrema boreale* (MB & NB) should probably also be included here, although it was not found in LA in the present investigation. Only three samples of *L. boreale* were found in the present investigation, but the 14 known samples (see Material examined & Appendix I) all indicate a continental preference. The species in this group probably have a distribution in Scandinavia similar to that of *Hypoxylon macrosporum*.

The species in group 5 were infrequent in both investigations, and the apparent regional preferences may therefore be incidental.

In addition to the continental and oceanic patterns mentioned above, the present study clearly shows that *Amphisphaerella erikssonii*, *Capronia collapsa*, *Cryptosphaeria subcutanea*, *Glyphium grisonense*, *Hypoxylon macrosporum*, *Lophiostoma compressum* (small-spored

form), *L. curtum* and *L. quadrinucleatum* are considerably more frequent in the northern parts of Scandinavia, at least on *Salix*, than in the southern parts. The opposite is the case for *Diatrype bullata*, *Enchnoa infernalis*, *Hysteroglyphium elongatum* and *Lophiostoma macrostomoides*. *Lophiotrema nucula* is probably widespread all over Scandinavia, but it seems to become more frequent towards the south.

The following species seem to be widespread over Scandinavia; *Anthostomella melanotes*, *Arthopyrenia lapponina*, *Keissleriella holmiorum*, *Leptosphaeria tollens*, *Lophiostoma compressum* s. lat., *Melanomma pulvis-pyrius*, *Rebentischia massalongii*, probably also *Bertia moriformis* var. *moriformis*, *Lophiotrema nucula* and *Rhynchostoma minutum*.

I have previously discussed the disjunct European distribution pattern of *Glyphium grisonense* and *Hypoxyton macrosporum* (Mathiassen 1985: 157, 1989: 21).

In my previous study (Mathiassen 1989), I gave several reasons for restricting my attention to one host genus and to a small geographical area. Although such a restriction is necessary, this study clearly illustrates that one should take care in drawing conclusions concerning the general ecology and distribution of pyrenomycetes. This topic is difficult and complex, and it is difficult or almost impossible to determine which is the most important criterion for pyrenomycete distribution among the many factors involved, e.g. climate, region, section, host, substrate. However, this study shows that the oceanicity of the climate is one important factor which influences the pyrenomycete species composition (see below).

## ORDINATION

The DCA results unequivocally show that all three variables encountered in this study, oceanicity, warmth and the substrate *Salix* species affect the distribution of pyrenomycetous fungi on *Salix*, thus corroborating the conclusions of my previous study (Mathiassen 1989), made without the aid of multivariate techniques. This study also shows that oceanicity is the one single factor among the three which most strongly influences the pyrenomycete species composition.

The pattern shown by the first two DCA axes indicates in a complex manner that the fungal flora is also differentiated along the regional gradient and among different hosts. However, the relative importance of region and taxon is not easily judged, as there are intercorrelations between the explanatory variables; the NB and LA regions only occur in the Norwegian section, and no *Salix* species have been investigated throughout all regions. The first DCA axis shows a sequence (in order of decreasing scores) from Sweden-SB to Norway-LA and Norway-SB, thus indicating a divergent pattern. This divergent pattern may have several causes: The ordination diagram (Figs 11, 12) shows a slight tongue effect (Minchin 1987, Økland 1990), that is a separation of trees along DCA 2 at one end of DCA 1 (the lower end), while the other end shows little separation. Økland (1990) discusses tongue effects in DCA, and concludes that such effects may result from shortcomings of the detrending procedure (due to inappropriate handling of gradients in species richness etc.), or they may represent a real gradient pattern (a secondary gradient only expressed near the end of the major gradient). Although the number of species per tree is generally low in this material, there are considerable and mostly consistent differences between the fungal flora on *Salix caprea* agg. and *S. myrsinifolia* agg. and *S. pentandra* on the one hand, and *S. glauca* ssp.



*glauca* and *S. lapponum* on the other, so that the presence of a secondary gradient in this case is well justified. The influence of region, independent of substrate species and section, is not easily judged, although some indications may be inferred: In the Swedish section, there is some displacement of *S. caprea* agg. and *S. myrsinifolia* agg. along DCA 1. In the Norwegian section, there are different trends among the *Salix* species. *Salix glauca* ssp. *glauca* and *S. lapponum* show displacement along DCA 1, *S. myrsinifolia* agg. shows displacement along DCA 2, *S. pentandra* shows displacement along DCA 1, but in the opposite direction, and finally, *S. caprea* agg. shows no consistent trend. From this we may conclude that the influence of region on the species composition is complex, and differs from species to species. There is a possibility that the amount of random variation in the data set (due to insufficient data set size) precludes the emergence of consistent trends, but the effect of host tree species is more likely to be more important than region, per se, as there are different patterns related to vegetation region for different host species. This is supported by the presence of species which are obviously more strongly related to host species than to region, e.g. *Arthopyrenia lapponina* on *S. glauca* ssp. *glauca* and *S. lapponum*. However, the distribution of species on the SRT combinations (Tab. 8) show that the species are, to a large extent, individualistic, dependent on differences in temperature requirements, and differences in substrate preferences at scales below the tree, i.e. preferences for bark versus wood, dead or living trees, rough or smooth bark, etc., and the differences in frequencies of these kinds of fine-scale substrates on the different host tree species and in different regions (see above).

## MORPHOLOGICAL VARIATION

A few species had smaller spores in central Scandinavia than in Troms, but no clear trends could be found in the material, except that the spores in SB-Norway were generally wider than in MB-Sweden (Tab. 9). The differences in spore sizes (cf. Mathiassen 1989: 22) could therefore not be explained by geographical variation.

The spores of *Anthostomella melanotes* and *Melanomma fuscidulum* decreased in size from Troms to central Scandinavia (Tab. 9), but the observed difference in *M. fuscidulum* (cf. Mathiassen 1989) was mainly due to the fact that the original description (Saccardo 1878) was based on only one single, immature sample. The majority of the spores in the type collection were small and immature. However, in another publication (Hilber & Hilber 1978b), spore sizes from central Europe agreed well with those from Troms.

The other four species, *Amphisphaerella erikssonii*, *Glyphium grisonense*, *Keissleriella holmiorum* and *Leptosphaeria tollens* are described as new species in the present paper. The observed differences in Troms (Mathiassen 1989) were therefore due to the comparison with different species.

Although there were several significant differences in spore characters between different geographical areas (Tab. 9), the treated species, except *Capronia nigerrima*, undoubtedly represent the same taxa as in Troms (Mathiassen 1989). The present study clearly shows that the variation in spore size and shape in different samples were just as pronounced within a small geographical area, as between areas situated far apart. The two collections of *Keissleriella holmiorum* from U.S.A. were identical with the material from Troms.

Other differences between pyrenomycetes from temperate regions and arctic areas (Savile 1963, 1972) are the deeper pigmented spores, the development of mucous sheaths, and

smaller ascomata in arctic areas.

Spores were usually darkest in LA for *Anthostomella melanotes* only, but were often light coloured in the material from the continental area in Sweden, for which I have no reasonable explanation.

The spores in *Arthopyrenia lapponina* are often enclosed in a mucous sheath, but this is not an adaption to alpine or arctic conditions, as mucous sheaths were observed just as often in MB as in LA.

However, ascomata seem to be smaller in central and northern Scandinavia than in central Europe. The ascomata of, e.g. *Melanomma fuscidulum* in Scandinavia were 300-500 µm diam., while those from central Europe, described by Hilber & Hilber (1978b), were 500-700 µm diam. (see also Mathiassen 1989: 22).

## TAXONOMIC CONSIDERATIONS

### *Herpotrichiellaceae*

Using material from Troms, I have earlier pointed out the close relationship between *Berlesiella* Sacc. and *Dictyotrichiella* Munk (cf. Mathiassen 1989: 24). In their work on the Herpotrichiellaceae, Müller et al. (1987) included *Berlesiella*, *Dictyotrichiella* and *Herpotrichiella* Petrak among synonyms for *Capronia* Sacc. Their conclusion was based on the variability of ascospore septation and stromatal development, and on the anamorph. Species with plurisporous asci were also included, and their dispositions are accepted here.

There seem to be many species of *Capronia*, considerably more than we recognize to this day. I have not found appropriate descriptions in the literature for the majority of my *Capronia* samples on *Salix* from northern Scandinavia. I have, for the time being, divided this material into different species groups, and some of these may represent new species or varieties. One large group, tentatively labelled *Herpotrichiella pilosella* var. "with long setae", was actually described as a new variety (*C. pilosella* var. *longiseta*) in 1990 (Nograsedk 1990: 104). My "*Berlesiella*" group on *Anthostomella melanotes* (Xylariaceae) is interesting, and the material probably represents a new species (G. Samuels in litt. 1991). Clearly, *Capronia* requires further taxonomic study.

Barr (1987) included the Herpotrichiellaceae among the Chaetothyriales, while Eriksson & Hawksworth (1990b) include it among the Dothideales.

### *Lophiostomataceae*

The slit-like ostioles and the flattened ascomatal papillae seem to be the only characters separating *Lophiostoma* Ces. & De Not. from *Massarina* Sacc., but these characters are not of particular importance at the family level (cf. Eriksson & Yue 1986: 251). According to Barr (1987), the Massarinaceae and the Lophiostomataceae are not separable from each other by any other combination of characters than those mentioned above, and the Massarinaceae was therefore included in the Lophiostomataceae by her (cf. Barr 1987: 106). The close relationship between these genera and families has previously been commented upon several times, e.g. by Eriksson (1967c, 1981), Eriksson & Yue (1986), Barr (1987), Holm & Holm

(1988), and *Massarina* was recently included in the Lophiostomataceae (Dothideales) by Eriksson & Hawksworth (1990d: 83), although on p. 42 they treat the Lophiostomataceae and the Massarinaceae as two separate families. Barr (1987) includes the Lophiostomataceae among the Pleosporales.

According to Barr (1987), the hamathecium in *Lophiostoma* consists of pseudoparaphyses, but this does not agree with my observations. In my opinion, the interascal threads in *Lophiostoma* are paraphysoids, which is in accordance with investigations carried out by, e.g. Chesters & Bell (1970b), Eriksson (1981), and Holm & Holm (1988). Chesters & Bell (1970b) made a thorough study of pseudothecium development in several species in Lophiostomataceae and concluded that the interascal threads were "pseudoparaphyses", but they obviously described and illustrated paraphysoids, in the sense of Eriksson (1981) and Hawksworth et al. (1983).

The distinction between paraphysoids and pseudoparaphyses is not always clear, and it is often difficult to separate the two. Eriksson (1981) reported paraphysoids in *Lophiostoma* and pseudoparaphyses "(or paraphysoids?)" in *Platystomum* Trev., while Barr (1987) reported the opposite.

The hamathecium is also variable within the same locule. In young, immature ascomata the filaments are broader than in mature ascomata. The length of the filaments increase by cell division, but they also seem to stretch, thus gradually becoming narrower as the ascomata increase in size. The lower part of the basal filaments is closely surrounded by asci. The basal filaments are broad at the base, but gradually taper towards the apex of the asci to form a uniform hamathecium structure above the asci. The peripheral filaments stretch very little as the ascomata increase in size, and they are always broader than the basal filaments in the upper part of the locule. As pointed out above, the identification of the hamathecium was thus always based on the uniform structure of the filaments above the asci.

I agree with Barr (1987, 1990a) that the hamathecium in *Lophiostoma compressum* consists of paraphysoids. Eriksson (1981) could not decide whether the hamathecium consists of pseudoparaphyses or paraphysoids. This is understandable, since the filaments may resemble pseudoparaphyses as they are often slightly broader in *L. compressum*, at least in Scandinavia, than in, e.g. *L. macrostomoides* and *L. quadrinucleatum*. The filaments are thus more "typical" paraphysoids in *L. macrostomoides* and *L. quadrinucleatum* than in *L. compressum*, and it is therefore impossible for me to agree with Barr (1987) in describing the filaments in *Lophiostoma* as pseudoparaphyses. Although some variation occurs, the hamathecium in *Platystomum*, *Lophiostoma* and *Lophiotrema* Sacc. consists, in my opinion, of paraphysoids. Therefore, when following Barr's (1987) system, the Lophiostomataceae should be placed among the Melanommatales, and not among the Pleosporales. The Lophiostomataceae is probably closely related to Melanommataceae, and previously, Barr (1979: 951) actually placed it near the Melanommataceae in Melanommatales (see also Eriksson 1981: 186).

No doubt, the structure of the hamathecium is important, but I am somewhat reluctant to accept the hamathecium as being the most important criterion in the classification of pyrenomycetes into higher taxa. There has undoubtedly been an evolution of the hamathecium since the origin of the pyrenomycetes, and we therefore have, as far as I know, no proof that there actually are fundamental differences between paraphysoids and pseudoparaphyses. Ove Eriksson (in litt. 1991) is confident that DNA-data are essential for a reliable classification of the pyrenomycetes into higher taxa.

Barr's (1987, 1990a) description of the peridium in *Lophiostoma compressum* as being composed of "rows of compressed cells" agree with my observations. Based on the

combination of characters such as the peridium, hamathecium, and the septation of the spores, she retained *Platystomum* as a separate genus in the Platystomaceae. As pointed out by Holm & Holm (1988), the peridial structure seems to be fairly constant within the species, although some variation occurs. There are also some differences in the peridial structure between immersed and more or less superficial ascomata, and between ascomata found in wood and bark, but the same variations are also found in *L. macrostomoides* and *L. quadrinucleatum*. I have found no principal differences between the peridial structure in *L. compressum* and the two species mentioned above. They all have rows of compressed cells, but the cells in *L. quadrinucleatum* are less elongate than in *L. compressum* (see also Holm & Holm 1988: Figs 64-69).

Holm & Holm (1988: 2, 25) retained *Lophiotrema* as distinct from *Lophiostoma*, and they discerned between two main types of peridium, the "*Lophiotrema*-type" and the "*Lophiostoma*-type". The peridium is undoubtedly different in *Lophiostoma compressum* and in *Lophiotrema nucula*, but the taxonomic significance of these differences is, according to Holm & Holm (1988: 2), uncertain. In retaining *Lophiotrema* as a separate genus within the Lophiostomataceae (Holm & Holm 1988), they pointed out that the group was somewhat vaguely circumscribed, and that the borderline between *Lophiotrema* and *Massarina* was probably diffuse. However, the cylindriaceous asci in *Lophiotrema* were a common diagnostic feature. *Lophiostoma curtum* is very important in this discussion. This species has muriform spores, cylindrical asci, and a peridial structure which is more similar to the "*Lophiotrema*-type" than the "*Lophiostoma*-type". Therefore, when considering all the species mentioned above, there seems to be a more or less continuous sequence in the differentiation of the peridial structure from *L. compressum* to *L. nucula*. This weakens the limits between *Lophiostoma* and *Lophiotrema*. The asci in *Massarina* are both cylindrical and clavate, and the mucous sheath surrounding the spores in some *Lophiotrema* species are also commonly found in *Massarina*. The terminal spore appendages found in several *Lophiostoma* species, and the mucous sheath surrounding the spores of some *Lophiotrema* species were considered to be taxonomically significant features by Holm & Holm (1988: 2, 3), but these features are important only at the species level.

In the present paper I have included *Platystomum* in *Lophiostoma*, and not *Lophiotrema*. In my opinion, the differences mentioned above are not sufficiently pronounced to justify the maintenance of three separate genera, and *Lophiotrema* should probably also be included in *Lophiostoma*. Eriksson & Hawksworth (1990d) have recently accepted *Lophiotrema* as being distinct from *Lophiostoma*, but more investigations on their circumscription, and on the borderline between these genera are necessary. *Lophiostoma* is a heterogenous taxon, typically variable both between and within the same species (cf. Holm & Holm 1988: 11-15). The features in common are the slit-like ostioles and the flattened ascomatal papillae, the hamathecium, and the more or less continuous sequence in the differentiation of the peridial structure. However, much remains to be done in *Lophiostoma*. Intergrading forms of familiar species are often found, and a good example is *L. caulium* (Fr.) Ces. & De Not., which Holm & Holm (1988) divided into five different "varieties", including the type variety. Even *L. compressum* seems to be problematic, and more field work is obviously needed.

### *Xylariaceae*

To confirm the teleomorph-anamorph relationship is important in modern mycological research. However, our knowledge about the anamorphs is still very limited, and mycologists

have jumped to conclusions about the anamorphs in the taxonomy of pyrenomycetes. The conidial states of many *Hypoxylon* Bull. : Fr. species (Xylariaceae) have been studied and described (e.g. Jong & Rogers 1972, Petrini & Müller 1986), but it is almost impossible to identify the anamorphs at the species level, and we are only able to assign the majority of them to particular form genera. Anamorphs belonging to the same form genus may indicate a close relationship of this group of species, although not necessarily so. In *Hypoxylon* for instance, the form genus *Virgariella* Hughes is found in two different sections, *Hypoxylon* and *Papillata*, while *Hadrotrichum* Fuckel and *Nodulisporium* Preuss are found in section *Hypoxylon* and *Primo-cinerea*. In addition, the form genus *Nodulisporium* pertains to *Daldinia* Ces. & De Not. (cf. Petrini & Müller 1986).

Twenty years ago, Jong & Rogers (1972) pointed out that the taxonomic-nomenclatural problems of conidial states of *Hypoxylon* were formidable. The species level of the anamorphs may be very important in taxonomy, but even today it is difficult to connect an anamorph state to a specific form genus. Whalley and Petrini (1984: 366) suggested that *Nodulisporium* is "the most suitable" form genus for the anamorph of *Hypoxylon macrosporum*, but it also has affinities to *Virgariella* "... the anamorph lacks the more elaborate branching and verticillate arrangement of conidiogenous cells typical of *Nodulisporium* and perhaps should be considered to have affinities to *Virgariella* Hughes".

*Hypoxylon macrosporum* was treated as a variety of *H. vogesiacum* (Pers. ex Curr.) Sacc. by Miller (1933), and later maintained at varietal rank by Whalley & Petrini (1984), Petrini (1985), Petrini & Müller (1986), and Granmo et al. (1989). Both anamorphs are placed in *Nodulisporium*, and I agree that they look similar. However, Petrini's drawings (1985: 92-94) of these varieties are misleading because they are not drawn on the same scale (e.g. Fig. 20 & 22). Also the measurements of the conidiogenous cells and the conidia given by Whalley & Petrini (1984: 366) are different from those given for *H. vogesiacum* s. lat. by Petrini & Müller (1986: 536). No doubt, these anamorphs are slightly different, at least morphologically, and should have been studied more carefully before firm conclusions were made (cf. Whalley & Petrini 1984: 368).

Characters which are considered to justify *Hypoxylon macrosporum* as a mere variety of *H. vogesiacum* by Petrini & Müller (1986) and Granmo et al. (1989) are said to be the similar anamorphs, the similar purplish colour of young stromata, and overlapping spore sizes. In my opinion, the following features are fully sufficient to consider *H. macrosporum* as a species, (1) anamorph, (2) distribution and ecology, (3) size of asci with its annulus (staining just faintly blue in M.r. and of different shape and size to those of var. *vogesiacum*) and (4) spores (shape, size and colour, the germ slit and the wall of the ascospores). One should also be consistent in the treatment of the characters within the genus, giving equal weight to ecology, distribution and anatomical features at each taxonomic level. When this is done, it is not possible to rank *H. macrosporum* lower than at the species level. DNA work may enlighten the problem about species delimitation, taking into consideration both the anamorph and teleomorph states.

## TAXONOMY

### KEY TO THE SPECIES

- 1 Ascospores 1-celled . . . . . 2  
 1 Ascospores 2- or more-celled . . . . . 8
- 2( 1) Ascospores allantoid, hyaline or light brownish . . . . . 3  
 2 Ascospores ellipsoid, light to dark brown . . . . . 5
- 3( 2) Astromatic, ascomata subepidermal in subiculum, ascospores 16.3-22.1 x 3.7-5  $\mu\text{m}$ ,  
 asci non-amyloid . . . . . *Enchnoa infernalis*  
 3 Stromatic, stromata well developed, asci non-amyloid . . . . . 4
- 4( 3) Stromata always covered by periderm, usually pulvinate, papillae prominent, sulcate,  
 ascospores 10.2-16.4 x 3.5-4.9  $\mu\text{m}$ , variable in shape *Cryptosphaeria subcutanea*  
 4 Stromata erumpent through bark, disc-shaped, circular to irregular, often coalescing,  
 surface rather smooth, ascospores 5-7.8 x 1-1.7  $\mu\text{m}$  . . . . . *Diatrype bullata*
- 5( 2) Ascospores with equatorially arranged germ pores . . . *Amphisphaerella erikssonii*  
 5 Ascospores with a germ slit . . . . . 6
- 6( 5) Stromata poorly developed, clypeoid, ascospores 11.5-17.3 x 5.5-7.7  $\mu\text{m}$ , asci non-  
 amyloid . . . . . *Anthostomella melanotes*  
 6 Stromata well developed, asci amyloid . . . . . 7
- 7( 6) Stromata usually growing in elongated bands close to bark on decorticated wood,  
 ascospores 22-35 x 8.3-12  $\mu\text{m}$ , germ slit indistinct . . . *Hypoxyton macrosporum*  
 7 Stromata erumpent through bark, orbicular to oval, strongly carbonized, ascospores  
 17.5-27 x 8.2-11.5  $\mu\text{m}$ , germ slit distinct . . . . . *Hypoxyton mammatum*
- 8( 1) Ascospores 2-celled . . . . . 9  
 8 Ascospores 3- or more-celled . . . . . 17
- 9( 8) Asci unitunicate, asci non-amyloid . . . . . 10  
 9 Asci bitunicate . . . . . 13
- 10( 9) Ascospores light brown, 7.6-11.5 x 3.4-4.9  $\mu\text{m}$ , adorned with parallel, diagonally  
 arranged ridges, neck long and cylindrical . . . . . *Rhynchostoma minutum*  
 10 Ascospores hyaline . . . . . 11
- 11(10) Ascomata immersed in bark, ascospores 14.7-23 x 4.9-7.2  $\mu\text{m}$  . . . . .  
 . . . . . *Cryptodiaporthe salicella*  
 11 Ascomata superficial . . . . . 12

- 12(11) Ascomata coarsly tuberculate, resembling small blackberries, ascospores 29.8-45.5 x 4.3-6.9  $\mu\text{m}$  . . . . . *Bertia moriformis* var. *moriformis*  
 12 Ascomata often collapsing to cup shape,  $\pm$  shiny black, ascospores 11.5-16.8 x 4.5-6.5  $\mu\text{m}$  . . . . . *Melanopsamma pomiformis*
- 13( 9) Ascospores olive-brown, 22.1-32.4 x 8.1-13.3  $\mu\text{m}$ ,  $\pm$  slipper shaped in outline, ascomata superficial and often  $\pm$  conical . . . . . *Kirschsteinothelia aethiops*  
 13 Ascospores hyaline . . . . . 14
- 14(13) Papilla covered with setae, ascospores 14-19.6 x 5.6-8  $\mu\text{m}$  *Keissleriella holmiorum*  
 14 Papilla without setae . . . . . 15
- 15(14) Papilla not prominent, ascomata scattered on bark, shiny black, ascospores 15-20 x 4.8-7  $\mu\text{m}$  . . . . . *Arthopyrenia lapponina*  
 15 Papilla prominent, laterally flattened, ascospores becoming 4-celled and light brown . . . . . 16
- 16(15) Ascospores 11.5-16.3 x 3.2-4.8  $\mu\text{m}$  . . . . . *Lophiotrema boreale*  
 16 Ascospores 17.3-24.1 x 5.5-7.2  $\mu\text{m}$  . . . . . *Lophiotrema nucula*
- 17( 8) Ascospores with transverse septa only . . . . . 18  
 17 Ascospores with transverse and longitudinal septa . . . . . 26
- 18(17) Ascospores 3 to 8-septate, greyish to light brown or brown at maturity . . . . . 20  
 18 Ascospores > 8-septate, ellipsoid or filiform . . . . . 19
- 19(18) Ascospores ellipsoid to broadly fusiform, 38.5-59.5 x 7.7-10  $\mu\text{m}$ , 11 to 18-septate, hyaline, ascomata immersed . . . . . *Saccardoella kanderana*  
 19 Ascospores filiform, 270-420 x 2.9-5.5  $\mu\text{m}$ , multiseptate, fragmenting before maturity into cylindrical, pale brown 3 to 7-septate units, ascomata superficial, ax-head shaped . . . . . *Glyphium grisonense*
- 20(18) Ascospores with a hyaline basal appendage, main body of ascospore 20.2-28.8 x 7.2-9.6  $\mu\text{m}$ , 4(-5-6)-septate, light brown . . . . . *Rebentischia massalongii*  
 20 Ascospores without such an appendage,  $\pm$  ellipsoid to fusiform . . . . . 21
- 21(20) Ascomata setose, ascospores 11.5-16.5 x 4.5-5.9  $\mu\text{m}$ , 3-septate, olive-greyish . . . . . *Capronia collapsa*  
 21 Ascomata glabrous . . . . . 22
- 22(21) Papilla laterally flattened . . . . . 25  
 22 Papilla not so, ascomata  $\pm$  globose . . . . . 23
- 23(22) Ascospores 20.2-27 x 6.7-9.2  $\mu\text{m}$ , 3(-5)-septate, light brown, ascomata shiny black, often coalescing . . . . . *Leptosphaeria tollens*  
 23 Ascospores smaller . . . . . 24

- 24(23) Ascospores 13.5-19 x 4.4-6.2  $\mu\text{m}$ , 3-septate, slightly curved, brown, papilla/neck prominent, cylindrical . . . . . *Melanomma fuscidulum*
- 24 Ascospores 14.4-20.2 x 5.3-7.4  $\mu\text{m}$ , 3-septate, olivaceous grey to pale brown, papilla not prominent, ascomata usually densely gregarious . . . *Melanomma pulvis-pyrius*
- 25(22) Ascospores 21-29 x 7-9.8  $\mu\text{m}$ , 3(-4-5)-septate, light ochre brown to dark brown . . . . . *Lophiostoma quadrinucleatum*
- 25 Ascospores 24.9-39.4 x 7-9.8  $\mu\text{m}$ , (4-)5-7(-8)-septate, brown . . . . . *Lophiostoma macrostomoides*
- 26(17) Ascomata in surface view  $\pm$  elliptical to fusiform, 0.8-2.2 mm long, ascospores 37.4-56 x 13.4-20.7  $\mu\text{m}$ , with (8-)9-12(-14) transverse septa and several longitudinal septa, orange brown to dark reddish brown . . . . . *Hysterographium elongatum*
- 26 Ascomata not so,  $\pm$  globose . . . . . 27
- 27(26) Ascomata setose, closely aggregated to form a compact stroma, ascospores 15-22 x 4-6  $\mu\text{m}$ , light olive-greyish, with 3-5(-7) transverse septa and middle cells usually longitudinally septate, saprophytic on old pyrenomycetous stromata . . . . . *Capronia nigerrima*
- 27 Ascomata glabrous, papilla laterally flattened . . . . . 28
- 28(27) Ascomata 550-800(-1050)  $\mu\text{m}$  diam., ascospores 19.5-29.8 x 8-10.9  $\mu\text{m}$ , oblong-ellipsoid, with 3-5(-8) transverse septa and (0-)1-3(-5) segments with 1(-2) longitudinal septa, brown, uni- to biseriate . . . . . *Lophiostoma compressum*
- 28 Ascomata 300-450(-600)  $\mu\text{m}$  diam., ascospores 14.5-21.1 x 5.5-8  $\mu\text{m}$ , subclavate, with 3-5(-6) transverse septa and (0-)1-2(-4) segments with one longitudinal septum, light ochre brown to brown, uniseriate . . . . . *Lophiostoma curtum*

## DESCRIPTIONS OF THE SPECIES

### *Amphisphaerella erikssonii* G. Mathiassen, sp. nov.

Refr. descr.: Mathiassen 1989: 27 (sub *Amphisphaerella* cf. *xylostei*). Refr. illustr.: Mathiassen 1989: Fig. 4 (sub *A. xylostei*).

*Stromata clypeoidea, interdum subnulla, saepius clypeos formantia 35-55  $\mu\text{m}$  crassos, nigros, sublucidos, e hyphis fuscis compositos parietes crassos praebentibus. Perithecia 360-540  $\mu\text{m}$  diam., globosa vel subglobosa, papillulata, partim vel omnino immersa, uno clypeo perithecium unicum vel saepius complura tegente. Ostiolum circulare, periphysibus circumdatum, 15-20  $\mu\text{m}$  diam. Peridium variae crassitudinis, plerumque 30-40  $\mu\text{m}$  crassum. Asci 125-185 x 10.5-15.2  $\mu\text{m}$  magni, media magnitudine 152.3 x 12.7  $\mu\text{m}$ , cylindrici, breviter stipitati, unitunicati, anulis apicalibus tenuibus amyloidibus, octo ascosporis unam seriem formantibus. Paraphyses ad bases 1-3(-3.5)  $\mu\text{m}$  diam., ad apices versus sensim attenuatae, numerosae, perlongae, septatae, diffuentes. Ascosporae (14.4-)15.3-21.2(-21.5) x (7.3-)7.7-10.6(-11.5)  $\mu\text{m}$  magnae, media magnitudine 18.1 x 9.0  $\mu\text{m}$ , late vel oblonge ellipsoides, unicellulares, fuscae contento saepe granulati, (3-)4(-5) poros aequatoriales manifestos monstrantes.*

Type: Norway: Tr.: Kåfjorddalen SE of Sabitjåkka EB 01.98 20 Aug 1983 *Salix lanata* ssp. *lanata* on wood and bark GM 2475a (TROM - holotype). Etymology: *Erikssonii* refers to Ove Eriksson, University of Umeå, Sweden.



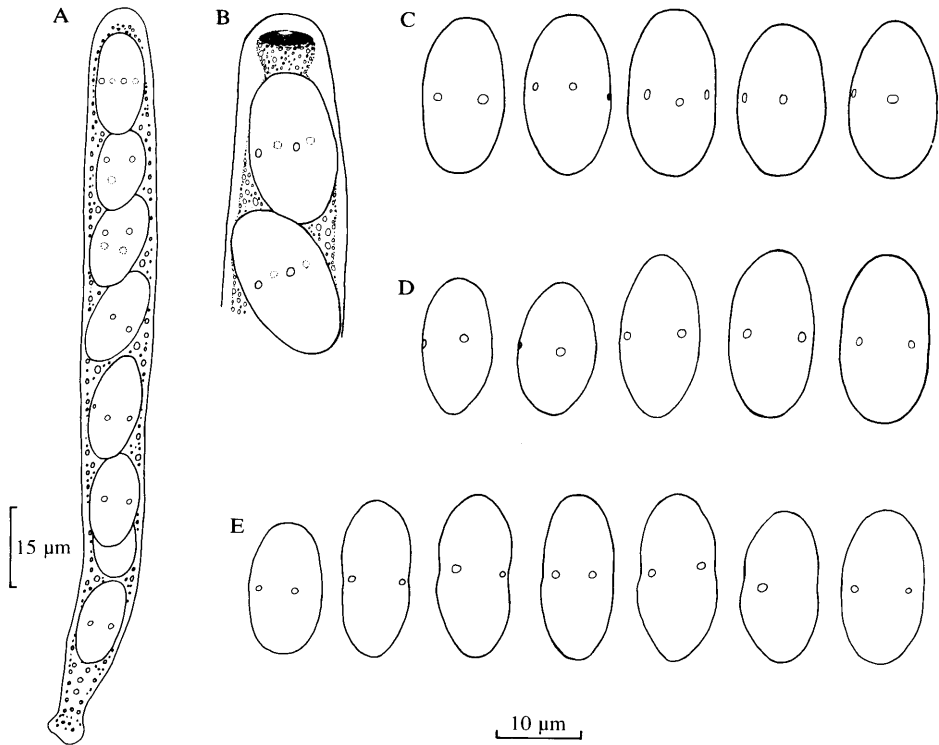


Fig. 95. *Amphisphaerella erikssonii*. A. Ascus with eight spores. GM 2524. B. Ascus apex. Treated with M.r. GM 2524. C-E. Spores. C. GM 2524. D. GM 2526. E. GM 2475a (type).

Figs 95, 96, 110.

**Description.** *Stromata* clypeoid, sometimes almost absent, but more often forming a 35-55 µm thick black, somewhat shiny clypeus, consisting of thick-walled, dark brown hyphae. *Perithecia* 360-540 µm diam., globose to subglobose, papillulate, partly to completely immersed, each beneath a clypeus. The clypeus covers a single perithecium or more often several perithecia growing close together. Ostiolum circular, periphysate, 15-20 µm diam. *Peridium* varying in thickness, generally 30-40 µm, consisting of an outer layer of thick-walled, elongated, brown cells, and an inner hyaline layer of thin-walled, isodiametric to somewhat elongated cells. Towards the papilla, the cells in the outer cell layer gradually turn to be more or less isodiametric. *Asci* 125-185 x 10.5-15.2 µm, mean 152.3 x 12.7 µm (n = 55), cylindrical, shortstiped, unitunicate, with a low, amyloid apical ring; with 8, uniseriate ascospore. *Paraphyses* 2-3(-3.5) µm wide at base, but gradually tapering towards apex, numerous, very long, septate, dissolving. *Ascospores* (14.4-)15.3-21.2(-21.5) x (7.3-)7.7-10.6(-11.5) µm, mean 18.1 x 9.0 µm,  $\bar{Q} = 2.0$  (n = 227), broadly ellipsoid to oblong-ellipsoid, one-celled, often with granular contents, brown to dark brown, and provided with (3-)4(-5) distinct, equatorial germ pores. The spore-wall seems to be slightly thickened around the pores.

**Nomenclatural and taxonomic notes.** *Amphisphaerella erikssonii* was previously treated as *A. cf. xylostei* (Mathiassen 1989: 27). The type material of *A. xylostei* was not examined, and the determination was based on the examined samples on *Lonicera* spp., and

on the descriptions given by other authors (Arx & Müller 1954, Munk 1957, Eriksson 1966a, Dennis 1978). They described *A. xylostei* as being very variable in both ascus and spore characters (e.g. Munk 1957, asci non-amyloid, ascospores 15-24 x 10-14  $\mu\text{m}$ ; Eriksson 1966a, asci amyloid, ascospores 14-18 x 6-9  $\mu\text{m}$ ), and I observed the same variability in the *Lonicera* material. The samples from *Salix* were all uniform, but as the spores in the material from Troms often turned out to be slightly different from those described in literature (cf. Mathiassen 1989: 22), I thought that these differences were probably due to geographical variation in spore size and the difference in hosts.

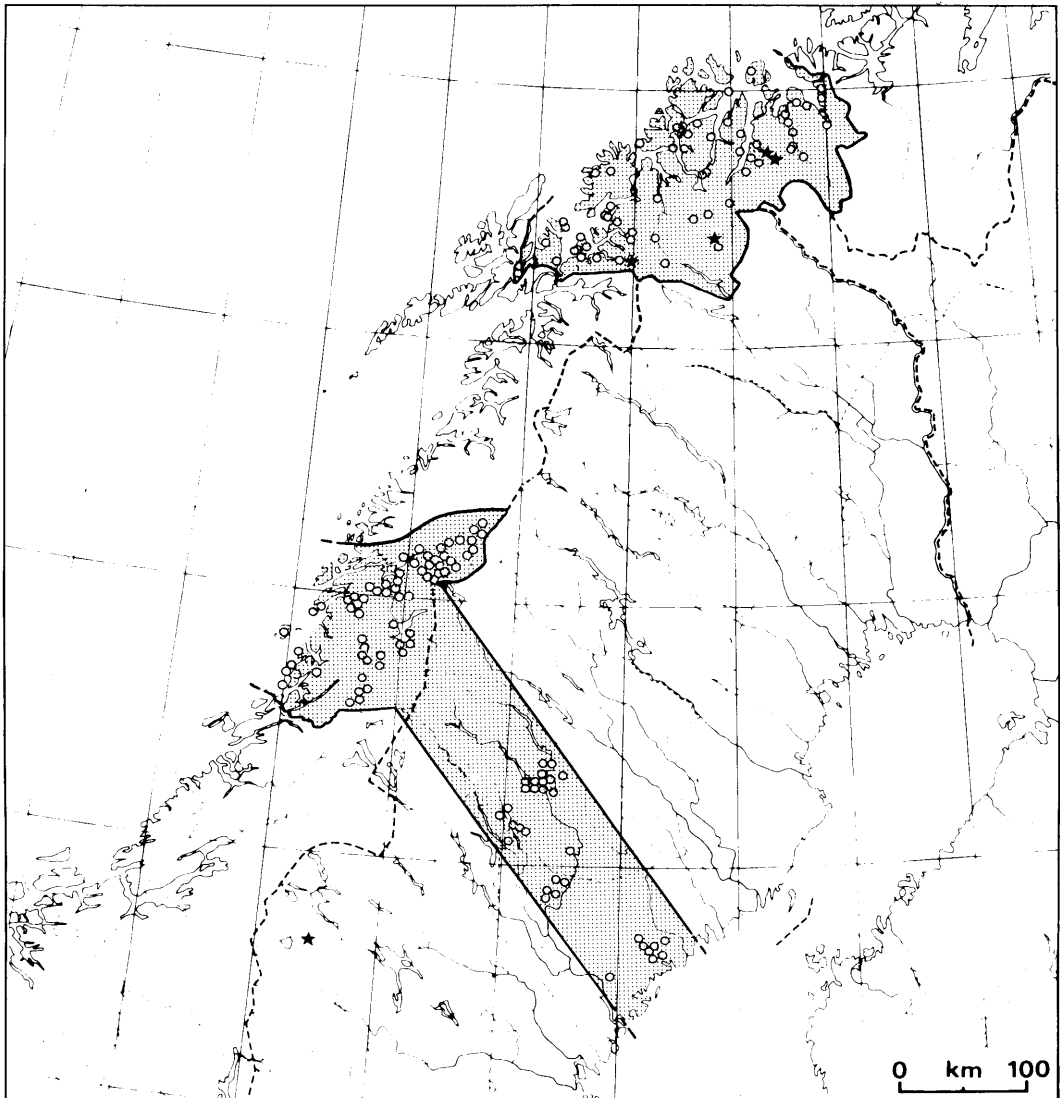


Fig. 96. Distribution map. *Amphisphaerella erikssonii*. Legend on p. 24.

*Amphisphaerella erikssonii* is easy to separate from *A. xylostei*. The type material of *A. xylostei* (L!) matches the descriptions given by Munk (1957) and Dennis (1978), but not those of Arx & Müller (1954), Eriksson (1966a), and Mathiassen (1989). The broad spores and the non-amyloid asci are typical for *A. xylostei*, while *A. erikssonii* has relatively narrow spores and amyloid asci.

The examination of all the Scandinavian collections labelled *Amphisphaerella xylostei* revealed two separate species on *Lonicera*; *A. xylostei*, and another *Amphisphaerella* species, probably undescribed, with amyloid asci. Because this particular species is often associated with *A. xylostei*, it has obviously been the cause of the many misinterpretations of *A. xylostei*. It is closely related to *A. erikssonii*, but separable on spore characters, small differences in the asci, ecology, hosts, and in the distribution pattern.

**Hosts.** *Amphisphaerella erikssonii* has so far only been found on *Salix*. It seems to have preference for *S. lanata* ssp. *lanata* (11 coll.), but was also found on *S. glauca* ssp. *glauca* (2 coll.) and *S. phlyicifolia* (1 coll.).

**Ecology.** Has preference for decorticated wood, but is also found on bark. It is a primary saprophyte, but has also been found in wounds of living twigs, thus indicating a weak parasitic ability. Usually found near ground level, but this is not necessarily an ecological adaptation because it was only collected from relatively low shrubs.

**Distribution.** Only known from Troms in North Norway, and from one alpine locality west of Östersund (Jmt) in central Sweden. I consider *Amphisphaerella erikssonii* as an alpine species and, as previously suggested (Mathiassen 1989: 19), continental in its distribution. It probably occurs in NB and alpine areas all along the Kjølén mountain range, but it was not found in the present investigation. It seems to be most frequent in the north. The Swedish locality is important in the discussion of its distribution, and it possibly occurs in the mountains even further south. As *Salix lanata* ssp. *lanata* and *S. glauca* ssp. *glauca* both are also common in MB and NB, the climatic conditions are probably more important for the distribution of this species than the substrate. Its distributional pattern is very similar to that of *Hypoxylon macrosporium*, but *A. erikssonii* seems to be more restricted to NB and LA, and to be more continental.

**Material examined** (in addition to the cited type). **Norway:** Tr: Lavangen: Høgtind Bukkemyra XS 15,19-20 22 Aug 1983 6 coll. *Salix glauca* ssp. *glauca* GM 2523a, *S. lanata* ssp. *lanata* GM 2524, 2526, 2533, 2547, *S. phlyicifolia* GM 2531. Målselv: Dividalen Dødesvann DB 45,41 21 Aug 1983 2 coll. *S. glauca* ssp. *glauca* GM 2496, *S. lanata* ssp. *lanata* GM 2499c. Kåfjord: Kåfjorddalen SE of Sabitjåkka EB 02,97 7 Sep 1982 2 coll. *S. lanata* ssp. *lanata* GM 1960b, 1963b. **Sweden:** Jmt: Åre: Åreskutan VL 00,30 13 Aug 1982 *S. lanata* ssp. *lanata* GM 2367a, 2368, 2376 (TROM).

### *Anthostomella melanotes* (Berk. & Br.) Martin

S. Afr. J. Bot. 42: 72 (1976) - *Sphaeria melanotes* Berk. & Br., Ann. Mag. nat. Hist. Ser. 2: 321 (No. 623 (1852) - *Anthostoma melanotes* (Berk. & Br.) Sacc., Michelia 1: 326 (1878) - Type: Great Britain, Batheaston, 11 Dec 1851, C.E. Broome (K!)

Refr. descr.: Mathiassen 1989: 29. Refr. illustr.: Mathiassen 1989: Fig. 5.

Exsic.: Romell, F. exsic. 66 (C).

Figs 14-16, 97, 99, 111.

**Description.** *Stromata* clypeoid. *Perithecia* 400-600(-800) µm diam., ± globose, immersed, usually scattered, papillate. *Asci* 101-135 x 8-11.1 µm, mean 115.6 x 9.5 µm (n = 64), cylindrical, non-amyloid. *Paraphyses* abundant. *Ascospores* (11.1-)-11.5-17.3(-19.2) x (4.8-)

5.5-7.7(-8.5)  $\mu\text{m}$ , mean 14.4 x 6.5  $\mu\text{m}$ ,  $\bar{Q} = 2.2$  (n = 800), gibbose to broadly ellipsoid, one-celled, brown, uniseriate. Germ slit indistinct.

**Taxonomic notes.** Taxonomic considerations on *Anthostomella melanotes* are previously given by me (Mathiassen 1989). The species is very uniform, and the type collection (K) matched my material perfectly. Typically, the spores often vary in shape within the same ascoma, and the same is true for the colour of the spores. Regional trends in spore colouration were also observed. Spores were usually darkest in LA, and were often rather light coloured in the material from the continental Vilhelmina-Junsele area in Sweden.

**Hosts.** Found on all the examined *Salix*-species. Shows no preference for one particular host species, and the same tendency was observed in Troms (Mathiassen 1989). In addition to *Salix*, *Anthostomella melanotes* has a wide range of hosts, e.g. *Acer*, *Castanea*, *Cytisus*, *Fraxinus*, *Quercus*, *Sorbus*, *Symphoricarpos* (cf. Mathiassen 1989, Appendix I). However, it does show preference for some particular host genera (Mathiassen 1989), and *Salix* seems to be its main host in Scandinavia. Within the transect it was found on *Salix caprea* ssp. *caprea* (30 coll.), and ssp. *sericea* (65 coll.), *S. glauca* ssp. *glauca* (37 coll.), *S. lapponum* (21 coll.), *S. myrsinifolia* ssp. *borealis* (22 coll.), and ssp. *myrsinifolia* (42 coll.), *S. pentandra* (35 coll.).

**Ecology.** As suggested by the wide distribution as well as the broad host range, *Anthostomella melanotes* seemed to have a broad ecological amplitude in Troms (Mathiassen 1989). This investigation clearly verifies and strengthens this assumption. Shows preference for decorticated wood, but found on all substrate categories. Mainly found on twigs and branches, and thrives on dry, as well as on rather moist substrate found near ground level. It is a primary saprophyte, but about 10% of the collections were found on decayed substrate. With regard to distribution, these adaptations must be very favourable.

**Distribution.** Found in all the vegetation regions. It is very common and rather evenly distributed throughout the transect, except for the coastal areas in Norway where it is rare. Most frequent in MB, particularly in the continental MB region in Sweden. This could indicate a weak continental preference, and it is actually more frequent around Örnsköldsvik (SB) in Sweden than in the oceanic SB region in Norway.

*Anthostomella melanotes* is the commonest species within the transect, and far more

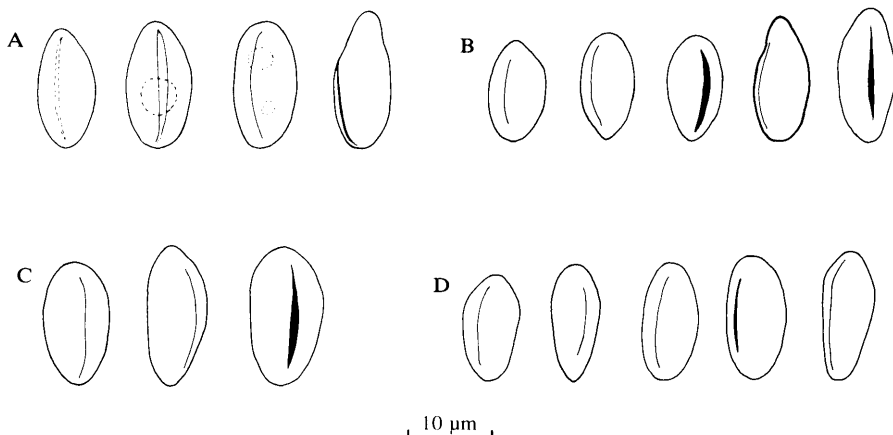


Fig. 97. *Anthostomella melanotes*. Spores. A. GM 623a. B. GM 3403a. C. GM 5260. D. Type.

frequent than in Troms (Mathiassen 1989). It is remarkable that this common species was unknown in Norway before I found it in Troms. However, it has also recently (1992) been found in Møre & Romsdal in southwestern Norway by S. Sivertsen (Sivertsen in litt. 1992). Nannfeldt (1969) reported it as quite common in Sweden, but only two samples have previously been found in the central and northern part of the country. It is also mentioned from Västergötland by Eliasson (1895), and nearly 30 samples are known from South Sweden. Only a few samples have so far been found in Finland.

**Material examined** (in addition to the cited type and exsiccata). **Norway:** No: Vefsn: Mosjøen W of Forsmoen VP 19,08 10 Jul 1987 *Salix caprea* ssp. *sericea* GM 5101, 5106, 5114, 5116a, 5119. - Drevja Forsmoen VP 19,17 11 Jul 1987 *S. glauca* ssp. *glauca* GM 5179a. - Drevja E of Nilsskogen VP 21,19 11 Jul 1987 *S. glauca* ssp. *glauca* GM 5187b, 5189, 5191, 5192, 5193, 5195. Grane: Majavatn S of Langås VN 22,24 1 Jul 1986 *S. glauca* ssp. *glauca* GM 3287a, 3289a. - Svenningdalen Svenningvik VN 24,46 2 Jul 1986 *S. caprea* ssp. *sericea* GM 3358. - Svenningdalen Fløtnes VN 25,66 3 Jul 1986 *S. caprea* ssp. *sericea* GM 3411b, 3416a, *S. myrsinifolia* ssp. *myrsinifolia* GM 3403a, 3404, 3405a, 3406a, 3407a, 3408a. - Grane S of Grane church VN 26,74 3 Jul 1986 *S. caprea* ssp. *sericea* GM 3506c, 3507a, 3510, 3511, *S. myrsinifolia* ssp. *myrsinifolia* GM 3459b, 3463, 3479, 3486, 3488, 3492, 3493b, 3494a, 3498, 3500a, 3502, *S. pentandra* GM 3447b, 3448a, 3465, 3467a. - Store Fiplingdalen N of Nerosen VN 38,55 4 Jul 1986 *S. lapponum* GM 3548a, 3549a, 3552. - Trofors at Båfjellmoen VN 25,68 27 Jul 1989 *S. caprea* ssp. *sericea* GM 7711b, 7772. *S. myrsinifolia* ssp. *myrsinifolia* GM 7787. Hattfjelldal: Røssvatnet Krutåga VN 61,85 7 Jul 1987 *S. myrsinifolia* ssp. *myrsinifolia* GM 4949a, 4956. - Hattfjelldal S of Øståsen VN 54,77 8 Jul 1987 *S. myrsinifolia* ssp. *myrsinifolia* GM 4978. - S of Røssvatnet Bjørkåsen VN 57,81 8 Jul 1987 *S. caprea* ssp. *sericea* GM 4997, *S. glauca* ssp. *glauca* GM 5029b, 5031, *S. myrsinifolia* ssp. *borealis* GM 5000, 5003, 5011, 5013, 5015a, 5057, 5058. - Røssvatnet near Grubben VN 60,82 9 Jul 1987 *S. myrsinifolia* ssp. *borealis* GM 5079, 5081. Hemnes: Korgfjellet SE of Ørntinden VP 41,27 20 Aug 1986 *S. glauca* ssp. *glauca* GM 4506, 4507. - Bryggfjelldalen Sjurfinnheimen VP 53,20-21 13 Jul 1987 *S. lapponum* GM 5260, 5261. - Korgfjellet S of Ørntinden VP 40-41,27 14 Jul 1987 *S. glauca* ssp. *glauca* GM 5297, *S. lapponum* GM 5292. - Bjerka S of Sjøenget VP 47,37 31 Jul 1989 *S. pentandra* GM 7893. - Sørfjorden Grønvikneset VP 40,40 1 Aug 1990 *S. lapponum* GM 8506, 8510, 8513a, 8514. Rana: Store Alteren VP 54,55 6 Aug 1987 *S. caprea* ssp. *sericea* GM 5785, 5786, 5790, 5791. - Nedre Jamtli VP 67,57 7 Aug 1987 *S. caprea* ssp. *sericea* GM 5835, 5836, 5837, 5839, 5841, 5842, 5844, 5845, *S. myrsinifolia* ssp. *borealis* GM 5803, 5807a, 5812a, 5820, 5821a, 5822a. - Randalen Stokkalia WP 11-12,76 21 Jul 1989 *S. glauca* ssp. *glauca* GM 7514a, 7527. - Randalen 2 km S of Bolna WP 10,73 21 Jul 1989 *S. caprea* ssp. *sericea* GM 7545. - Virvassdalen near Verdal WP 08,62 21 Jul 1989 *S. caprea* ssp. *sericea* GM 7548, 7555a. - Dunderlandsdalen near Storvollen VP 96-97,76 22 Jul 1989 *S. caprea* ssp. *sericea* GM 7574, 7576, 7589a. - Grønfjelldalen near Lappsætra VP 95,51 24 Jul 1989 *S. glauca* ssp. *glauca* GM 7659, 7661, 7664, 7665. - Plurdalen Tappeskard VP 85,55 25 Jul 1989 *S. myrsinifolia* ssp. *borealis* GM 7716, 7720, 7723a. - Grønfjelldalen S of Grønfjell VP 83,60 26 Jul 1989 *S. caprea* ssp. *sericea* GM 7739. - Plurdalen SE of Langfjellet VP 76,58 26 Jul 1989 *S. myrsinifolia* ssp. *myrsinifolia* GM 7758. - Langvatnet Røfsholm VP 67,63 1 Aug 1989 *S. lapponum* GM 7928, 7929a. - Skonseng near Seljehaugen VP 71,59-60 1 Aug 1989 *S. caprea* ssp. *sericea* GM 7952, 7953a, 7960, *S. pentandra* GM 7948. - Gruben N of Englia VP 65,55 20 Jul 1990 *S. pentandra* GM 8188, 8207. - Villen near Lynghaug VP 71,55 24 Jul 1990 *S. lapponum* GM 8282. - Saltfjellet Arctic Circle WP 15,82 25 Jul 1990 *S. glauca* ssp. *glauca* GM 8292, 8299. - Nedre Jamtli VP 67,57 7 Aug 1987 *S. myrsinifolia* ssp. *borealis* GM 5823. Saltdal: Saltfjellet near Sukkertoppen WP 15,87 20 Jul 1989 *S. glauca* ssp. *glauca* GM 7504, 7505a. **Sweden:** Ång: Kramfors: Almsjönäs N of Norr-Almsjön CR 98,50 3 Aug 1987 *S. caprea* ssp. *caprea* GM 5682, 5683a, 5685, 5686, 5688, 5689, *S. myrsinifolia* ssp. *myrsinifolia* GM 5668, 5669, 5678, 5679a, 5681. Sollefteå: Junsele Pustviken W of the road WL 66,95-96 4 Aug 1989 *S. pentandra* GM 8033, 8034, 8036, 8038. - Junsele Pustviken E of the road WL 66,96 4 Aug 1989 *S. pentandra* GM 8071, 8082a, 8084. - Lillsele W of Ångermanälven XL 76,03 30 Jul 1990 *S. myrsinifolia* ssp. *myrsinifolia* GM 8461a. - Lillsele E of Ångermanälven XL 76,03 31 Jul 1990 *S. myrsinifolia* ssp. *myrsinifolia* GM 8480, 8481, 8481c, 8483, 8486. Örnsköldsvik: Örnsköldsvik N of Sundåsen CR 17,83 1 Aug 1987 *S. caprea* ssp. *caprea* GM 5535, 5541. - Vågefjärden Vikbotten CR 12,89 2 Aug 1987 *S. myrsinifolia* ssp. *myrsinifolia* GM 5613. - Arnäs E of Älvsjösjön CR 25-26,90 4 Aug 1987 *S. caprea* ssp. *caprea* GM 5719a, 5720, 5723, *S. pentandra* GM 5756a. - Haffstafjärden N of Billsta CR 25,75 8 Jul 1988 *S. caprea* ssp. *caprea* GM 5958, 5964, 9 Jul 1988 GM 6006, 6009, 6010, 6012a, 6015, 6017a, 6047a, 6067, 6095, 6096a, 6097, 8 Jul 1988 *S. pentandra* GM 5938, 5945, 5973, 5977, 6001. - Haffstafjärden SE of Gala CR 27,74 10 Jul 1988 *S. pentandra* GM 6122, 6124. Jmt: Åre: Supra Mörviken 3 Sep 1931 *Salix* sp. A.G. Eliasson

"*Anthostoma melanotes*" (S). Nb: Luleå: Jul 1915 *Sorbus aucuparia* J. Lind "*Anthostoma melanotes*" (C). ÅsL: Dorotea: N of Ormsjön along Stutvattenbäcken WM 49,45 11 Jul 1988 *S. caprea* ssp. *sericea* GM 6183, 6184a, 6185, 6186, 6187, 6189, *S. pentandra* GM 6160, 6161, 6168. - Ormsjön near Lövstrand WM 40,48 11 Jul 1988 *S. myrsinifolia* ssp. *borealis* GM 6201, 6202a, 6203. - W of Dorotea WM 26,66 12 Jul 1988 *S. myrsinifolia* ssp. *myrsinifolia* GM 6231a, 6235. - Dorotea along Bergvattenån WM 26,67 12 Jul 1988 *S. caprea* ssp. *sericea* GM 6283, 6285, 6286b, 6289, 6291. Vilhelmina: Djupdal WM 59,65 5 Jul 1986 *S. caprea* ssp. *caprea* GM 3556, 3559a, 3560b, 3562, *S. caprea* ssp. *sericea* GM 3571a, 3574, 3575a, 3578, 3579a, 3580, 3582, 3586, 3596, 3597, 3598, 3599a, 3600, 3602. - E of Djupdal Svältmyran WM 60,71 6 Jul 1986 *S. lapponum* GM 3707, 3709, 3712a, 3717a, 3719, 3720, 3722a. - Vilhelmina Lövåsen WM 62,83 8 Jul 1986 *S. caprea* ssp. *sericea* GM 3755, 3756, 3789, *S. myrsinifolia* ssp. *myrsinifolia* GM 3764, 3769, 3771, 3772, 3774, 3778. - W of Bäksjön L. Annevare WM 81,98 29 Jul 1987 *S. glauca* ssp. *glauca* GM 5334, 5335, 5337, 5338. - Vilhelmina WM 66,80 30 Jul 1987 *S. caprea* ssp. *caprea* GM 5382, 5383. - SE of Siksjön along Siksjöbäcken WM 68,88 30 Jul 1987 *S. glauca* ssp. *glauca* GM 5389, 5410, 5413, 5415. - Bäksjöle E of Vojmån WM 68,89 30 Jul 1987 *S. glauca* ssp. *glauca* GM 5459, 5461b, 5461f, 5465, *S. lapponum* GM 5457, *S. pentandra* GM 5428, 5431, 5433a, 30 Jul 1990 GM 8388, 8392, 8396a, 8396b. - Vilhelmina W of Lövåsen WM 62,83 5 Aug 1989 *S. glauca* ssp. *glauca* GM 8155. Åsele: Gavsele W of Ångermanälven XL 99,10 30 Jul 1990 *S. pentandra* GM 8436, 8445.

### *Arthopyrenia lapponina* Anzi

Comm. Soc. critt. ital. 2: 25 (1864) - Type: Anzi Lang. 347, Italy, Bormio, *Salix lapponum*, Anzi (FH, iso!) - *Verrucaria epidermis* var. *fallax* Nyl., Bot. Not. 1852: 178 (1852) - Type: Finland, Holmia, Nylander 955 (H, holo!) - Other synonyms; see Harris (1975).

Refr.: Harris 1975: 56, Mathiassen 1989: 31. Refr. illustr.: Harris 1975: Figs 53-59, Mathiassen 1989: Fig. 8. Exsic.: Malmé, Lich. succ. 542 (C, H) - Malmé, Lich. succ. 892 (C, LD, H) - Lich. fenn. 344, 345 (C).

Figs 17-19, 98, 100, 112.

**Description.** *Pseudothecia* 230-500µm diam., subglobose to flattened, scattered in the upper layer of periderm, shiny black; basal tissue thin or lacking. Asci 57-97 x 11.5-17.3 µm, mean 77.3 x 14.9 µm (n = 29), clavate to narrowly ellipsoid. *Pseudoparaphyses* 2-2.5 µm

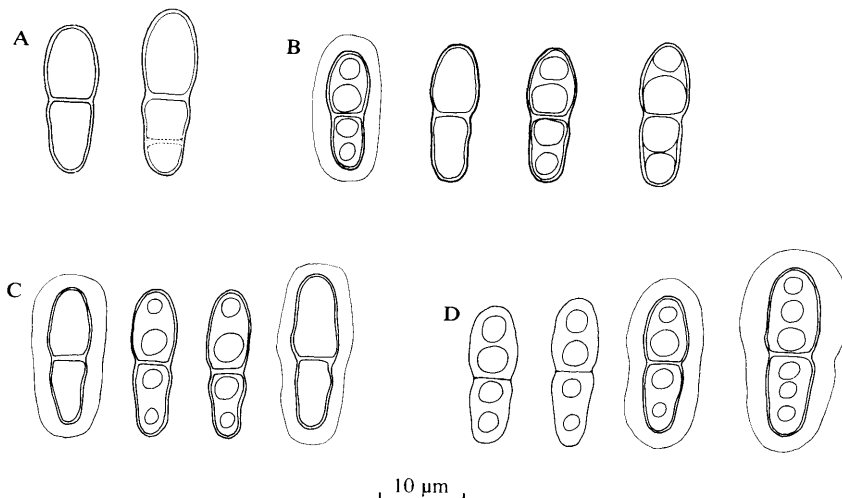


Fig. 98. *Arthopyrenia lapponina*. Spores. A. GM 2062a. B. GM 443. C. GM 5246. D. Type.

diam., abundant, septate, branched and anastomosing. *Ascospores* (13.9-)15-20(-22) x (4.5-)4.8-7(-7.8)  $\mu\text{m}$ , mean 17.4 x 5.7  $\mu\text{m}$ ,  $Q = 3.0$  ( $n = 380$ ), narrowly obovoid, two-celled, hyaline, often enclosed in a thick mucous sheath, irregularly biseriate.

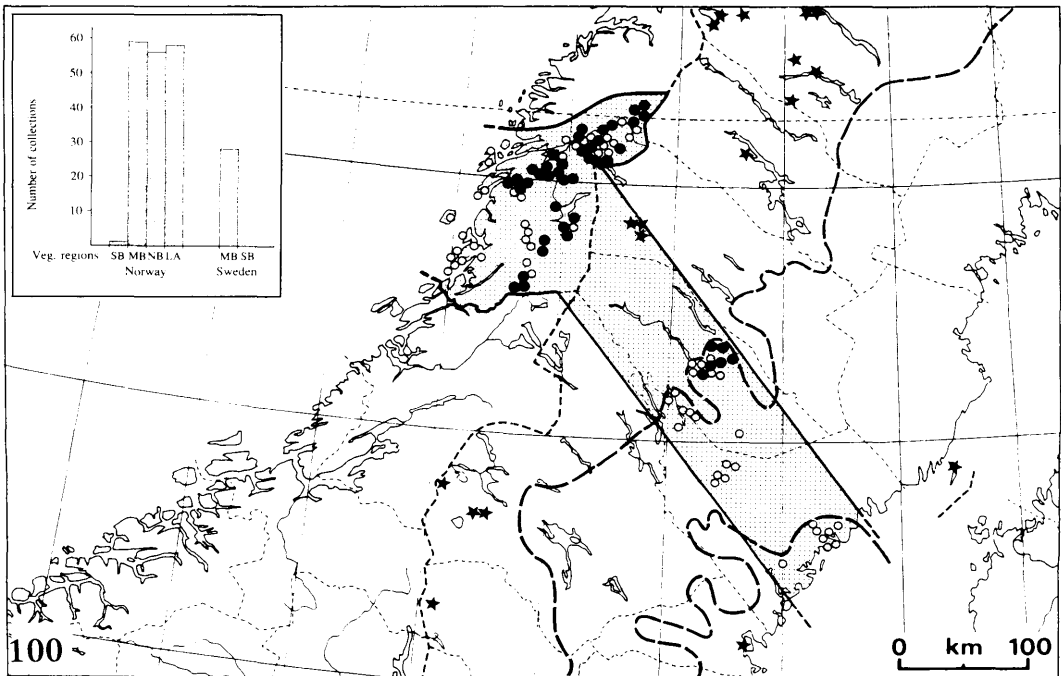
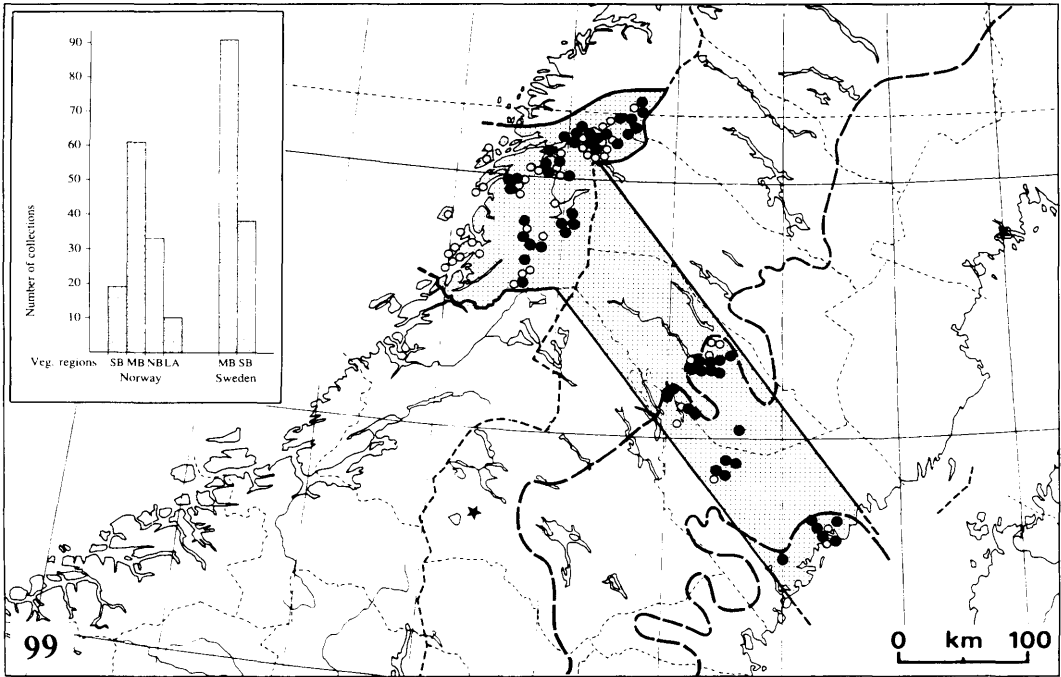
**Taxonomic notes.** *Arthopyrenia lapponina* is very uniform on *Salix*, but the ascomata often vary, and are slightly different on other host genera. The spores are often enclosed in a mucous sheath. This was most frequently observed in the LA collections from Troms (Mathiassen 1989), and I therefore thought this might be an adaptation to alpine conditions. However, to the contrary, mucous sheaths were in the present investigation observed just as often in MB as in LA.

**Hosts.** Most frequently found on the medium shrubs *Salix glauca* ssp. *glauca* (83 coll.) and *S. lapponum* (105 coll.), but some samples were also found on *S. myrsinifolia* ssp. *borealis* (5 coll.), and ssp. *myrsinifolia* (9 coll.). In Troms (Mathiassen 1989) it was found on other *Salix* species, and was therefore put in the group of species with no particular host preference. However, it was most frequently found on the medium and low shrubs, which have smooth bark, and this seems to be an ecological adaptation (see below). *Arthopyrenia lapponina* has a wide host range (cf. Material examined).

**Ecology.** A corticolous species, most frequently found on dead bark. About 25% of the collections were found on living substrate, but *Arthopyrenia lapponina* seems to cause very little damage. It prefers smooth bark (cf. Harris 1975), and this character seems to be more important for *A. lapponina* than the particular *Salix* species. All the medium and low shrubs have smooth bark, but material for this study was only collected from *S. glauca* ssp. *glauca* and *S. lapponum*. On *Salix* it is most common on twigs, and often found below the snow line. This was also pointed out by Øvstedal (1980), but is not necessarily an ecological adaptation. Neither *S. glauca* ssp. *glauca* nor *S. lapponum* are usually very tall, and a major part of these species is therefore always snow covered in winter.

**Distribution.** As in Troms (Mathiassen 1989), it is very common in MB, NB and LA. Only one sample was found in SB. It has previously been found in the Swedish SB area, and I expect it to be more common in SB than this study suggests. As suggested above, *Arthopyrenia lapponina* seems to have preference for the *Salix* species with smooth bark, but material was not collected from any of these species in the SB regions. *Arthopyrenia lapponina* is widespread all over Fennoscandia.

**Material examined** (in addition to the cited types and exsiccatae). Norway: Te: Tokke: Høydalsmo 19 Aug 1887 *Sorbus* sp. J.M. Norman, det. B. J. Coppins (BG). VA: Vennessla: Pr. Mosby 21 Jul 1939 *Corylus* sp. A.H. Magnusson "*Didymella fallax*" (C). Ro: Tysvær: Kårstø 21 Jan 1981 *Fraxinus excelsior* L. Skjolddal (BG). - Kårstø Kleiva gård 21 Jan 1981 *Corylus avellana* L. Skjolddal 17 (BG). - Kårstø Kleiva gård 21 Jan 1981 *Quercus* sp. L. Skjolddal 18 (BG). - Kårstø Sletta gård 28 May 1981 *Quercus* sp. 2 coll. L. Skjolddal 19 & 20 (BG). Karmøy: Myklebust Apr 1971 D.O. Øvstedal (BG). Ho: Sund: Steinsland Nov 1967 D.O. Øvstedal, det. R. Santesson (BG). Modalen: Vikanes 1 May 1974 D.O. Øvstedal, det. B. Coppins (BG). Lindås: Lauvås Oct 1976 D.O. Øvstedal (BG). - S of Mongstad 5 Mar 1977 *Sorbus aucuparia* D.O. Øvstedal (BG). - Isdal Apr 1977 *Populus tremula* D.O. Øvstedal (BG). Fjell: Solsvik 10 May 1978 *Sorbus aucuparia* D.O. Øvstedal (BG). Tysnes: Heggland 16 Aug 1978 *Corylus* V. Søchting "*Arthopyrenia fallax*" (C). Austevoll: Litla Karlsøy 13 Jun 1981 *Crataegus curvisepala* D.O. Øvstedal (BG). SF: Høyanger: Østerbø 13 Aug 1983 *Betula pubescens* L. Skjolddal 204 (BG). No: Vefsn: Fustvatnet S of Straum VP 27,12 10 Jul 1987 *Salix myrsinifolia* ssp. *myrsinifolia* GM 5125a, 5128. - Mjåvatnet near Sandvik VP 27,14 10 Jul 1987 *S. glauca* ssp. *glauca* GM 5146a, 5150a, 5156a, 5157. *S. lapponum* GM 5162a, 5163a. - Luktvatnet N of Myrenga VP 32,25 29 Jul 1989 *S. glauca* ssp. *glauca* GM 7859, 7859a, 7863. - Luktvatnet Dyrvika VP 33,26 29 Jul 1989 *S. lapponum* GM 7868, 7869, 7870, 7871a. - Drevja Forsmoen VP 19,17 11 Jul 1987 *S. glauca* ssp. *glauca* GM 5179, 5180. - Drevja E of Nilsskogen VP 21,19 11 Jul 1987 *S. glauca* ssp. *glauca* GM 5191a, 5199. Grane: Majavatn E of Stortjønnå VN 22,22 1 Jul 1986 *S. lapponum* GM 3267a. - Majavatn S of Langås VN 22,24 1 Jul 1986 *S. glauca* ssp. *glauca* GM 3282a, 3287b, 3288. - Majavatn Myrstad VN 24,32 2 Jul 1986 *S. lapponum* GM 3319b, 3322a, 3325a, 3326a. - Lille Fipling-



Figs 99-100. Distribution maps. Fig. 99. *Anthostomella melanotes*. Fig. 100. *Arthopyrenia lapponina*. Legend on p. 24.



dalen N of Storbakken VN 37.63 4 Jul 1986 *S. glauca* ssp. *glauca* GM 3523, 3524. - Store Fiplingdalen N of Nerosen VN 38,55 4 Jul 1986 *S. lapponum* GM 3533a, 3534, 3535a, 3536a, 3537, 3538, 3546, 3547, 3548, 3549, 3550. Hattfjellidal: Røssvatnet Krutåga VN 61.85 7 Jul 1987 *S. lapponum* GM 4894a, 4897a, 4904, 4906a, 4908. - Hattfjellidal S of Øståsen VN 54.77 8 Jul 1987 *S. myrsinifolia* ssp. *myrsinifolia* GM 4969, 4976. - S of Røssvatnet Bjørkåsen VN 57.81 8 Jul 1987 *S. glauca* ssp. *glauca* GM 5030, 5033a, *S. myrsinifolia* ssp. *borealis* GM 4999c. Hennes: Korgfjellet SE of Ørntinden VP 41,27 20 Aug 1986 *S. glauca* ssp. *glauca* GM 4507a, *S. lapponum* GM 4495, 4496. - Bryggfjellidalen Innerdalen VP 51-52,21 13 Jul 1987 *S. glauca* ssp. *glauca* GM 5221, 5222. - Bryggfjellidalen Sjurfinnheimen VP 53,20-21 13 Jul 1987 *S. glauca* ssp. *glauca* GM 5244a, 5245, 5246, 5246b, 5248, 5276b, 5277, 5277a, *S. lapponum* GM 5241, 5241c, 5242, 5242b, 5260a. - Korgfjellet S of Ørntinden VP 40-41,27 14 Jul 1987 *S. glauca* ssp. *glauca* GM 5298a, 5300, *S. lapponum* GM 5280a, 5281, 5281a, 5284, 5286a, 5287a, 5288, 5289. - Tustervatnet S of Tustervatn VP 50,00 14 Jul 1987 *S. myrsinifolia* ssp. *borealis* GM 5318a, 5321a, 5327. - Bjerka S of Sjøenget VP 47,37 31 Jul 1989 *S. glauca* ssp. *glauca* GM 7900c, 7900d, 7902, 7907, 7907a, *S. lapponum* GM 7914a, 7915. - Bjerka E of Vallabotnet VP 47,36 31 Jul 1989 *S. lapponum* GM 7918a, 7921a, 7924, 7924a. - Sørfjorden Grønvikneset VP 40,40 1 Aug 1990 *S. glauca* ssp. *glauca* GM 8522, 8526, 8528, *S. lapponum* GM 8504, 8506a, 8513, 8520, 8533. Rana: Saltfjellet N of Stødi WP 15,83 19 Aug 1986 *S. lapponum* GM 4459, 4464, 4465, 4474, 4478. - Nedre Jamtlia VP 67,57 7 Aug 1987 *S. myrsinifolia* ssp. *borealis* GM 5821c. - Randalen Stokkalia WP 11-12,76 21 Jul 1989 *S. glauca* ssp. *glauca* GM 7513c. - Dunderlandsdalen Grotjørenget VP 93,72 22 Jul 1989 *S. myrsinifolia* ssp. *myrsinifolia* GM 7598a, 7599b, 7604a. - Dunderlandsdalen Oppdalheia VP 83,62 22 Jul 1989 *S. glauca* ssp. *glauca* GM 7609a, 7611. - Grønfjellidalen near Lappsætra VP 95,51 24 Jul 1989 *S. glauca* ssp. *glauca* GM 7659a, 7661a, 7665a. - Plurdalen Kaldvatnet W of Revet VP 89,47 25 Jul 1989 *S. glauca* ssp. *glauca* GM 7698a, 7699b, 7701a, 7704b, 7705, 7715. - Plurdalen SE of Langfjellet VP 76,58 26 Jul 1989 *S. myrsinifolia* ssp. *myrsinifolia* GM 7752, 7760a. - Umshardet SE of Umshardtjønnna VP 80-81,40 25 Jul 1989 *S. glauca* ssp. *glauca* GM 7737, 7737a, *S. lapponum* GM 7728a, 7729, 7732. - Umshardalen S of Store Umshardtva VP 79,42 2 Aug 1989 *S. glauca* ssp. *glauca* GM 7961, 7961a, 7964a, 7965, 7965b, 7969. - Langvatnet Røfsholm VP 67,63 1 Aug 1989 *S. lapponum* GM 7928a, 7929, 7931, 7932a, 7933. - Illgruben VP 70,54 19 Jul 1990 *S. lapponum* GM 8165, 8166, 8171, 8173. - Utsikten VP 72,53 23 Jul 1990 *S. glauca* ssp. *glauca* GM 8243, 8253, 8255, 8258, 8259, *S. lapponum* GM 8263, 8271, 8274c, 8275, 8277. - Villen near Lynghaug VP 71,55 24 Jul 1990 *S. lapponum* GM 8279, 8280, 8280a, 8284, 8286. - Saltfjellet Arctic Circle WP 15,82 25 Jul 1990 *S. glauca* ssp. *glauca* GM 8293, 8294, 8296, 8298, *S. lapponum* GM 8300, 8301a, 8302, 8307, 8309, 8311. Lurøy: Nesøya Sørnes 8 Aug 1876 J.M. Norman, det D.O. Øvstedal (TROM). Saltdal: Saltfjellet near Sukkertoppen VP 15,87 20 Jul 1989 *S. glauca* ssp. *glauca* GM 7505c, *S. lapponum* GM 7489, 7490a, 7494a, 7497a, 7498a. Tysfjord: Storåvand 5 Aug 1878 *Salix* sp. J.M. Norman (O). Vågan: Pr. Svolvær s. dat. J.M. Norman "*Arthopyrenia fallax*" (TRH). Tr: Bardu: Setermoen Jan 1976 *Sorbus aucuparia* D.O. Øvstedal (BG). Balsfjord: Balsfjordeidet 1877 *Salix lapponum* J.M. Norman (O). Berg: Straumsbotn s. dat. *Salix* sp. J. M. Norman (O). Tromsø: Tromsø "ad Ladenæs" s. dat. *Salix* sp. J.M. Norman (O). - Tromsdalen 8 May 1983 *Alnus incana* D.O. Øvstedal, S. Spjelkavik, A. Elvebakk, det. D.O. Øvstedal (TROM). - Kroken 28 May 1983 *Sorbus aucuparia* A. Elvebakk 83:075 (TROM). Karlsøy: Hansnes Sep 1982 *S. aucuparia* D.O. Øvstedal (BG). Fi: Hammerfest: Storfjellet s. dat. *Salix galuca* 5 coll. J.M. Norman (O, TRH, TROM). Lebesby: Mastervik s. dat. *S. lapponum* J.M. Norman (O). Sweden: Sk: Östra Göinge: Hjartsås 22 Jun 1932 *Sorbus?* C. Stenholm "*Didymella fallax*" (H). Mpd: Sundsvall: Söderåsen 9 Jun 1899 *Quercus* sp. A. Alsthin "*Arthopyrenia fallax*" (BG, H). Hrj: Härjedalen: Fjällnäs Jul 1924 *Salix glauca* E.P. Vrang "*Arthopyrenia fallax*" (BG, H). Jmt: Åre: Pr. Åre Jul 1887, associated with *Arthopyrenia padi* Rabenh. and *Cryptosphaeria subcutanea* (Wahl. : Fr.) Rappaz, A.G. Grevillius (S). - Storlien 31 Jul 1909 E.P. Vrang "*Arthopyrenia fallax*" (H, LD). Åre: Åreskutan VL 00,30 13 Aug 1982 *Salix lapponum* GM 2372, 2374 (TROM), *S. glauca* ssp. *glauca* GM 2375 (TROM), *S. lanata* ssp. *lanata* GM 2376a (TROM). Vb: Umeå: Holmön pr. Umeå Jun 1909 *Salix* sp., associated with *Lophiostoma compressum* J. Vleugel (C). Lerum: Skallsjø 4 Oct 1931 *Sorbus?* C. Stenholm (H). ÅsL: Vilhelmina: E of Djupdal Svältmyran WM 60.71 6 Jul 1986 *S. lapponum* GM 3717b, 3721c. - W of Bäsksjön L. Annevare WM 81,98 29 Jul 1987 *S. glauca* ssp. *glauca* GM 5334a, 5335c, 5338a. - SE of Siksjön along Siksjöbacken WM 68,88 30 Jul 1987 *S. glauca* ssp. *glauca* GM 5399, 5400a, 5402a, 5412a. - Bäsksele E of Vojmån WM 68,89 30 Jul 1987 *S. glauca* ssp. *glauca* GM 5461c, 5464a, 5465a, *S. lapponum* GM 5457a. - Storsele W of Vojmån WM 86,85 29 Jul 1990 *S. lapponum* GM 8315a, 8316, 8317, 8318, 8320, 8341b, 8343a, 8345a, 8346, 8347, 8348. - Storsele E of Vojmån WM 86,85 29 Jul 1990 *S. glauca* ssp. *glauca* GM 8352, 8354, 8361, 8367. LyL: Tärna: Yttervik 8 Jul 1924 *Alnus* sp. A.H. Magnusson 7919 "*Didymella fallax*" (UPS). - Yttervik by Stensjöbacken 9 Jul 1924 *Betula* sp. A.H. Magnusson 8021 "*Didymella fallax* v. *crætægi*" (UPS). - Yttervik near Häutajavre 10 Jul 1924 *Salix* sp. A.H. Magnusson 8094a "*Didymella fallax*" (UPS). - Laxfjället 11

Jul 1924 *Sorbus aucuparia* A.H. Magnusson 8111 "*Didymella fallax*" (UPS). - Björkfors near Syterbäcken 15 Jul 1924 *Salix lapponum* A.H. Magnusson 8267 "*Didymella fallax*" (UPS). PL: Arjeplog: Jäkkvik, Peljekaise 4 Jul 1919 C. Stenholm "*Didymella fallax*" (UPS). LL: Gällivare: Stora Luleälv, Satisjaure 10 Jul 1963 *Salix* sp. G. Eriksson 470 "*Arthopyrenia fallax*" (UPS). - Satisjaure, Vietasjokka 31 Jul 1963 *Salix* sp. G. Eriksson 700c "*Arthopyrenia fallax*" (UPS). - Pätsasjaure 6 Aug 1962 *Salix caprea* G. Eriksson 222 "*Arthopyrenia fallax*" (UPS). Jokkmokk: Snjäckrak 1864 *Salix* sp. P.J. Hellbom (S, UPS). - Virihaure area 31 Jul 1941 *Salix lanata*, & ibid. 2 Aug 1941 *S. glauca* G. Degelius "*Arthopyrenia fallax*" (UPS). - Lilla Luleälv, Blackälven 2 Jul 1963 *S. caprea* G. Eriksson 43 "*Arthopyrenia fallax*" (UPS). - Lilla Luleälv, Peuraure 12 Jul 1966 *S. hastata* G. Gilenstam 1515c "*Arthopyrenia fallax*" (UPS). - Lilla Luleälv, Sitojaure 8 Jul 1964 *Salix* sp. G. Gilenstam 979c "*Arthopyrenia fallax*" (UPS). - Sarek, W of Perikjaure 2 Aug 1962 *Salix* sp. L. Tibell 1369 "*Didymella fallax*" (UPS). TL: Karesuando Nielo 19 Jul 1910 B. Lyngé "*Arthopyrenia fallax*" (BG). Kiruna: Vadjetjåkka Nat. Park 15 Jun 1984 *Salix* sp. V. Alstrup (C). - Jukkasjärvi, Jebrenjokk 29 Jul 1916 *Salix* sp. E. Häyrén, det. A.H. Magnusson "*Didymella fallax*" (H), ibid. 15 Jul 1921 *Alnus incana* 4 coll. A.H. Magnusson (S, UPS), & ibid. 16 Jul 1921 *Betula* sp. A.H. Magnusson (S, UPS).

### *Bertia moriformis* (Tode : Fr.) De Not. var. *moriformis*

G. bot. ital. 1: 335 (1844) - *Sphaeria moriformis* Tode : Fr., Syst. mycol. 2: 458 (1823); Tode, Fungi Mecklenb. sel. 2: 22 (1791). - Type: Not seen. - Synonymes; see Corlett & Krug (1984).

Refr. descr.: Corlett & Krug 1984: 2561, Mathiassen 1989: 34. Refr. illustr.: Mathiassen 1989: Fig. 10. Exsic.: Fr., Scl. succ. 125 (UPS).

Figs 20-22, 101, 103.

**Description.** *Perithecia* up to 1000 µm high and 700 µm diam., superficial, scattered or crowded, coarsely tuberculate, often laterally collapsed, black. *Asci* 57-93 p.sp. x 11.5-19.5 µm, mean 75.7 x 15.2 µm (n = 63), clavate, long-stiped, non-amyloid. *Ascospores* (27-)29.8-48.5(-50.6) x (3.8-)4.3-6.9(-7.2) µm, mean 39.4 x 5.3 µm,  $\bar{Q} = 7.5$  (n = 240), fusiform, strait to curved, 1(-3)-septate, hyaline.

**Taxonomic notes.** The reasons for still keeping *Bertia* within the Nitschkiaceae were discussed in detail by Eriksson & Santesson (1986) and Eriksson & Hawksworth (1989), and are therefore not discussed further here.

*Bertia moriformis* var. *latispora* Corlett & Krug, and var. *multiseptata* Sivanesan are distinguishable from the type variety on mature spore characters only. The variety *latispora*, which also is found in Scandinavia, seems to be a distinct variety, but I have some reservations in accepting var. *multiseptata*. Corlett & Krug (1984) found one sample with pluriseptate, *latispora*-like spores, but they did not erect a new taxon for this sample. I consider that this particular sample only represents a pluriseptate condition of var. *latispora*, and var. *multiseptata* as the pluriseptate equivalent of the type variety. Normally, the spores in *B. moriformis* var. *moriformis* are one septate, but spores with 1-3 real septa are occasionally observed in some collections. However, the spores in the type variety tend to be multiseptate, because the content of the spores often split up, particularly in H<sub>2</sub>O, forming 2, 4 or 6 pseudosepta. Corlett & Krug (1984) suggested that pluriseptation might be the natural condition at spore maturation just prior to spore germination. I have examined a lot of old spores from different samples, and formation of additional septa was not observed.

The present investigation revealed *Bertia moriformis* s. lat. to be more diverse than indicated by Corlett & Krug (1984). About 75% (16 samples) of the material collected as *B. moriformis* was rejected. The ascomata and asci were too large, and the spores too long (up to 75 µm) and broad to fit within var. *moriformis*, or the other varieties. In appearance it is

similar to *B. moriformis* var. *moriformis*, but considerably larger in all characters. Karsten's (1888) description of *Bertia moriformis* var. *majuscula* from Mustiala in Finland agrees well with this material, but I have not examined his sample. One particular sample from central Sweden (S) is important, because it probably represents the pluriseptate condition of my cf. var. *majuscula* material. The spores generally had 1-6 real septa, but spores with only two septa were frequently observed. These two-septated spores had no median septation, but the septa were located between the ends and the middle of the spores, thus dividing the spores into three more or less equal parts.

I have not succeeded in tracing the type material of *Bertia moriformis* var. *moriformis*. However, Tode's herbarium is, according to Hawksworth (1974), destroyed and the type material is probably lost. Tode's original illustrations (1791: Fig. 90a-c) are good, and should be selected as the type, but as no spores are figured, we can't be sure whether his illustrations represent the type variety or some of the other varieties. Another solution is to designate the collection cited by Fries (1823: 458 = Fr. Scl. suc. 125) as the type of *B. moriformis* var.

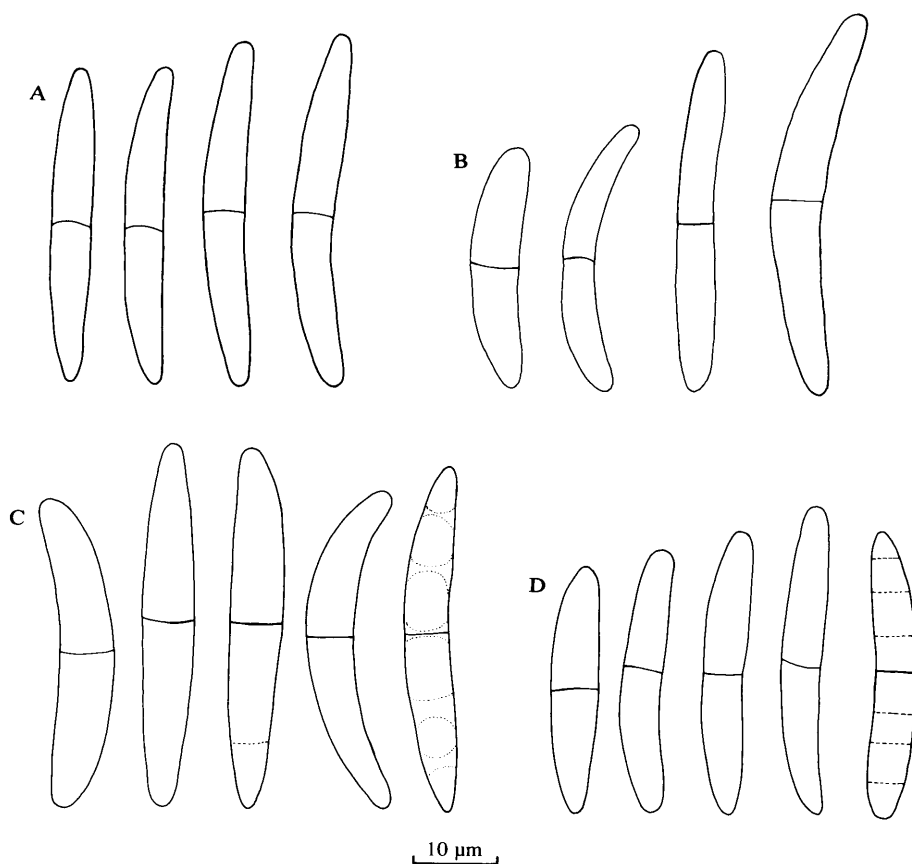


Fig. 101. *Bertia moriformis* var. *moriformis*. Spores. A. GM 817a. B. GM 7580. C. GM 2724. D. GM 4789.

*moriformis*.

**Hosts.** Found only on the large trees *Salix caprea* ssp. *caprea* (1 coll.), and ssp. *sericea* (2 coll.), and *S. pentandra* (2 coll.). In Troms it was most frequently found on *S. myrsinifolia* agg. (Mathiassen 1989). *Bertia moriformis* var. *moriformis* has a wide host range (cf. Mathiassen 1989, Material examined, Appendix I).

**Ecology.** Mainly found on decorticated wood on old substrate, and always collected near, or at ground level. It seems to prefer moist conditions and fits fairly well among the secondary saprophytes, as suggested earlier (Mathiassen 1989: 14). It is of course impossible to make ecological conclusions on a few collections only, but var. *moriformis* seems to have the same ecology as the cf. var. *majuscula*-samples, which were typically found on decayed substrate near ground level.

**Distribution.** Very rare on *Salix* within the transect area, and only found in the Norwegian SB and MB regions. In Troms (Mathiassen 1989) it was fairly common, and evenly distributed all over the county, except in LA. In Sweden, it was considered as fairly common by Fries (1817), and later as very common by Nannfeldt (1969). It actually seems to be common all over Fennoscandia.

**Material examined** (in addition to the cited exsiccata). **Norway:** O: Oslo: Montebello s. dat. & nom. coll. (C). - Sine loc. 1840 *Salix* sp. s. nom. coll. (C). Vf: Larvik: Larvik 3 Sep 1879, associated with *Melanomma pulvis-pyrius*, A. Blytt (O). Sem: Gullkrona 18 Sep 1982 S. Aase (O). Nøtterøy: Hella 13 Nov 1982 *Polydesmia pruinosa* S. Aase (O). - Hella 27 Oct 1983 *Fagus* sp. S. Aase (O). Ho: Stord: Ådland 5 May 1986 S. Olsen (BG). No: Sømna: Sømna S of Vennesund UN 61-62,35 5 Jul 1987 *Salix caprea* ssp. *caprea* GM 4789. Alstahaug: Offersøya N of Vågen UP 84,07 25 Jun 1986 S. *pentandra* GM 2724. Grane: Grane S of Grane church VN 26,74 28 Jul 1989 S. *pentandra* GM 7819. Rana: Dunderlandsdalen near Storvollen VP 96-97,76 22 Jul 1989 S. *caprea* ssp. *sericea* GM 7580, 7592. Saltdal: Pr. Balvatnet NE 28 Aug 1988 A.-E. Torkelsen 207/88 (O). **Sweden:** Bl: Ronneby: Ronneby Aug 1887 *Fagus?* L. Romell (C). Sm: Hylte: Femsjö 2 coll. E. Fries (UPS). Kalmar: Skärvsjö 20 Mar 1982 H.F. Göttsche (C). Jmt: Krokomb: Västerberg VL 50,40 11 Aug 1982 *Salix caprea* ssp. *caprea* GM 2339, 2345 (TROM). Östersund: Sunne Andersön nature reserv. 12 Aug 1982 *Populus* sp. E. Johannesen, det. A. Granmo (S). - Andersön VL 70,00 12 Aug 1982 *Salix caprea* ssp. *caprea* GM 2353 (TROM, Oulu). Åre: Pr. Åre 11 Aug 1931 *Rubus idaeus* A.G. Eliasson (S). Vb: Umeå: Böle Jun 1909 *Alnus* sp. J. Vleugel (S). - Innertavle 20 Oct 1971 *Salix caprea* Å. Strid 9378, det. G. Mathiassen (S). - Ersmark 30 Oct 1983 *Rhamnus frangula* O. Eriksson (UME 27411). LL: Jokkmokk: Låddepakta *Salix nigricans* 28 Jul 1901 T. Vestergren, det. J. Lind (C). TL: Kiruna: Jukkasjärvi Nuolja 9 Aug 1909 *Salix* sp. L. Romell (S), ibid. 4 Sep 1910 *Betula* sp. L. Romell (UPS), & ibid. 4 Jul 1928 *Salix* sp. J.A. Nannfeldt 1060 (UPS). - Jukkasjärvi 16 Jul 1928 *Betula* sp. J.A. Nannfeldt 1323 (UPS).

### *Capronia collapsa* (Mathiassen) Barr

Mycotaxon 41: 427 (1991) - *Herpotrichiella collapsa* Mathiassen, Sommerfeltia 9: 51 (1989) - Type: Norway: Tr: Kåfjord: Kåfjorddalen EB 02,97 7 Sep 1982 *Salix lanata* ssp. *lanata* GM 1969a (TROM, holotype!).

Refr. discr.: Mathiassen 1989: 51. Refr. illustr.: Mathiassen 1989; Figs 37, 41-44.

Figs 23-25, 102A-F, 104, 113.

**Description.** *Pseudothecia* 120-240(-300)µm diam., typically collapsing, superficial, scattered, papillate, black. Densely covered with thick-walled, dark brown setae 15-70 x 3-4 µm. Ostioles periphysate. Asci 48-72 x 10-13.5 µm, mean 60.7 x 11.7 µm (n = 41), subcylindrical or saccate, ascus wall thicker above than below. *Hamathecium* of short, apical periphysoids. *Ascospores* (10.6-)11.5-16.5(-18.4) x (4-)4.5-5.9(-6.5) µm, mean 13.8 x 5.2 µm,  $\bar{Q} = 2.7$  (n = 460), broadly ellipsoid-fusiform, 3-septate, light olive-greyish to light brown, overlapping biseriate or crowded in ascus.

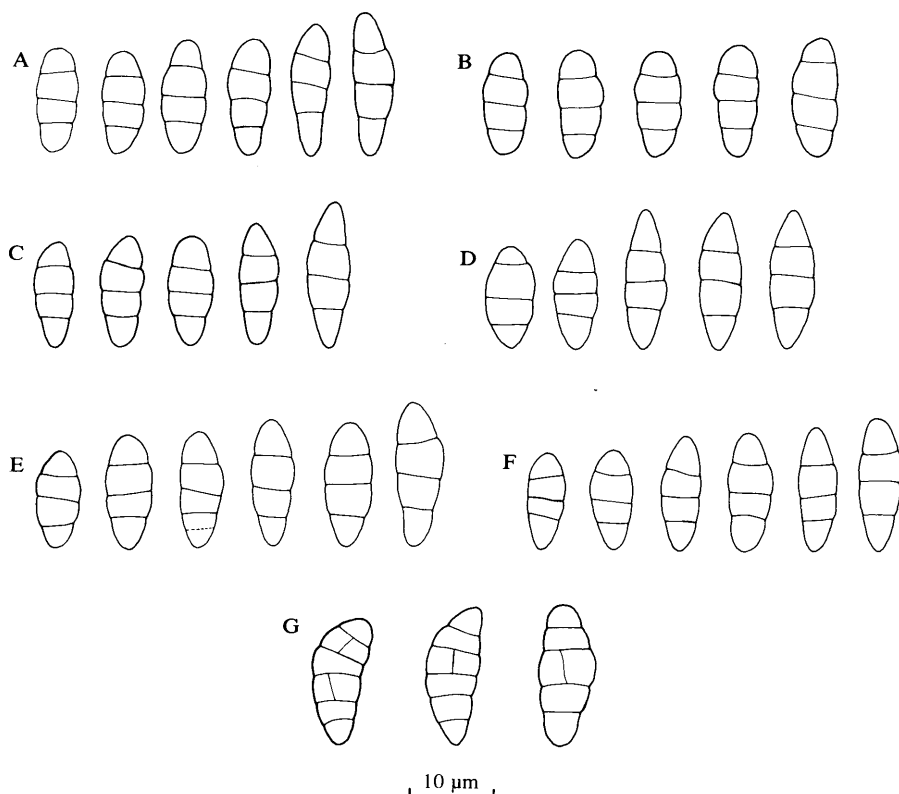
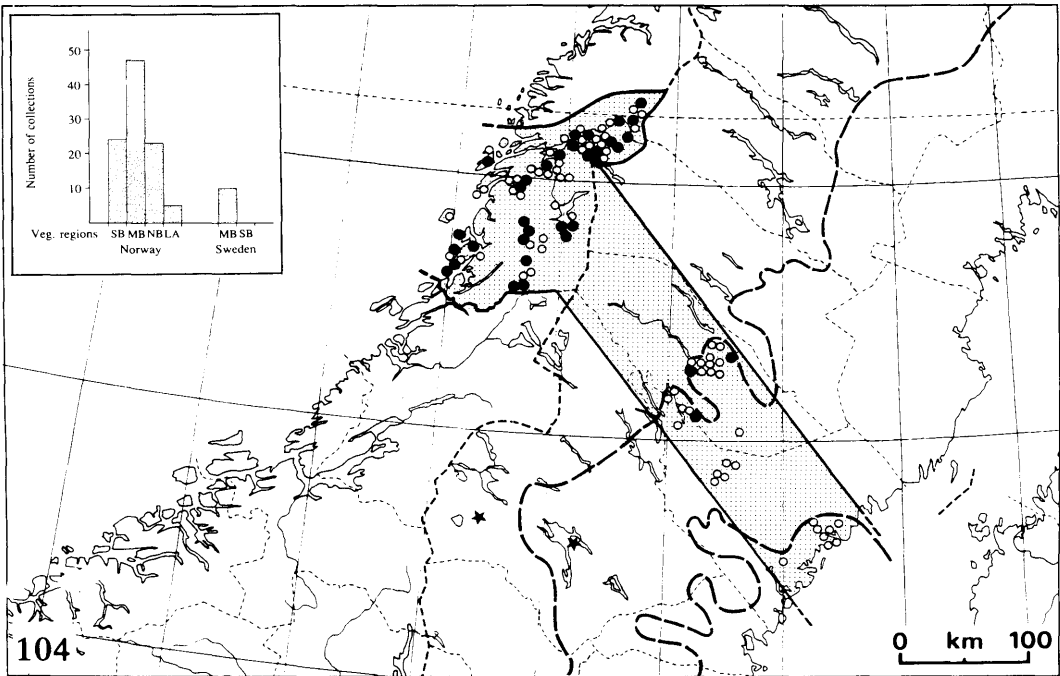
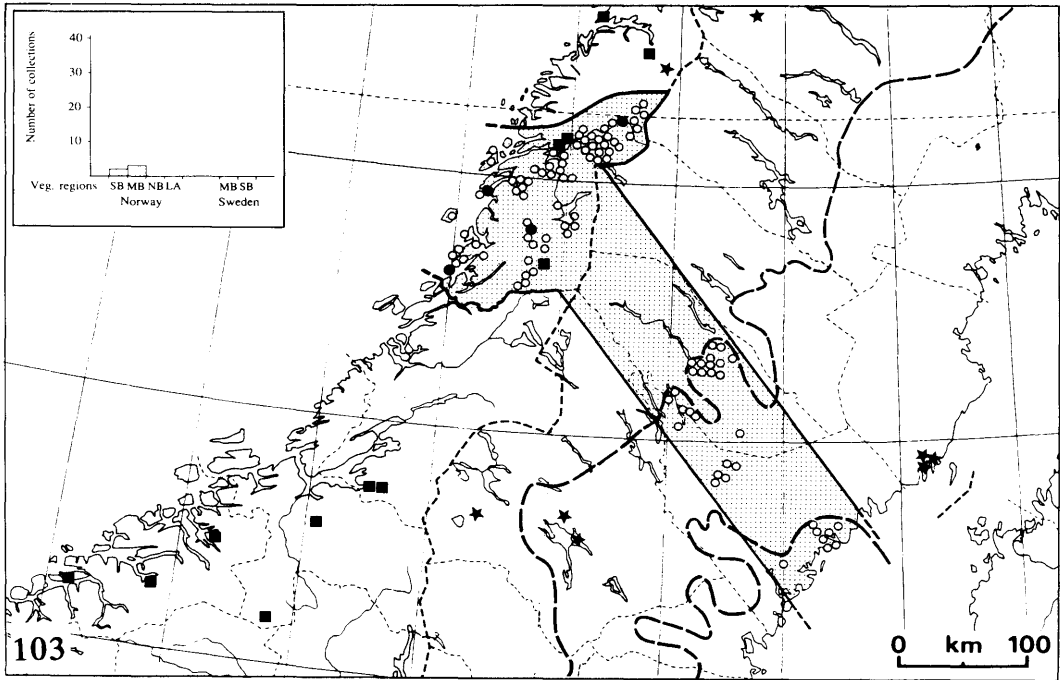


Fig. 102. Spores. A-F. *Capronia collapsa*. G. *Capronia nigerrima*. A. GM 2705a. B. GM 3078a. C. GM 3447c. D. GM 5309b. E. GM 3573. F. GM 1969a (type). G. Type.

**Taxonomic notes.** Müller et al. (1987: 72) included *Herpotrichiella* as a synonym of *Capronia*, and *C. collapsa* is added here to this enlarged genus. Müller et al. (1987) seem to have included *C. collapsa* in *C. pilosella* (Karst.) Müller et al., but later accepted it as a separate species (Samuels in litt. 1991). I have examined the type material of *C. pilosella* (H), and numerous other samples of this species, and *C. collapsa* and *C. pilosella* are undoubtedly two separate species.

**Hosts.** Found on all the examined *Salix* species; *S. caprea* ssp. *caprea* (14 coll.), and ssp. *sericea* (38 coll.), *S. glauca* ssp. *glauca* (11 coll.), *S. lapponum* (4 coll.) *S. myrsinifolia* ssp. *borealis* (10 coll.), and ssp. *myrsinifolia* (10 coll.), *S. pentandra* (22 coll.). Shows no preference for one particular host, and the same tendency was observed in Troms (Mathiassen 1989). In addition to the different *Salix* species listed by Mathiassen (1989: 54), it is also found on *S. appendiculata* and *Rhamnus alpina* (see Material examined). Barr (1991) also mentions *Arctostaphylos*, *Populus* and *Vaccinium*, but I have not examined the samples found on these substrates.

**Ecology.** Predominantly lignicolous, most frequently found on dead twigs, associated with other pyrenomycetes. Often also found on decayed substrate near ground level, but the association with other fungi seems to be more important than the condition of the substrate.



Figs 103-104. Distribution maps. Fig. 103. *Bertia moriformis* var. *moriformis*. Fig. 104. *Capronia collapsa*. Legend on p. 24.

It is therefore probably correct to regard *Capronia collapsa* as a hypersaprophyte.

**Distribution.** It is very common, and found in all the vegetation regions in Norway. Considerably less frequent in Sweden, and not found in the Swedish SB area. I have no explanation to this, but more investigation is obviously needed. I expect it to be more or less common further to the south in both countries, but only one sample is known from South Norway. It seems to become more frequent to the north, and the known samples in Europe found outside Scandinavia were both collected from high altitude localities in France and Switzerland (see Material examined). *Capronia collapsa* is also found in North America (cf. Barr 1991: 427).

**Material examined** (in addition to the cited type). **Norway:** O: Oslo: Bogstadåsen s. dat., associated with a discomycete, N.G. Moe "*Melanopsamma pomiformis*" (C). No: Dønna: Dønna N of Hildselvatnet UP 89,34 24 Jun 1986 *Salix caprea* ssp. *caprea* GM 2700a, 2701c, 2702a, 2703b, 2705a. Sømna: Sømna N of Berg UN 69-70,53 27 Jun 1986 *S. pentandra* GM 2915. - Sømna S of Vennesund UN 61-62,35 5 Jul 1987 *S. caprea* ssp. *caprea* GM 4783a, 4788a, 4799. - Sømna S of Våg UN 66,40 6 Jul 1987 *S. pentandra* GM 4830. Brønnøy: Sømna Akselberg UN 83,55 29 Jun 1986 *S. caprea* ssp. *caprea* GM 3078a, 3079a, 3084a, *S. myrsinifolia* ssp. *borealis* GM 3094c, 3095a. - Brønnøysund Mossem UN 73,67 30 Jun 1986 *S. myrsinifolia* ssp. *myrsinifolia* GM 3217a, *S. pentandra* GM 3195a, 3198a, 3200c. Vefsn: Fustvatnet S of Straum VP 27,12 10 Jul 1987 *S. myrsinifolia* ssp. *myrsinifolia* GM 5129a. - Mjåvatnet near Sandvik VP 27,14 10 Jul 1987 *S. pentandra* GM 5138a, 5141a, 5144a, 5166b, 5168a, 5170b. Grane: Majavatn E of Stortjønna VN 22,22 1 Jul 1986 *S. caprea* ssp. *caprea* GM 3269. - Majavatn S of Langås VN 22,24 1 Jul 1986 *S. glauca* ssp. *glauca* GM 3289b. - Svenningdalen Svenningvik VN 24,46 2 Jul 1986 *S. caprea* ssp. *sericea* GM 3350, 3354, 3355a, 3360, 3361, 3362. - Grane S of Grane church VN 26,74 3 Jul 1986 *S. caprea* ssp. *sericea* GM 3504a, 3506a, 3507b, 3508a, 3510d, *S. myrsinifolia* ssp. *myrsinifolia* GM 3459c, 3460, 3464a, 3481a, 3489a, 3495, *S. pentandra* GM 3447c, 3450a, 3452, 3454c, 3467b, 3468c, 3471, 3472a, 3475a. - Grane S of Grane church VN 26,74 28 Jul 1989 *S. pentandra* GM 7806. - Trofors at Bålfjellmoen VN 25,68 27 Jul 1989 *S. caprea* ssp. *sericea* GM 7768a, 7771, 7773a, 7777a, 7779b. Hattfjell: Hattfjell S of Øståsen VN 54,77 8 Jul 1987 *S. myrsinifolia* ssp. *myrsinifolia* GM 4978a. - S of Røssvatnet Bjørkåsen VN 57,81 8 Jul 1987 *S. caprea* ssp. *sericea* GM 4998b, *S. myrsinifolia* ssp. *borealis* GM 5013a, 5015. - Røssvatnet near Grubben VN 60,82 9 Jul 1987 *S. myrsinifolia* ssp. *borealis* GM 5076a. Hemnes: Korgfjellet S of Ørntinden VP 40-41,27 14 Jul 1987 *S. glauca* ssp. *glauca* GM 5308a, 5309b. Hemnes: Finneidfjord N of Neset VP 45,43 31 Jul 1989 *S. caprea* ssp. *sericea* GM 7876, 7877a, 7878a, 7879a, 7880, 7881, 7884, 7885a, 7886a, 7887a. Rana: Nedre Jamtli VP 67,57 7 Aug 1987 *S. caprea* ssp. *sericea* GM 5844a, *S. myrsinifolia* ssp. *borealis* GM 5818, 5820b, 5822c, 5828b. - Randalen Stokkalia WP 11-12,76 21 Jul 1989 *S. glauca* ssp. *glauca* GM 7515a, 7518a, 7526a, *S. lapponum* GM 7532. - Virvassdalen near Verdalen WP 08,62 21 Jul 1989 *S. myrsinifolia* ssp. *myrsinifolia* GM 7570b. - Dunderlandsdalen near Storsvollen VP 96-97,76 22 Jul 1989 *S. caprea* ssp. *sericea* GM 7589c, 7590a. - Grønfjeldalen near Lappsætra VP 95,51 24 Jul 1989 *S. glauca* ssp. *glauca* GM 7664a. - Grønfjeldalen E of Rundmoen VP 92,54 24 Jul 1989 *S. caprea* ssp. *sericea* GM 7669a, 7672. - Plurdalen Tappeskard VP 85,55 25 Jul 1989 *S. myrsinifolia* ssp. *borealis* GM 7723. - Umskardet SE of Umskardtjønna VP 80-81,40 25 Jul 1989 *S. lapponum* GM 7732a. - Skonseng near Seljehaugen VP 71,59-60 1 Aug 1989 *S. caprea* ssp. *sericea* GM 7955. - Gruben N of Englia VP 65,55 20 Jul 1990 *S. pentandra* GM 8188c. - Utsikten VP 72,53 23 Jul 1990 *S. lapponum* GM 8274a. Saltdal: Saltfjellet near Sukkertoppen WP 15,87 20 Jul 1989 *S. glauca* ssp. *glauca* GM 7505b, *S. lapponum* GM 7498b. Tr: Karlsøy: Karlsøy DC 58-59,66 22 Jul 1981 *S. myrsinifolia* ssp. *borealis* GM 984b. **Sweden:** ÅsL: Dorotea: Dorotea along Bergvattenån WM 26,67 12 Jul 1988 *S. caprea* ssp. *sericea* GM 6291a. Vilhelmina: Djupdal WM 59,65 5 Jul 1986 *S. caprea* ssp. *caprea* GM 3555a, 3557, *S. caprea* ssp. *sericea* GM 3573, 3576a, 3580b, 3586a. - W of Bäcksjön L. Annevare WM 81,98 29 Jul 1987 *S. glauca* ssp. *glauca* GM 5335b, 5336, 5361. Jmt: Åre: Åreskutan VL 00,30 13 Aug 1982 *S. lanata* ssp. *lanata* GM 2376b (TROM). Østersund: Andersön VL 70,00 12 Aug 1982 *S. caprea* ssp. *caprea* GM 2360a (TROM). **Switzerland:** Kt. Wallis Aletschreservat Aletschwald 31 Jul 1964 *S. appendiculata*, associated with *Glyphium schizosporum*, E. Müller (ZT). **France:** Aiquilles en Queyras 25 Jun 1958 *Rhamnus alpina*, associated with *Glyphium schizosporum*, H. Zogg (ZT).

***Capronia nigerrima* (Bloxam ex Currey) Barr**

Mycotaxon 41: 431 (1991) - *Sphaeria nigerrima* Bloxam ex Currey, Trans. Linn. Soc. Lond. 22: 272 (1858) - *Berlesiella nigerrima* (Bloxam ex Currey) Sacc., Rev. mycol. 10: 7 (1888) - Other synonyms; see Bigelow & Barr (1969). - Type(?): Great Britain, pr. St. Catherines, 3 Feb 1852, *Ulmus*, ex herb. Broome (K!)

Refr. descr.: Bigelow & Barr 1969: 193. Refr. illustr.: Bigelow & Barr 1969: Figs 1-5, Müller et al. 1987: Fig. 4a, b.

Figs 102G, 114.

**Description.** *Stromata* pulvinate, superficial on ostioles or stromata of members of Diatrypaceae. *Pseudothecia* (loculi) 50-120 µm diam., usually less than 100 µm, globose to subglobose, immersed or erumpent, gregarious, black, covered with short setae. *Asci* 40-65 x 10-17 µm, oblong to saccate, almost sessile. **Ascospores** (12-)15-22(-24) x 4-6(-7.5) µm, usually inequilateral fusiform-ellipsoid, 3-5(-7) septate, mostly with only one or two longitudinal septa, light olive-grey to light olivaceous brown, overlapping biseriate or crowded in ascus. (Description based on the type material, but supplied with information from Munk (1957), Bigelow & Barr (1969), Dennis (1978)).

**Taxonomic notes.** The material described as *Berlesiella nigerrima* earlier (Mathiassen 1989) represents a species of *Capronia*, but not *C. nigerrima*. The "type" material (K) matched the many descriptions of *C. nigerrima* perfectly, but my material deviates in too many distinctive characters.

*Capronia nigerrima* seems to be rare in Scandinavia, and was not found in the present investigation.

***Cryptodiaporthe salicella* (Fr.) Petr.**

Annls mycol. 19: 180 (1921) - *Sphaeria salicella* Fr., Syst. mycol. 2: 377 (1823) - Type: Fries, Scl. suec. 188 (UPS!) - Synonyms: see Butin (1958) - Anamorph: *Diplodina microsperma* (Johnston) Sutton, Mycol. Pap. 141: 69 (1977) - Synonyms; see Boerema (1970).

Refr. descr.: Butin 1958: 411, Mathiassen 1989: 40. Refr. illustr.: Mathiassen 1989: Fig. 20.  
Exsic.: Fr., Scl. suec. 188 (UPS).

Figs 26-28, 105, 107, 115.

**Description.** *Perithecia* (300-)400-550(-650) µm diam., globose, immersed in bark, densely scattered or gregarious, papillate, slightly raising and splitting the bark. Ostiolar canal long, periphysate. *Asci* 62-88 x 11.3-16.3 µm, mean 73.3 x 13.6 µm (n = 69), cylindrical-clavate, loosening 8-spored, non-amyloid, but with two refractive bodies in the thickened apex. *Ascospores* (14.2-)14.7-23(-27.8) x (4.4-)4.9-7.2(-7.7) µm, mean 17.9 x 6.0 µm,  $\bar{Q} = 3.0$  (n = 320), oblong-ellipsoid, often slightly bent, two-celled, rarely with one or two additional septa, hyaline, biseriate in ascus.

**Taxonomic notes.** The confusion in the nomenclature of the perfect state of this species was pointed out by Butin (1958), and a short summary of the dispositions was later given by Boerema (1970; see also Mathiassen 1989: 42). Boerema (1970) also commented upon the difficult and confusing nomenclatural history of the imperfect state. This was summarized by Sutton (1977), who demonstrated that its correct name is *Diplodina microsperma*.

I understand better the natural variation within *Cryptodiaporthe salicella* after having examined all the samples found in this investigation. They were found on different *Salix*



species, in different vegetation regions, and in both oceanic and continental areas. The spores are very variable, and they show, when compared with Butin's (1958) data, an extension in both size and shape. I have not seen this indicated by other authors, but it must be emphasized, as it seems to be typical for the species within the transect area. The type

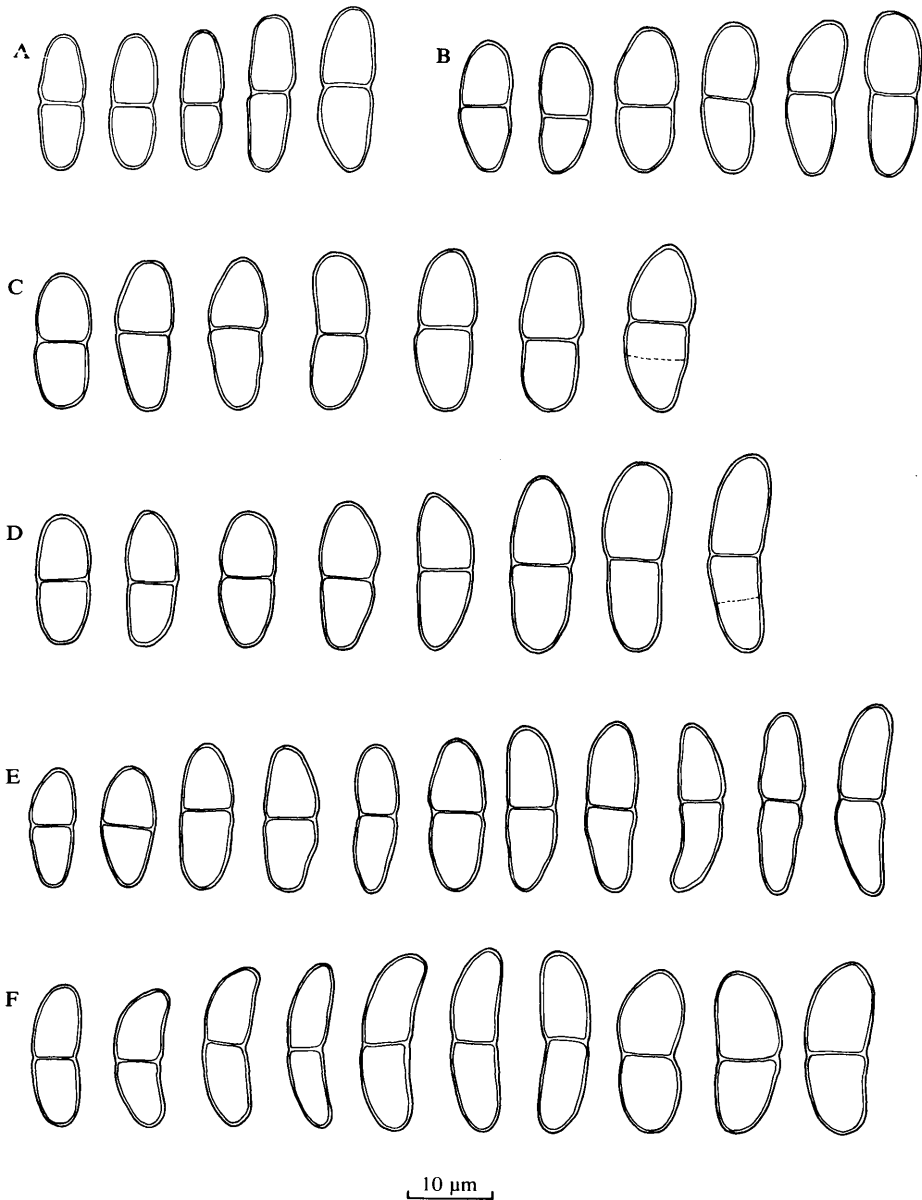


Fig. 105. *Cryptodiaporthe salicella*. Spores. A. GM 134. B. GM 2891. C. GM 8531. D. GM 5742. E. GM 5503. F. Type.

material (UPS) had spores measuring up to 22.6 µm in length, but larger spores, up to 24.5 µm in length were found in some of my samples. However, the spores gradually increased in length from 16 to 24.5 µm, and, in my opinion, fit well in *C. salicella*. In one particular collection, GM 4834, the majority of the spores measured from 19 to 24 µm in length, but some spores approached 28 µm. With some reservations, I have also included this collection in *C. salicella*.

**Hosts.** Found on all the examined *Salix* species; *S. caprea* ssp. *caprea* (1 coll.), and ssp. *sericea* (2 coll.), *S. glauca* ssp. *glauca* (1 coll.), *S. lapponum* (7 coll.), *S. myrsinifolia* ssp. *borealis* (6 coll.), and ssp. *myrsinifolia* (1 coll.), *S. pentandra* (1 coll.). Most frequent on *S. lapponum* as in Troms (Mathiassen 1989), but the samples from Troms are too few to make any conclusions on this subject. *Cryptodiaporthe salicella* is so far only found on *Salix*.

**Ecology.** A corticolous species. Frequently found about 2 m above the ground, and typically on rather thin twigs. It fits well among the primary saprophytes, but I also regard *Cryptodiaporthe salicella* as parasitic. Empty ascomata were frequently found on old twigs, and it seems to sporulate on fresh or recently dead substrate. This agrees well with Butin's (1958) observations but living, sound-looking twigs were not collected systematically. As a result, several samples of *C. salicella* may have been missed.

**Distribution.** Found in all the vegetation regions, except LA, and distributed throughout the transect. May seem to be rare in the Swedish section, but the species is more common than the distribution map indicates. Several samples with empty ascomata were found on old twigs, but these samples are not included here. *Cryptodiaporthe salicella* is previously mentioned from several investigations in Sweden, and Nannfeldt (1969: 193) reported it as quite common. Not found within the map area, but about 20 samples are known from South Sweden. In Norway only mentioned by Rostrup (1904) and Mathiassen (1989), and it is infrequent in Finland.

**Material examined** (in addition to the cited type and exsiccata). **Norway:** No: Sømna: Sømna N of Berg UN 69-70,53 26 Jun 1986 *Salix myrsinifolia* ssp. *borealis* GM 2891. - Sømna S of Våg UN 66,40 6 Jul 1987 *S. pentandra* GM 4834. Brønnøy: Sømna Akselberg UN 83,55 29 Jun 1986 *S. myrsinifolia* ssp. *borealis* GM 3096a. Grane: Store Fiplingdalen N of Nerosen VN 38,55 4 Jul 1986 *S. lapponum* GM 3533. - Trofors at Båfjellmoen VN 25,68 27 Jul 1989 *S. caprea* ssp. *sericea* GM 7769, 7778. Hattfjelldal: Røssvatnet Krutåga VN 61,85 7 Jul 1987 *S. lapponum* GM 4889, 4893a, 4898. - S of Røssvatnet Bjørkåsen VN 57,81 8 Jul 1987 *S. myrsinifolia* ssp. *borealis* GM 5048. - Røssvatnet near Grubben VN 60,82 9 Jul 1987 *S. lapponum* GM 5064. Hemnes: Sørfjorden Grønvikneset VP 40,40 1 Aug 1990 *S. lapponum* GM 8531, 8534. Rana: Nedre Jamtli VP 67,57 7 Aug 1987 *S. myrsinifolia* ssp. *borealis* GM 5811, 5826. **Sweden:** Ång: Örnköldsvik: Arnäs E of Älvsjösjön CR 25-26,90 4 Aug 1987 *S. pentandra* GM 5742. - Örnköldsvik N of Sundåsen CR 17,83 1 Aug 1987 *S. caprea* ssp. *caprea* GM 5537a, *ibid.* *S. pentandra* GM 5503a, & *ibid.* 2 Aug 1987 *S. myrsinifolia* ssp. *myrsinifolia* GM 5568a. ÅsL: Vilhelmina: Vilhelmina W of Lövasen WM 62,83 5 Aug 1989 *S. glauca* ssp. *glauca* GM 8153.

### *Cryptosphaeria subcutanea* (Wahl. : Fr.) Rappaz

Mycotaxon 10: 581 (1984) - *Sphaeria subcutanea* Wahl. : Fr., Syst. mycol. 2: 371 (1823); Wahl.: Flora lapp.: 520 (1812) - Type: Finland, Lapponia Kemensis, Iwalojoensuu, 16 Aug 1802, *Salix phylicifolia*, G. Wahlenberg (UPS, lecto! in sched., proposed as neotype by Rappaz 1984, *vide infra*) - *Diatrype vicinula* (Nyl.) Berl., Icon. fung. 3: 98 (1902) - *Sphaeria vicinula* Nyl., Flora 21: 321 (1863) - Type: Soviet Union, Lapponia tulomensis, Kola, 25 Jul 1861, *Salix* sp., P.A. Karsten (H, lecto! proposed by Rappaz 1984) - Other synonyms; see Rappaz (1987) - Anamorph; see Glawe & Rogers (1986).

Refr. descr.: Rappaz 1987: 392, Mathiassen 1989: 42. Refr. illustr.: Rappaz 1987: Figs 4d, 30a, Mathiassen 1989: Fig. 21.

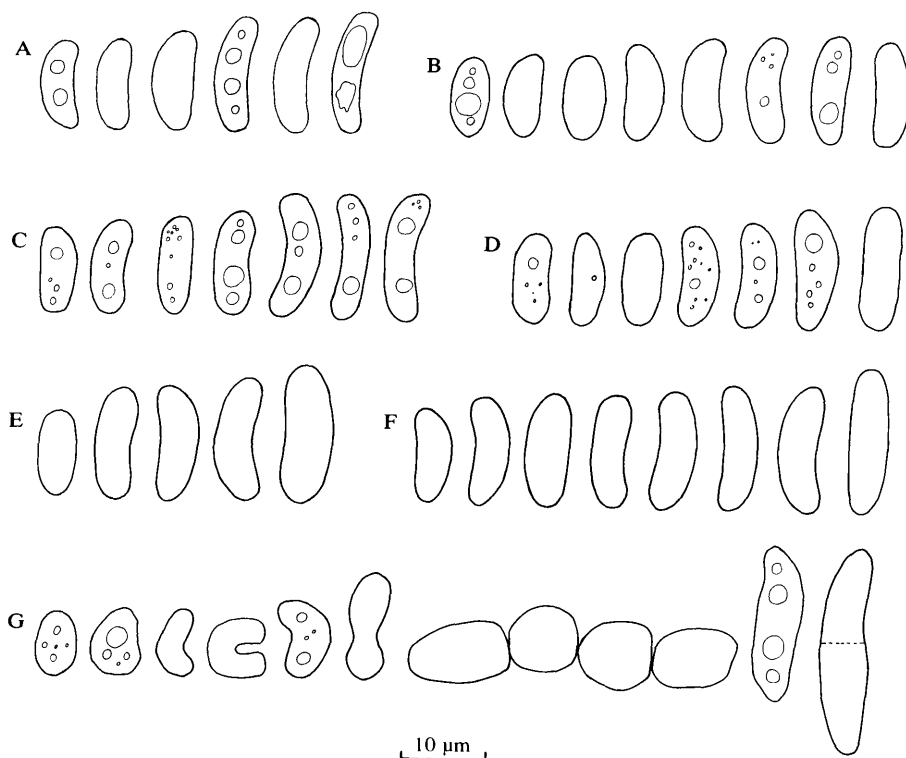


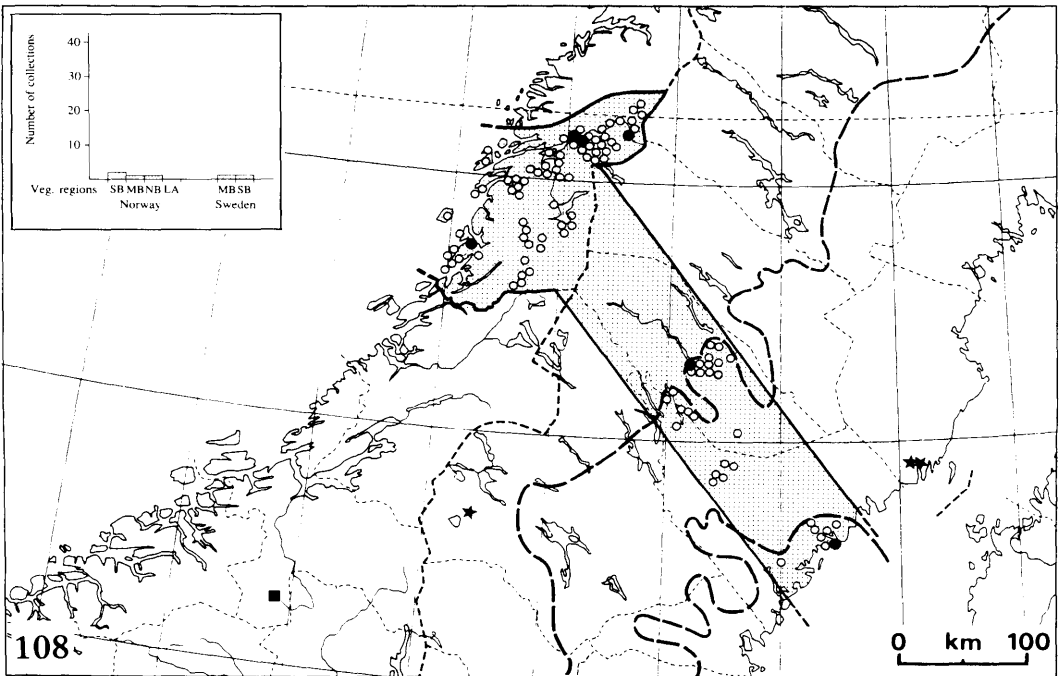
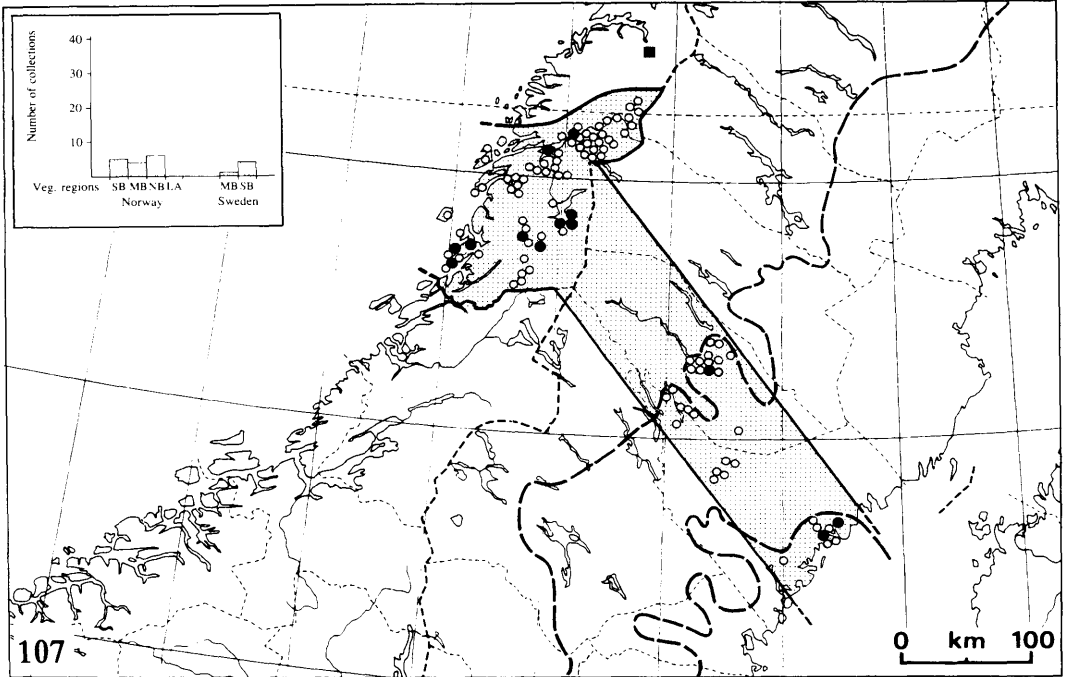
Fig. 106. *Cryptosphaeria subcutanea*. Spores. A. GM 1912. B. GM 6335. C. GM 3094b. D. GM 7569. E. Type. F. Type of *Sphaeria vicinula*. G. Abnormal spores found in the collections cited above.

Figs 29-31, 106, 108, 116.

**Description.** *Stromata* immersed in bark, pulvinate or wide-spreading, always covered with periderm. Black zones in the underlying wood always present. *Perithecia* (450-)600-750(-950)  $\mu\text{m}$  diam.,  $\pm$  subglobose, immersed, gregarious, papillae prominent, separately erumpent, 3-5 sulcate, carbonized, black. *Asci* 45-80 p.sp.  $\times$  7-11.2  $\mu\text{m}$ , mean 58.4  $\times$  8.9  $\mu\text{m}$  (n = 52), clavate, long-stiped, non-amyloid, mostly 8-spored. *Paraphyses* 1.5-2.5  $\mu\text{m}$  diam., septate. *Ascospores* (9.6-)10.2-16.4(-16.7)  $\times$  (3.4-)3.5-4.9(-5.5)  $\mu\text{m}$ , mean 13.3  $\times$  4.0  $\mu\text{m}$ ,  $\bar{Q} = 3.3$  (n = 280), reniform to allantoid, variable, one-celled, brown, uni-biseriate.

**Nomenclature note.** The type collection of *Cryptosphaeria subcutanea* (cited above) was proposed as neotype by Rappaz (1984: 582), but I don't agree with his typification. No particular collection was indicated by Wahlenberg (1812: 520) in his original description, but this collection is original, and was undoubtedly among the samples on which the original description was based. It is therefore a syntype, but as this material was typical and in good condition, it seems permissible to designate it as lectotype.

**Taxonomic notes.** A very characteristic and easily recognizable species, both macro-



Figs 107-108. Distribution maps. Fig. 107. *Cryptodiaporthe salicella*. Fig. 108. *Cryptosphaeria subcutanea*. Legend on p. 24.

and microscopically. The spores are very variable, but this is typical for the species (cf. Mathiassen 1989: 42, 45). The type collection (UPS) matched perfectly with my material, and also with that from Troms. Some taxonomic considerations are given by me earlier (Mathiassen 1989: 43, 45), and a summary of the dispositions based on the teleomorph is given by Rappaz (1987: 391).

**Hosts.** The majority of the 75 samples of *Cryptosphaeria subcutanea* in Troms (Mathiassen 1989) was found on *Salix myrsinifolia* agg. As the species was represented in numerous samples and localities, I considered the preference for *S. myrsinifolia* agg. to be a true distributional pattern for the species. The present investigation seems to confirm my assumption, as *C. subcutanea* was found on *S. myrsinifolia* agg. only; *S. myrsinifolia* ssp. *borealis* (3 coll.), and ssp. *myrsinifolia* (3 coll). However, Wahlenberg (1812) reported the species to be frequent on twigs of *S. phylicifolia* in northern Finland "...ramorum *Salicis phylicifoliae* per totam Lapponiam usque ad lacum Enarensem passim.", and the type collection was also found on *S. phylicifolia* (according to Wahlenberg, in sched.). This *Salix* species was not included in this investigation, but I don't think that *C. subcutanea* is particularly more frequent on *S. phylicifolia* than on *S. myrsinifolia* agg. in northern Finland. *Salix myrsinifolia* ssp. *borealis*, and ssp. *myrsinifolia* are both rather common in this part of Fennoscandia. *Cryptosphaeria subcutanea* is restricted to *Salix* only.

**Ecology.** A corticolous species, found both on twigs and stems. It was also found on rather decayed substrate, and has a broader ecological amplitude than previously suggested (cf. Mathiassen 1989: 14). It is able to exploit the substrate for a long time, and seems to cause severe damage to *Salix*.

**Distribution.** Very rare within the transect area, but found in all the vegetation regions, except LA. This is exactly the same pattern as found in Troms (Mathiassen 1989), where it was considerably more frequent. I considered *Cryptosphaeria subcutanea* to be very rare in South Norway, but expected it to become gradually more frequent northwards. These assumptions were correct, and the distribution in Sweden is surely the same as in Norway. Common in northern Finland, according to Wahlenberg (see above), and several samples are found near Kola in the Soviet Union (see Appendix I). In Scandinavia, only one sample (S) is found south of the map area. No doubt its main distribution in Europe is in northern Fennoscandia. Also known from Canada as *Anthostoma ontariensis* Ell. & Ev.

**Material examined** (in addition to the cited types). Norway: No: Brønnøy: Sømna Akselberg UN 83,55 29 Jun 1986 *Salix myrsinifolia* ssp. *borealis* GM 3094b. Rana: Nedre Jamtlia VP 67,57 7 Aug 1987 *S. myrsinifolia* ssp. *borealis* GM 5825. - Virvassdalen near Verdal WP 08,62 21 Jul 1989 *S. myrsinifolia* ssp. *myrsinifolia* GM 7569. - Skuggei at Holmen VP 68-69,57 23 Jul 1989 *S. myrsinifolia* ssp. *borealis* GM 7642. Sweden: Ång: Örnköldsvik: Vågefjärden Vikbotten CR 12,89 2 Aug 1987 *S. myrsinifolia* ssp. *myrsinifolia* GM 5612. Jmt: Åre: Pr. Åre Jul 1887 *Salix* sp. A.G. Grevillius "*Cryptosphaeria vicinula*" (UPS, S). Vb: Umeå: Umeå *S. nigricans* J. Vleugel "*Cryptosphaeria vicinula*" (UPS). - Umeå Aug 1912 *S. myrsinifolia* J. Vleugel "*Cryptosphaeria vicinula*" (S). ÅsL: Vilhelmina: W of Lövliden near Lillån WM 70,73 13 Jul 1988 *S. myrsinifolia* ssp. *myrsinifolia* GM 6335.

### *Diatrype bullata* (Hoffm. : Fr.) Fr.

Summ. veg. Scand. 2: 385 (1849) - *Sphaeria bullata* Hoffm.: Fr., Syst. mycol. 2: 349 (1823); Hoffm., Veg. crypt. 1: 5 (1787) - Type: Fries, Scl. suec. 342 (FH-Curtis, neo! proposed by Rappaz 1987) - Synonyms; see Rappaz (1987) - Anamorph; see Rogers & Glawe (1983: 78).

Refr. descr.: Glawe & Rogers 1984: 419, Rappaz 1987: 412, Mathiassen 1989: 45. Refr. illustr.: Glawe & Rogers 1984: Figs 27, 28, 30, Mathiassen 1989: Fig. 24.

Exsic.: Fr., Sci. suec. 342 (FH) - Lundell & Nannf., F. suec. 295 (C).

Figs 32-34, 109, 117, 119.

**Description.** *Stromata* erumpent through bark, pulvinate, usually slightly convex and somewhat elongated or irregular, often coalescing, reddish to blackish-brown. *Perithecia* 200-280  $\mu\text{m}$  diam., subglobose to ovoid, often compressed, immersed, gregarious, papillae papillate, 3-4 sulcate, black. *Asci* 13-25 p.sp. x 3.5-6.4  $\mu\text{m}$ , mean 19.3 x 4.8  $\mu\text{m}$  (n = 98), narrowly clavate, long-stiped, slightly amyloid or inamyloid. *Ascospores* 5.0-7.8(-8.7) x 1-1.7(-1.8)  $\mu\text{m}$ , mean 6.5 x 1.3  $\mu\text{m}$ ,  $\bar{Q}$  = 4.9 (n = 320), allantoid, subhyaline, light brown when clustering.

**Hosts.** Only found on the large trees *Salix caprea* ssp. *caprea* (8 coll.), and ssp. *sericea* (4 coll.), *S. pentandra* (16 coll.), and on *S. myrsinifolia* agg., *S. myrsinifolia* ssp. *borealis* (9 coll.), and ssp. *myrsinifolia* (20 coll.). The preference for *S. myrsinifolia* agg. in Troms (Mathiassen 1989) seems to be incidental, but in both investigations it was only found on rather large trees. The size of the trees may therefore be important for *Diatrype bullata*, but more field work, ecological studies and laboratory experiments are needed to justify any further discussion on this subject. However, I have earlier (Mathiassen 1989: 18-19) commented upon other factors that are probably important with regard to substrate preference and host specificity.

**Ecology.** A corticolous species, most frequently found on dead branches about 1.5-2.5 m above the ground. I still consider it as a primary saprophyte, but its ecological amplitude is broader than previously suggested (Mathiassen 1989). In the Swedish SB area, *Diatrype bullata* was frequently found together with *Hypoxyylon mammatum*, typically growing close together on the same twigs or branches, but occupying different niches; *D. bullata* always above *H. mammatum*. I have no explanation for this ecological phenomenon. As *Cryptosphaeria subcutanea* and *H. mammatum*, *D. bullata* seems to cause severe damage to *Salix*.

**Distribution.** I regarded *Diatrype bullata* as very rare in Troms (Mathiassen 1989), and it seems to be rare all over northern Fennoscandia. Becomes more frequent southwards, and is very common in southern Fennoscandia. It has a distinct distributional pattern in central Scandinavia, being found most frequently along the Norwegian west coast and the Swedish east coast. Within the transect it was only found in the two SB regions, and in MB in Norway.

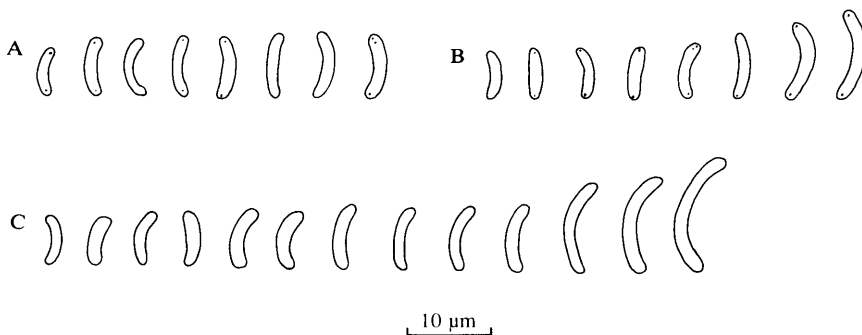
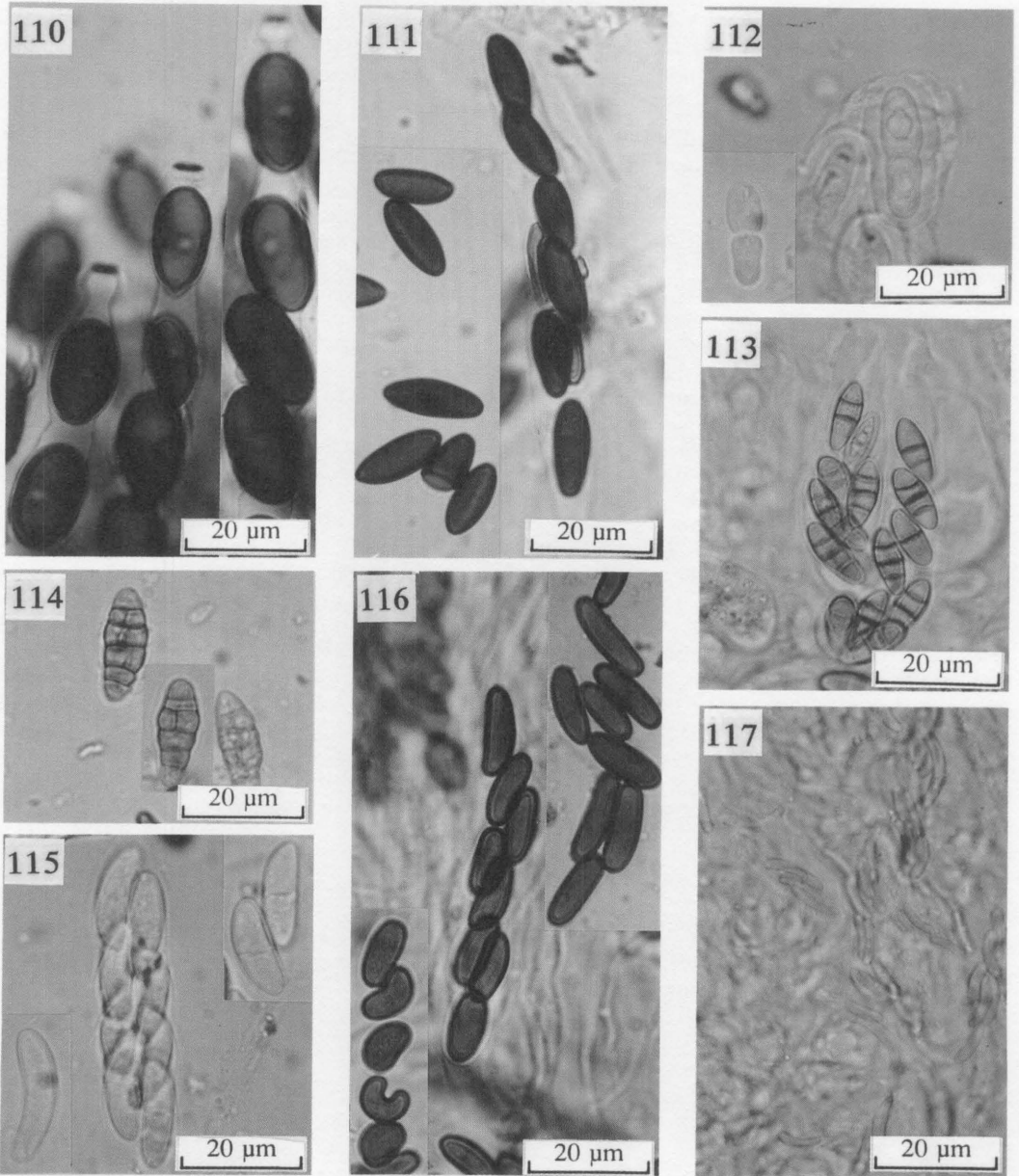


Fig. 109. *Diatrype bullata*. Spores. A. GM 2719. B. GM 5113. C. Type.



Figs 110-117. Photographs of type collections. Fig. 110. *Amphisphaerella erikssonii* (TROM). Fig. 111. *Anthostomella melanotes* (K). Fig. 112. *Arthopyrenia lapponina* (FH). Fig. 113. *Capronia collapsa* (TROM). Fig. 114. *Capronia nigerrima* (K). Fig. 115. *Cryptodiaporthe salicella* (UPS). Fig. 116. *Cryptosphaeria subcutanea* (UPS). Fig. 117. *Diatrype bullata* (FH).

Very frequent in the Swedish SB area. Within the map area, it is not found in the interior, continental areas, except for one sample found at Oppdal (ST). This indicates a oceanic preference, at least in central Scandinavia, and *D. bullata* is most frequent in SB and MB. From north-central Sweden it is previously mentioned by Vleugel (1908), and Nannfeldt (1969) reported it as very common in Sweden. According to S. Svensson (Univ. of Lund, in litt. 1991), it is far more frequent in southern Sweden than the ca. 60 known samples indicate.

**Material examined** (in addition to the cited type and exsiccatae). **Norway:** Op: Sør-Fron: S of Hundorp 14 May 1989 *Salix* sp. A.-E. Torkelsen & G. Gulden 87/89 (O). Ringebu: Pr. Lågen 14 May 1989 *Salix* sp. A.-E. Torkelsen 128/89 (O). Søndre Land: Ånes at Randsfjorden 28 May 1983 *Alnus incana* G. Gulden 30/83 (O). Vf: Sande: Kommersøya 30 May 1981 *S. Aase* (O). Sem: Panne 6 May 1984 *Salix caprea* S. Aase (O). Nøtterøy: Hella 13 Nov 1982 *S. caprea* S. Aase (O). - Føyland 3 Nov 1983 *Populus tremula* S. Aase (O). SF: Jølster: Løset 10 Apr 1989 *Salix* sp. O. Befring 742 (BG). MR: Ålesund: Lerstad 18 May 1988 *S. caprea* O. Grande, det. A.-E. Torkelsen (O). NT: Levanger: Østborg 16 Sep 1972 *S. caprea* Å. Strid 11305 (S). No: Sømna: Sømna N of Vik near Knyk UN 69,47-48 4 Jul 1987 *S. caprea* ssp. *sericea* GM 4739. - Sømna S of Våg UN 66,40 6 Jul 1987 *S. pentandra* GM 4831. Alstahaug: Offerøya N of Vågen UP 84,07 25 Jun 1986 *S. myrsinifolia* ssp. *myrsinifolia* GM 2757. 2759. *S. pentandra* GM 2719, 2720, 2722, 2723, 2726. Vefsn: Mosjøen W of Forsmoen VP 19,08 10 Jul 1987 *S. caprea* ssp. *sericea* GM 5113, 5117. - Mosjøen S of Kulstad VP 18,06 28 Jul 1989 *S. myrsinifolia* ssp. *myrsinifolia* GM 7836. Hemnes: Finneidfjord N of Neset VP 45,43 31 Jul 1989 *S. caprea* ssp. *sericea* GM 7888. Rana: Skuggehei at Holmen VP 68-69,57 23 Jul 1989 *S. myrsinifolia* ssp. *borealis* GM 7643, 7645. Saltdal: Junkerdalsura 27 Aug 1988 *Salix* sp. A.-E. Torkelsen 183/88 (O). **Sweden:** Upl: Läby: W of Vadbacka 23 Mar 1961 *Salix* sp. O. Eriksson (UME 26606). Mpd: Timrå: S of Timrå church 24 Sep 1972 *Salix* sp. Å. Strid 11956 (S). Vb: Skellefteå: Kåge 4 Sep 1972 *Salix* sp. Å. Strid 10537 (S). Vindeln: Degerön 26 Sep 1971 *S. caprea* Å. Strid 9228 (S). Umeå: Grisbacka 18 May 1898 *Salix* sp. C.P. Laestadius, det. O. Eriksson (UME 26625). - Holmön pr. Umeå 16 Jul 1906 *S. pentandra* J. Vleugel (S). - Brännland 24 May 1969 *Salix* sp. O. Eriksson (UME 25577). - Brännland 22 May 1976 *Salix* sp. O. Eriksson (UME 26949) - Innertavle 2 Oct 1971 *S. caprea* Å. Strid 9358 (S). - Sørfors 16 May 1972 *S. caprea* Å. Strid 9623 (S). Ång: Örnköldsvik: Arnäs E of Älvsjösjön CR 25-26,90 4 Aug 1987 *S. caprea* ssp. *caprea* GM 5717, *S. myrsinifolia* ssp. *myrsinifolia* GM 5710. *S. pentandra* GM 5732, 5733, 5736, 5753. - Gärdal 12 Sep 1972 *S. caprea* Å. Strid 10678 (S). - Örnköldsvik N of Sundåsen CR 17,83 1 Aug 1987 *S. caprea* ssp. *caprea* GM 5538, *S. myrsinifolia* ssp. *borealis* GM 5486, 5504, 5506, 5507, 5528, 5529, 5532, *S. myrsinifolia* ssp. *myrsinifolia* GM 5562, 5567. - Haffstafjärden N of Billsta CR 25,75 9 Jul 1988 *S. caprea* ssp. *caprea* GM 6044, 6065, 6084, 6088, 6091, 6104, *S. myrsinifolia*

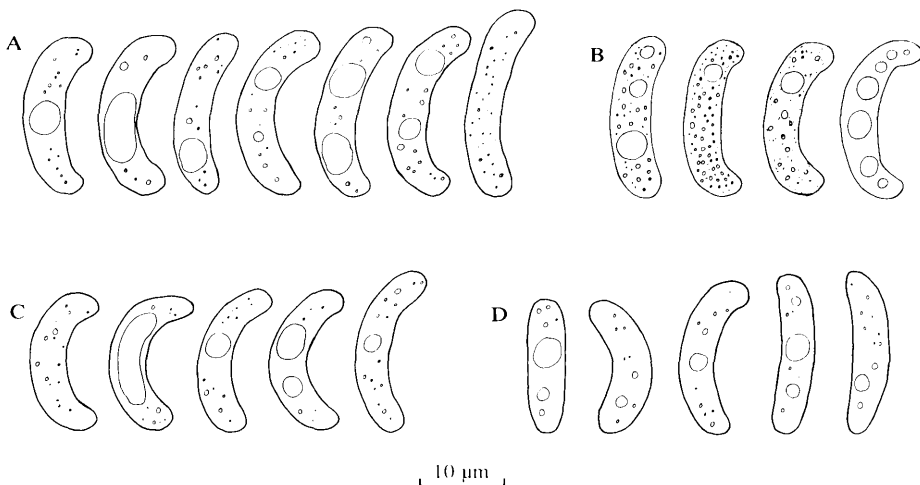
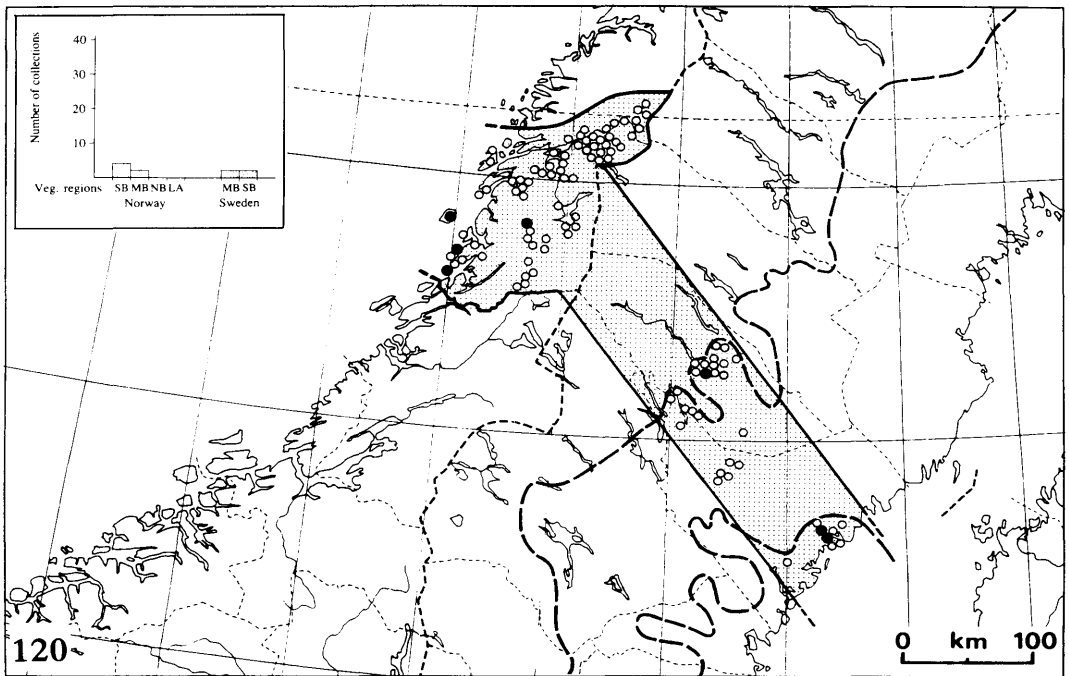
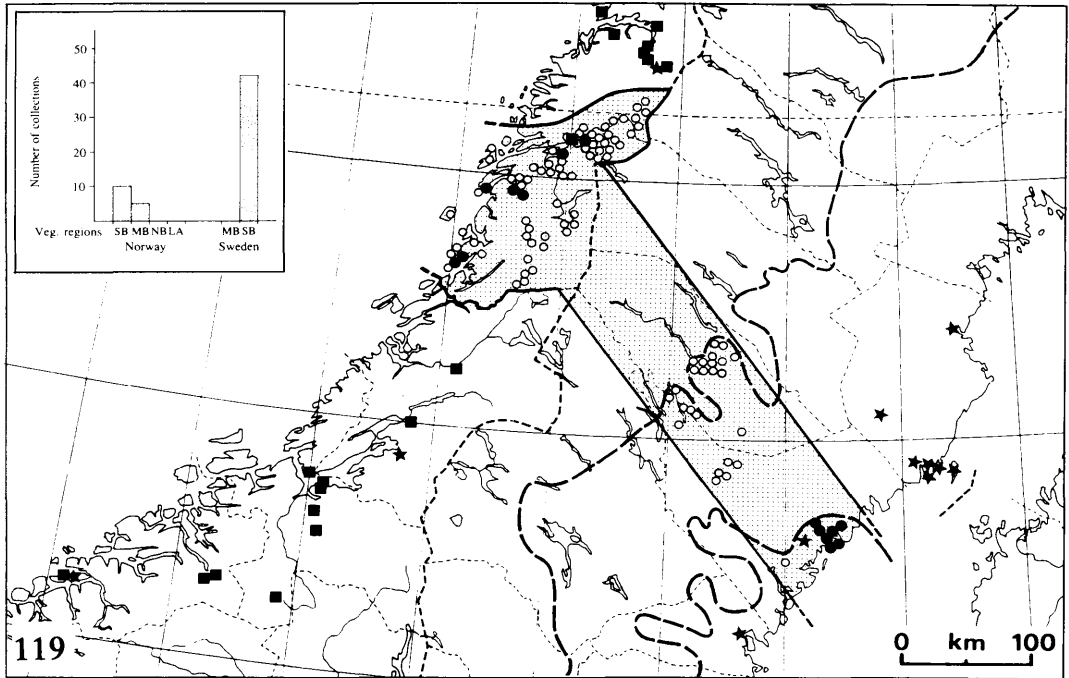


Fig. 118. *Enchnoa infernalis*. Spores. A. GM 2872. B. GM 1899a. C. GM 3498a. D. GM 3709a.





Figs 119-120. Distribution maps. Fig. 119. *Diatrype bullata*. Fig. 120. *Enchnoa infernalis*. Legend on p. 24.

ssp. *myrsinifolia* GM 5983, 5984, 5987, 5991, 6025, 6027, 6031, 6034, *S. pentandra* GM 5940, 5979, 5994. - Haffstafjärden SE of Gala CR 27,74 10 Jul 1988 *S. pentandra* GM 6127a. - Vågefjärden Vikbotten CR 12,89 2 Aug 1987 *S. myrsinifolia* ssp. *myrsinifolia* GM 5605, 5614. - Vågefjärden E of Norrvåge CR 12-13,88 8 Jul 1988 *S. myrsinifolia* ssp. *myrsinifolia* GM 5920, 5922, 5923, 5925, *S. pentandra* GM 5899. - Örnsköldsvik Västerås CR 20,82 2 Aug 1987 *S. pentandra* GM 5592. **Finland:** Pohjois-Pohjanmaa: Muhos Hyrkäs 2 Jul 1966 *Salix* sp. T. Ulvinen (C).

### ***Enchnoa infernalis* (G. Kunze : Fr.) Fuckel**

Symb. mycol.: 302 (1871) - *Sphaeria infernalis* G. Kunze : Fr., Syst. mycol. 2: 371 (1823) -Type: Germany, leg. G. Kunze, Herb. E. Fries (UPS!, vide infra).

Refr. descr.: Mathiassen 1989: 46. Refr. illustr.: Mathiassen 1989: Fig. 25.

Figs 35-37, 118, 120.

**Description.** *Perithecia* 400-850(-1000)  $\mu\text{m}$  diam., subglobose, often collapsing, immersed in bark, solitary or densely scattered, papillulate, raising and splitting the bark. Surrounded by and seated upon a brown subiculum. *Asci* 42-79 p.sp. x 10.8-16.4  $\mu\text{m}$ , mean 57.7 x 13.2  $\mu\text{m}$  (n = 58), clavate, long-stiped, non-amyloid. *Paraphyses* variable, mostly ca. 4  $\mu\text{m}$  diam., branched, septate, early deliquescent. *Ascospores* (15.4-)16.3-22.1(-24) x (3.5-)3.7-5  $\mu\text{m}$ , mean 19.0 x 4.3  $\mu\text{m}$ , Q = 4.4 (n = 155), allantoid, one-celled, light brownish.

**Taxonomic notes.** All the ascomata on the type collection (UPS) were destroyed. No spores were found, but the type collection was typical for *Enchnoa infernalis* with a lot of subiculum surrounding the remnants of the ascomata. However, the type collection has previously been examined by R.A. Shoemaker (Ottawa, Ontario), and a microscopic preparation is filed in DAOM Ottawa. Unfortunately, I have not received this preparation yet.

*Enchnoa infernalis* is a characteristic species (cf. Mathiassen 1989), but it is often difficult to decide whether the spores are mature or not. Ascus-stipe often considerably longer than shown in Fig. 25a by Mathiassen (1989).

**Hosts.** Found on *Salix caprea* ssp. *caprea* (1 coll.), and ssp. *sericea* (1 coll.), *S. lapponum* (2 coll.), *S. myrsinifolia* ssp. *borealis* (3 coll.), and ssp. *myrsinifolia* (3 coll.) Shows no preference for one particular *Salix* species. Previously only reported from *Quercus* and *Salix* (cf. Mathiassen 1989).

**Ecology.** A corticolous species, only found on dead twigs. Seems to fit fairly well among the primary saprophytes, but one sample was found on decayed substrate.

**Distribution.** *Enchnoa infernalis* is very rare in northern Scandinavia, and the only known sample north of the Arctic Circle was found in Troms (cf. Mathiassen 1989). Rather rare in central Scandinavia, but found scattered throughout the transect. Becomes more frequent southwards, and Hungnes (1982) reported it as common on *Quercus* in South Norway. Twelve samples are known from South Sweden. No Finnish collections were preserved in the Finnish herbaria.

**Material examined** (in addition to the cited type). **Norway:** No: Sømna: Sømna N of Berg UN 69-70,53 26 Jun 1986 *Salix myrsinifolia* ssp. *borealis* GM 2872, 2876b. - Sømna S of Vennesund UN 61-62,35 5 Jul 1987 *S. caprea* ssp. *sericea* GM 4760a. Vega: Vega W of Rørøy PT 37,84-85 30 Jun 1986 *S. myrsinifolia* ssp. *myrsinifolia* GM 3155a. Grane: Grane S of Grane church VN 26,74 3 Jul 1986 *S. myrsinifolia* ssp. *myrsinifolia* GM 3494b, 3498a. **Sweden:** Ång: Örnsköldsvik: Örnsköldsvik N of Sundåsen CR 17,83 1 Aug 1987 *S. myrsinifolia* ssp. *borealis* GM 5527a. - Haffstafjärden N of Billsta CR 25,75 9 Jul 1988 *S. caprea* ssp. *caprea* GM 6047b. ÅsL: Vilhelmina: E of Djupdal Svältmyran WM 60,71 6 Jul 1986 *S. lapponum* GM 3709a, 3721a.

***Glyphium grisonense* G. Mathiassen sp. nov.**

Refr. descr.: Mathiassen 1989: 49 (sub *Glyphium* cf. *schizosporum*). Refr. illustr.: Mathiassen 1989: Fig. 32 (sub *G. schizosporum*).

*Subiculum densum vel debile, e hyphis compositum ramificatis, septatis, fuscis, parietibus crassis, circiter 3.5 µm diam., e base vel dimidia parte inferiore pseudothecii formatis. Pseudothecia 0.7-1.5(-2) mm alta, in subiculo verticalia, sparsa vel gregulata, compressa, dolabriformia sed provecta aetate saepe plus minusve obpyriformia se e latere praebentia, nigra, fissura 200-750 µm longa marginem superiorem acutum secuta. Peridium 80-115 µm crassum, e duobus stratis compositum. Stratum exterius 30-55 µm crassum, densum, carbonaceum, fragile, juxta latera angusta pseudothecii mox in duas laminas transverse striatas fissum. Stratum interius 35-60 µm crassum, e cellulis plus minusve isodiametricis, fuscis, parietibus tenuibus formatum, cellulis intimis plerumque angustioribus, colore minus saturato. Asci 340-459 x 12.4-18.7 µm magni, media magnitudine 396.3 x 15.9 µm, cylindrico-clavati, ad basem versus sensim attenuati, bitunicati, parietibus crassis, initio octospori, postea polyspori. Paraphysoides circiter 1.5 µm diam., numerosae, longae, ramificatae, anstomosantes, septatae, plerumque guttulas parvas multas foventes. Ascospores 270-420 µm longae, filiformes, aliquantulum in helicem tortae, septis multis divisae, ante maturitatem in partes cylindricas subfuscas, (2-)3-7(-11)-septis divisas dissilientes (13.8-)15.1-42.8(-48) x 2.9-5.5(-6) µm magnas, media magnitudine 24.2 x 4.3 µm. Status anamorphus pseudothecii et subiculo contiguus visus, colonias effusas, nigras in ligno nudo formans. Catenae conidiorum simplices, septis multis divisae, irregulariter constrictae, verrucosae, fuscae, parietibus crassis, e base sursum matura.*

Type: Norway: Tr: Tromsø: Tromsøya S of Langnes DC 19,30 24 Aug 1982 *Salix lanata* ssp. *glandulifera* on wood GM 1814 (TROM - holotype). Etymology: From Graubünden = grisonensis. The first known find of this species is from Graubünden in Switzerland.

Figs 38-40, 121, 123, 135.

**Description.** *Subiculum* dense, or very sparsely developed, composed of branched, thick-walled, septate brown hyphae ca. 3.5 µm diam., formed from the base or the lower half of pseudothecium. *Pseudothecia* 0.7-1.5(-2) mm high, seated upright in subiculum, scattered or clustered, laterally flattened, dolabriform, but often ± obpyriform in outline with age, black, with a 200-750 µm long slit along the sharp upper edge. *Peridium* 80-115 µm thick, two-layered, outer layer 30-55 µm thick, dense, carbonized and brittle, early bursting vertically along the narrow sides of pseudothecium into two laterally transversely striate plates. (This outer layer is unable to grow as fast as the rest of the peridium, thus uncovering larger parts of the inner layer as the pseudothecium develops). Inner layer 35-60 µm thick, consisting of ± isodiametric, thin-walled, dark brown cells, the innermost usually becoming narrower and somewhat lighter. *Asci* 340-459 x 12.4-18.7 µm, mean 396.3 x 15.9 µm (n = 50), cylindrical-clavate, gradually tapering towards base, bitunicate, thick-walled, at first 8-spored, later polysporous. *Paraphysoids* ca. 1.5 µm diam., numerous, long, branched, anastomosing, septate, usually with many small guttulae. *Ascospores* 270-420 µm (n = 118) long, filiform, multiseptate, slightly spiralling, fragmenting before maturity into cylindrical, pale brown (2-)3-7(-11)-septate units, measuring (13.8-)15.1-42.8(-48) x 2.9-5.5(-6) µm, mean 24.2 x 4.3 µm, Q = 5.8 (n = 132). *Anamorph* seen as effuse, black colonies on naked wood, in close connection with pseudothecia and subiculum. *Conidial* chains unbranched, thick-walled, multiseptate, irregularly constricted, verrucose and dark brown. Maturing acropetally.

**Nomenclatural and taxonomic notes.** *Glyphium grisonense* was previously treated as *G. cf. schizosporum* (Mathiassen 1989). The type material of *G. schizosporum* was not examined, and the determination was based on descriptions given by other authors (Maire 1917, Zogg 1962, Sutton 1970). The type collection of *G. schizosporum* is kept in Montpellier (MPU), but I have not seen it, as MPU does not lend out types. Slides of the type collection are kept in Edmonton (CFB, cf. Sutton 1970, Holmgren et al. 1990), but unfortunately I have

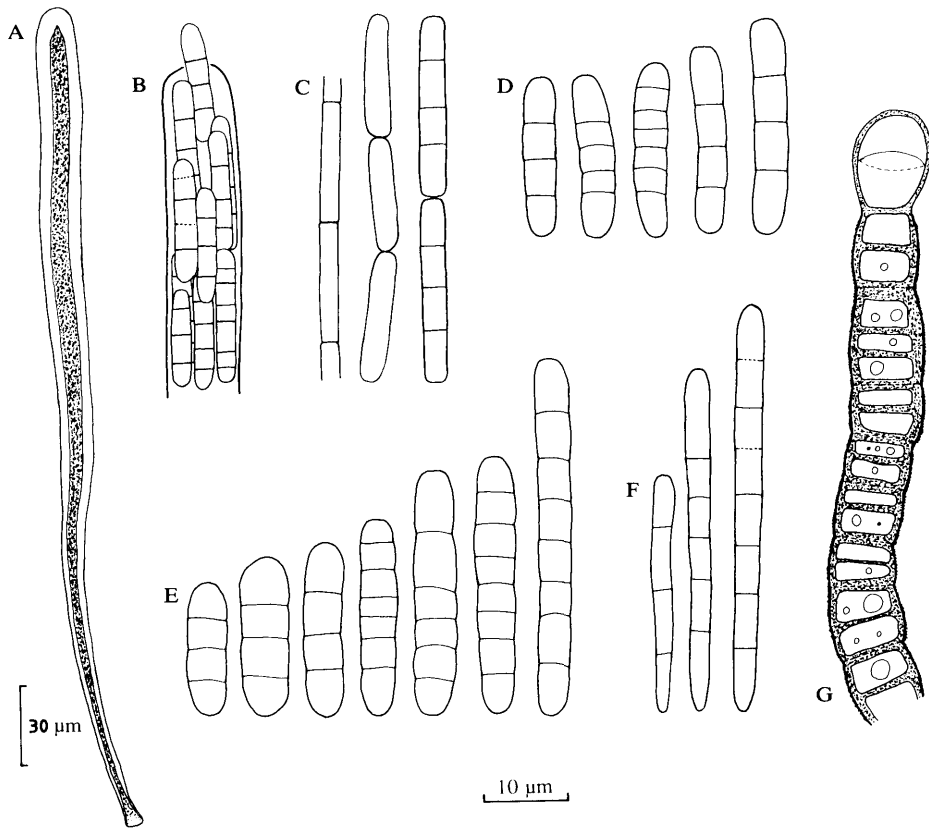


Fig. 121. *Glyphium grisonense*. A. Immature ascus.. GM 913a. B. Apical part of a mature ascus with fragmented spores. GM 913a. C. Part of a spore, and fragmenting spores. GM 913a. D-F. Spore fragments. D. GM 3482. E. GM 7768. F. Fragments from basal part of ascus. GM 913a. G. Apical part of a conidial chain.

not received these slides yet. However, I have examined all the known collections of *G. schizosporum* in Europe. With one exception, they were all different from my material, and matched the descriptions of *G. schizosporum* perfectly. Therefore, these collections are undoubtedly identical with the type collection.

*Glyphium grisonense* is closely related to *G. schizosporum*, but the differences are sufficiently pronounced to justify the rank of different species. The ascomata of *G. schizosporum* are narrow, and never develop to become obpyriform in outline, the asci are very long, but only 7-12 µm wide, the spores are very narrow, and the conidiophores slightly different from those of *G. grisonense*. Only known from a few high altitude localities in Switzerland, France and Algeria (Zogg 1962). These species are thus separated on several morphological characters, and in different geographical distribution.

One of the two known samples from Switzerland (Kt. Graubünden, Arosa, on *Betula*), turned out to be *Glyphium grisonense*. Although both Zogg (1962) and Sutton (1970) refer to this sample in their publications, they have hardly examined it microscopically. Their

descriptions of, e.g. the asci fits only *G. schizosporum*; 7-9  $\mu\text{m}$  wide (Zogg 1962: 102), 9.5  $\mu\text{m}$  wide (Sutton 1970: 260). The mature ascomata of *G. schizosporum* are very similar to young and immature ascomata of *G. grisonense*, but even young, immature and empty asci are considerably wider than mature asci of *G. schizosporum*.

**Hosts.** In this investigation found on *Salix caprea* ssp. *sericea* (9 coll.), *S. myrsinifolia* ssp. *myrsinifolia* (11 coll.), *S. pentandra* (18 coll.). So far only known from *Betula* and *Salix* (see also Mathiassen 1989: 49).

**Ecology.** A predominantly lignicolous species, but in some samples also found on bark. Most frequent on dead twigs, probably a primary saprophyte, but also able to sporulate on decayed substrate. Usually accompanied with the anamorph (*Peyronelia* sp., see Sutton 1970: 263).

**Distribution.** Only known from North Norway and from one high altitude locality in Switzerland. Fits within the disjunct distribution pattern which I earlier discussed for *Glyphium* cf. *schizosporum* and *Hypoxylon macrosporum* (cf. Mathiassen 1989: 21). More samples were found in central Scandinavia than in Troms, but as the majority of these samples were restricted to only one, rather small geographical area, it seems to be more common in the north. In Troms (Mathiassen 1989) it was distributed in all the vegetation regions, except in pure LA, and I therefore expect it to occur in northern Sweden too. This large region has so far been very little investigated, except for a few small areas. This probably explains its absence in the Swedish pyrenomycete lists and herbaria.

**Material examined** (in addition to the cited type). **Norway:** No: Alstahaug: Offersøya N of Vågen UP 84.07 25 Jun 1986 *Salix pentandra* GM 2721, 2728. Vefsn: Mjåvatnet near Sandvik VP 27,14 10 Jul 1987 *S. pentandra* GM 5141, 5144, 5164, 5166a, 5169. Grane: Grane S of Grane church VN 26,74 3 Jul 1986 *S. caprea* ssp. *sericea* GM 3504, 3506, 3507, 3508, 3510a, *S. myrsinifolia* ssp. *myrsinifolia* GM 3464, 3477, 3480, 3482, 3483, 3485, 3487, 3493, 3494, 3501, *S. pentandra* GM 3447, 3448, 3467, 3468, 3472. - Grane S of Grane church VN 26,74 28 Jul 1989 *S. pentandra* GM 7803, 7807, 7808, 7813, 7814, 7818. - Trofors at Båfjellmoen VN 25,68 27 Jul 1989 *S. caprea* ssp. *sericea* GM 7768, 7771a, 7773, 7777, *S. myrsinifolia* ssp. *myrsinifolia* GM 7784. Rana: Plurdalen SE of Langfjellet VP 76,58 26 Jul 1989 *S. myrsinifolia* ssp. *myrsinifolia* on coll. GM 7756a. Tr: Harstad: Sørvik-Sørvikfjellet WS 60,20-61,19 7 Jul 1981 *Salix myrsinifolia* ssp. *myrsinifolia* GM 230. Lavangen: Høgtind Bukkemyra XS 15,19-20 22 Aug 1983 3 coll. *S. lanata* ssp. *lanata* GM 2534a, 2536, 2537a. Salangen: Skårvikdalen XS 13,45 11 Jul 1981 *S. myrsinifolia* ssp. *borealis* GM 365. Målselv: Dividalen Dødesvann DB 45,41 21 Aug 1983 *S. lanata* ssp. *lanata* GM 2500b. Tranøy: Vangsvik XS 09,76 12 Jul 1981 *S. caprea* ssp. *sericea* GM 429b. Lenvik: W of Laukhella XS 12,83 12 Jul 1981 4 coll. *S. myrsinifolia* ssp. *borealis* GM 453c, 455a, *S. pentandra* GM 442a, 445. Balsfjord: The outlet of Laksvatn DB 36,97 18 Jul 1981 *S. lanata* ssp. *lanata* x ssp. *glandulifera* GM 729. Tromsø: Tromsøya S of Langnes DC 19,30 24 Aug 1982 *S. lanata* ssp. *lanata* x ssp. *glandulifera* GM 1816. - Tromsdalen Storsteinen DC 22,26-27 13 Sep 1982 7 coll. *S. caprea* ssp. *sericea* GM 2061, *S. myrsinifolia* ssp. *borealis* GM 2014, 2019, 2047, 2056, *S. myrsinifolia* ssp. *myrsinifolia* GM 2007, 2040. Karlsøy: Karlsøy DC 58-59,66 22 Jul 1981 *S. myrsinifolia* ssp. *borealis* GM 894c. Skjervøy: Arnøy Årviksand DC 81,86 20 Jul 1981 *S. glauca* ssp. *glauca* x *myrsinifolia* ssp. *myrsinifolia* GM 913a. **Switzerland:** Kt. Graubünden Arosa 25 May 1959 *Betula* sp. E. Rahm, det H. Zogg "*Glyphium schizosporum*" (ZT).

### *Hypoxylon macrosporum* Karst.

Not. Sällsk. F. Fl. fenn. Förh. 8: 211 (1882, 1866 as preprint) - Syntype prop.: Soviet Union, Kola Peninsula "Olenji vid Ishafvet", 4 Jul 1861, *Salix* sp., P.A. Karsten (H! = Karst., F. fenn. 775, vide infra) - *Hypoxylon vogesiacum* (Pers.) Sacc. var *macrosporum* J.H. Miller. Mycologia 25: 325 (1933) - Type: U.S.A., Wyoming, Medicine Bow Mts., 1922 *Salix* sp., C.H. Kauffman & L.E. Wehmeyer (MICH, iso!) - Anamorph: *Nodulisporium* sp. fide Whalley & Petrini (1984).

Refr. descr.: Granmo 1977: 61, Petrini & Müller 1986: 538, Mathiassen 1989: 54. Refr. illustr.: Granmo 1977: Fig. 8, Mathiassen 1989: Fig. 40.

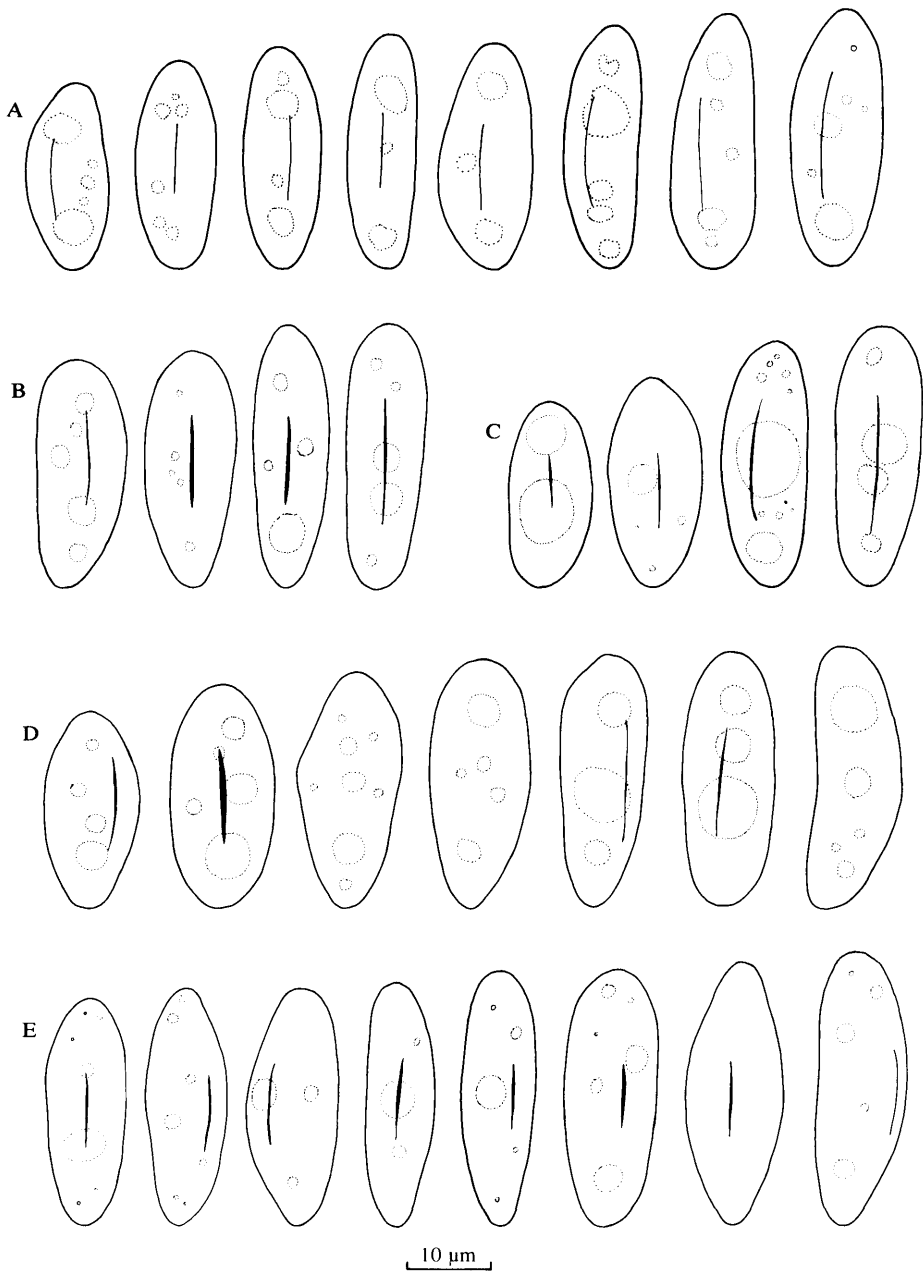


Fig. 122. *Hypoxylon macrosporum*. Spores. A. GM 2549. B. GM 3335. C. GM 5228. D. GM 8380. E. Type.

Exsic.: Karst., F. fenn. 775 (H).

Figs 41-43, 122, 124, 136.

**Description.** *Stromata* superficial, usually growing in elongate bands on wood close to bark, more rarely erumpent from bark. Reddish brown when young, dark brown to black with age. Black zones in the underlying wood always present. *Perithecia* 350-500  $\mu\text{m}$  diam., globose to ovoid, gregarious, immersed, upper portion prominent, usually with umbilicate papillae. *Asci* 125-203 p.sp. x 12.7-19.3  $\mu\text{m}$ , mean 157.1 x 15.8  $\mu\text{m}$  (n = 58), cylindrical-clavate, long-stiped, amyloid. *Paraphyses* 3-5  $\mu\text{m}$  diam., long, septate, rarely branched. *Ascospores* (21.1-)-22.1-35(-39.1) x (7.7-)-8.3-12(-12.5)  $\mu\text{m}$ , mean 27.6 x 9.8  $\mu\text{m}$ ,  $Q = 2.8$  (n = 340), broadly ellipsoid to  $\pm$  gibbose, one-celled, light brown to brown, germ slit straight, short and indistinct, uni- to partly biseriolate. Spores often abnormal in shape.

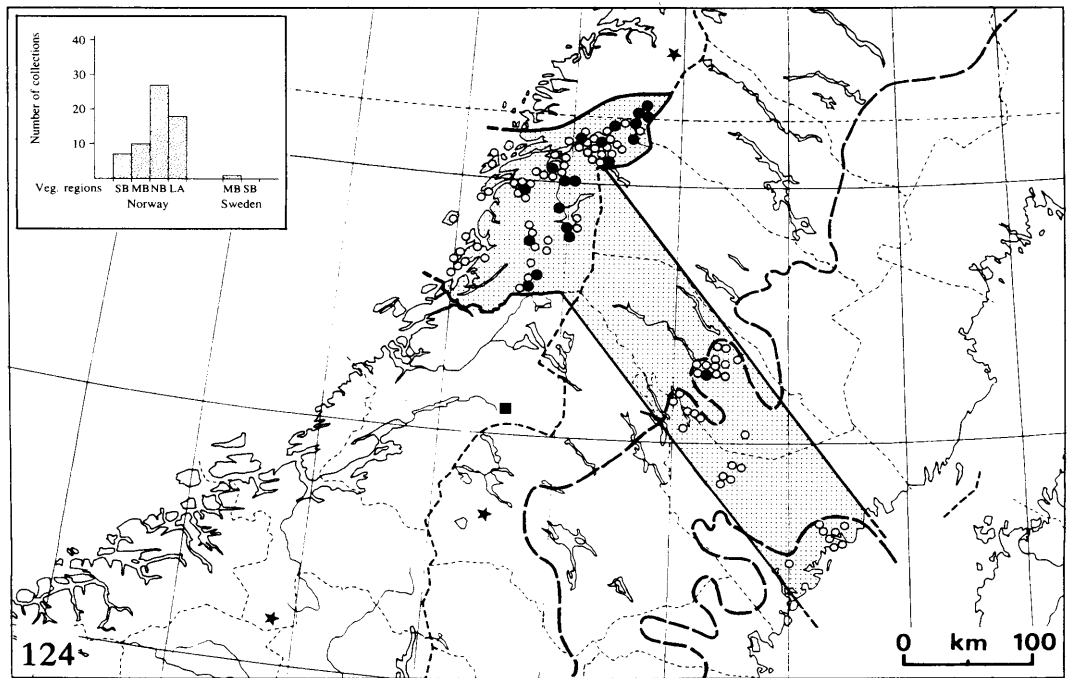
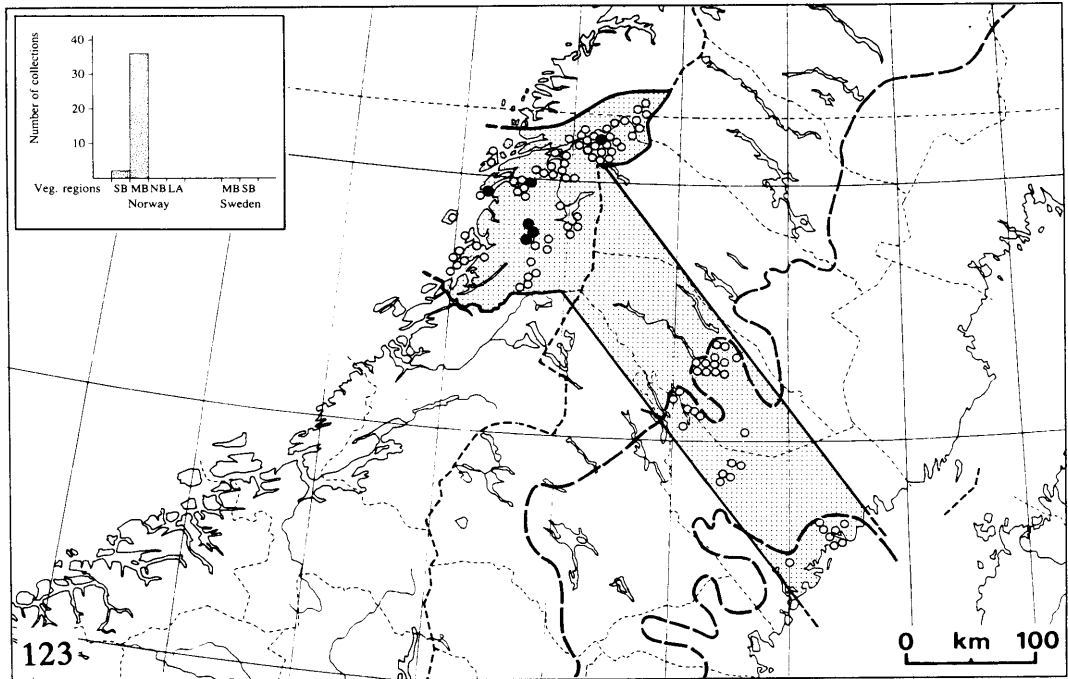
**Nomenclatural note.** Petrini & Müller (1986) regarded Karsten's F. fenn. exsic. 775 (K) as the isotype of *Hypoxylon macrosporum*. This may be correct, but the possibility of a mixed gathering must always be considered. No particular collection was indicated by him in his original description (Karsten 1882, 1866 as preprint). The opposite is actually true, as he referred to finds on *Salix* from both near Kola and Olenji in June and July 1861. The particular sample from Olenji (4 July 1861) can therefore be regarded as a syntype, but not as a holotype. An appropriate lectotype may be selected among Karsten's samples from the Soviet Union (Karst., F. fenn. 775), but the type collection cited above (H) was rather small and in poor condition. It is therefore proposed here as a syntype only.

**Taxonomic notes.** Without doubt, the type collections of *Hypoxylon macrosporum* (H) and *H. vogesiacum* var. *macrosporum* (MICH) represent the same species. The short and indistinct germ slit is a very typical feature for *H. macrosporum* and I regard it as an important character, although Whalley & Petrini (1984: 365) said the germ slit ran the length of the spore.

Several authors (Whalley & Petrini 1984, Petrini & Müller 1986, Granmo et al. 1989) recognize *Hypoxylon macrosporum* only as a variety of *H. vogesiacum* (Pers. ex Curr.) Sacc., but I prefer to consider it as a separate species. The reasons for this I have mentioned above.

**Hosts.** Only found on medium and tall shrubs, and shows no particular preference for any of these hosts; *Salix glauca* ssp. *glauca* (21 coll.), *S. lapponum* (14 coll.), *S. myrsinifolia* ssp. *borealis* (12 coll.), and ssp. *myrsinifolia* (16 coll.). In Troms (Mathiassen 1989) it was most frequently found on *S. myrsinifolia* agg., but this group of species was more investigated than any of the other *Salix* species in Troms. However, its total absence on *S. pentandra* and *S. caprea* agg. is interesting and probably not incidental. The same tendency was observed in Troms (Mathiassen 1989), where only one of 81 samples was found on these species (additional comments below). *Salix* is undoubtedly its main host, but in addition to the previously recorded sample on *Alnus viridis*, it has also been recorded on *A. crispa* (Granmo et al. 1989).

**Ecology.** A predominantly lignicolous species. Most frequently found on dead twigs, typically growing in elongate bands on wood close to bark. It is, according to Granmo et al. (1989), often found on completely decorticated branches, but this does not fit with my observations. I still consider it as a primary saprophyte, but in the present investigation it was also found on decayed substrate, and rather often near ground level. Its ecological amplitude is thus broader than previously suggested (Mathiassen 1989). Its absence on *Salix pentandra* and *S. caprea* agg. may be an ecological adaptation, but the biochemical contents and the anatomy of both bark and wood are perhaps slightly different from the other *Salix* species, thus making these hosts an unsuitable substrate for *Hypoxylon macrosporum*. However, a



Figs 123-124. Distribution maps. Fig. 123. *Glyphium grisonense*. Fig. 124. *Hypoxylon macrosporum*. Legend on p. 24.



systematic investigation of the biochemical contents, laboratory experiments and more field work are needed to justify any further discussion on this subject.

**Distribution.** Common, and found in all the vegetation regions in the Norwegian section of the transect. The finds are mostly located in the interior of Nordland, and no samples were found along the coast in the more typical oceanic localities. This could indicate a continental preference. *Hypoxylon macrosporum* is most frequent in NB and LA, and this agrees well with my investigation from Troms (Mathiassen 1989). It occurs all along the Kjølén mountain range to the Kola Peninsula. Its main distribution is in the NB and alpine areas in Scandinavia, and it seems to be most frequent in the northern parts. The NB and LA areas in Sweden were unfortunately not investigated, but I expect it to be just as common in these areas in Sweden as in Norway. I also expect it to be rather common in the northernmost parts of both Sweden and Finland. The known samples outside the transect area support this theory. The species is considerably more common in Nordland than previously suggested (Mathiassen 1989), but otherwise the distributional pattern agrees well with the one discussed earlier (cf. Mathiassen 1989: 20, 21). However, with regard to distribution, the samples from the Norwegian SB region are important and indicate that it is probably more common further south in Norway than previously suggested (cf. Granmo 1977, Mathiassen 1989). Only one sample was found in the continental MB region in Sweden, and the results of this investigation clearly indicate that *H. macrosporum* diminishes gradually towards the east. Not found east of this locality in Sweden, and it has never been found in Finland. *Hypoxylon macrosporum* has a rather wide distribution, but it is infrequent outside Scandinavia (cf. Mathiassen 1989, Granmo et al. 1989). Earlier (Mathiassen 1985: 157) I discussed its disjunct European distribution, and this was later summarized by Granmo et al. (1989: 80).

**Material examined** (in addition to the cited types and exsiccata). **Norway:** ST: Oppdal: Fisktjørn NQ 36,08 23 Jun 1984 *Salix lanata* S. Sivertsen (TRH). No: Vefsn: Fustvatnet S of Straum VP 27,12 10 Jul 1987 *S. myrsinifolia* ssp. *myrsinifolia* GM 5125, 5129, 5131a. Grane: Majavatn S of Langås VN 22,24 1 Jul 1986 *S. glauca* ssp. *glauca* GM 3282. - Øvre Fiplingvatnet S of Jensnes VN 26,36 2 Jul 1986 *S. myrsinifolia* ssp. *myrsinifolia* GM 3335, 3339. - Trofors at Båfjellmoen VN 25,68 27 Jul 1989 *S. myrsinifolia* ssp. *myrsinifolia* GM 7781. Hattfjeldal: Hattfjeldal S of Øståsen VN 54,77 8 Jul 1987 *S. myrsinifolia* ssp. *myrsinifolia* GM 4968, 4975, 4984. - S of Røssvatnet Bjørkåsen VN 57,81 8 Jul 1987 *S. glauca* ssp. *glauca* GM 5041, 5044, *S. myrsinifolia* ssp. *borealis* GM 4999, 5005. Hemnes: Bryggfjelldalen Innerdalen VP 51-52,21 13 Jul 1987 *S. glauca* ssp. *glauca* GM 5244, 5278, *S. lapponum* GM 5257a. - Korgfjellet S of Ømtinden VP 40-41,27 14 Jul 1987 *S. glauca* ssp. *glauca* GM 5299, 5307, 5308, 5310, *S. lapponum* GM 5280, 5283. - Tustervatnet S of Tustervatn VP 50,00 14 Jul 1987 *S. myrsinifolia* ssp. *borealis* GM 5318, 5321, 5325. Rana: Saltfjellet N of Stødi WP 15,83 19 Aug 1986 *S. lapponum* GM 4466. - Nedre Jamtli VP 67,57 7 Aug 1987 *S. myrsinifolia* ssp. *borealis* GM 5806, 5808, 5817, 5819, 5828, 5831, 5834. - Randalen Stokkalia WP 11-12,76 21 Jul 1989 *S. glauca* ssp. *glauca* GM 7511, 7517, 7519, 7526b, 7528, *S. lapponum* GM 7530, 7531, 7534. - Virvassdalen near Verdal WP 08,62 21 Jul 1989 *S. myrsinifolia* ssp. *myrsinifolia* GM 7565. - Dunderlandsdalen Grotjømenget VP 93,72 22 Jul 1989 *S. myrsinifolia* ssp. *myrsinifolia* GM 7597, 7601. - Plurdalen Kaldvatnet W of Revet VP 89,47 25 Jul 1989 *S. glauca* ssp. *glauca* GM 7697, 7702, 7706, 7709a. - Plurdalen SE of Langfjellet VP 76,58 26 Jul 1989 *S. myrsinifolia* ssp. *myrsinifolia* GM 7753, 7753d, 7755, 7760. - Saltfjellet Arctic Circle WP 15,82 25 Jul 1990 *S. glauca* ssp. *glauca* GM 8291, *S. lapponum* GM 8301, 8310. Saltal: Saltfjellet near Sukkertoppen WP 15,87 20 Jul 1989 *S. glauca* ssp. *glauca* GM 7500, *S. lapponum* GM 7492, 7493, 7494, 7498. - Pr. Balvatnet 28 Aug 1988 A.-E. Torkelsen 208/88 (O). Fi: Kautokeino: Øvre Anarjåkka nasjonalpark MS 02 NE 5 Jul 1969 *S. phyllicifolia* S. Sivertsen, det. A. Granmo (TRH). **Sweden:** Jmt: Åre: Åreskutan VL 00,30 13 Aug 1982 *S. lanata* ssp. *lanata* GM 2367 (TROM). ÅsL: Vilhelmina: E of Djupdal Svältmyran WM 60,71 6 Jul 1986 *S. lapponum* GM 3712.

***Hypoxylon mammatum* (Wahl.) Karst.**

Not. Sällsk. F. Fl. fenn. Förh. 8: 212 (1882, 1866 as preprint) - *Sphaeria mammatum* Wahl., Fl. suec.: 1003 (1826) - Syntype prop.: Finland, Lapponia Inarensis ad Ivalojoensuu, 14 Aug 1802, *Salix caprea*, G. Wahlenberg (UPS!, vide infra) - Synonyms; see Petrini & Müller (1986) - Anamorph: *Geniculosporium* sp. fide Petrini & Müller (1986).

Refr. descr.: Mathiassen 1989: 57. Refr. illustr.: Mathiassen 1989: Fig. 47.

Exsic. Rbh., F. eur. 3359 (S) - Rehm, Asc. 1231, 1232 (S) - Romell, F. scand. 180 "*Hypoxylon holwayi*" (S).

Figs 44-46, 125, 126, 128, 137.

**Description.** *Stromata* erumpent through bark, discrete, usually orbicular, often collabent in the middle. Ectostroma strongly carbonized, finally black. Black zones in the underlying wood always present. *Perithecia* 0.8-1.6 mm diam., a few to many in each stroma, adjacent, immersed, usually compressed, upper portion prominent, papillae papillate. *Asci* 119-168 p.sp. x 11-18.8 µm, mean 140.4 x 15.2 µm (n = 104), cylindrical, long-stiped, amyloid. *Paraphyses* 3-4 µm wide at base, tapering towards apex, long, sparsely septate, rarely branched. *Ascospores* (17.3-)17.5-27(-33.6) x (7.7-)8.2-11.5(-12) µm, mean 22.0 x 9.3 µm, Q = 2.4 (n = 240), broadly ellipsoid or oblong-ellipsoid, one-celled, dark brown, germ slit distinct, running all the length of the spore, uniseriate or obliquely uniseriate. Spores often abnormal in shape.

**Nomenclatural note.** Wahlenberg's (1826) description of *Sphaeria mammata* was undoubtedly based on the specimens he collected in Lapponia Inarensis in 1802 (on *Salix caprea* and *Betula "alba"*), but no particular collection was indicated by him as the "type" (see also Wahlenberg 1812: 520). Miller (1961: 65) selected the particular collection on *S. caprea* (cited above) as the type of *S. mammata*, and it is proposed here as syntype. It may be assigned as the lectotype, but it is possible that Wahlenberg collected other specimens on *S. caprea* in Lapponia Inarensis in 1802, which are in better condition.

Petrini & Müller (1986: 551) considered *Hypoxylon mammatum* (Wahl.) J.H. Miller to be the correct citation, but *H. mammatum* was validly published by Karsten in 1882 (1866 as a preprint, cf. Whalley & Petrini 1984).

**Taxonomic notes.** Miller (1961) synonymized *Hypoxylon pruinautum* (Klotz.) Cke., the fungus causing canker on *Populus* spp., with *H. mammatum* which occurs as a saprophyte on other tree genera. This was later accepted by other mycologists, e.g. French et al. (1969), Pinon (1979), Petrini & Müller (1986), and Granmo et al. (1989).

The differences between samples from aspen and willow are actually very pronounced (anamorph, pathogenicity, stromata, asci and spore sizes, hosts and distribution), and fully sufficient to consider the fungus on aspen as a separate species, or a variety, but when samples from alder and birch are also considered, the dimensions of the spores on the fungus on aspen are perhaps not sufficiently different to justify maintaining *Hypoxylon pruinautum* as a species separate from *H. mammatum*. The average spore dimensions for samples from alder and birch are intermediate, and according to French et al. (1969), there seems to be a more or less continuous increase in spore sizes from willow, via alder and birch, to aspen. However, the average spore dimensions are clearly different, and very constant within the different hosts. This agrees well with my investigation of the Scandinavian aspen and willow collections (see Fig. 126). The differences in the size and shape of the stromata on the various hosts, can, as suggested by French et al. (1969), be mainly attributed to the differences in bark characteristics of the different hosts. I have therefore, with some reservations, included the as-

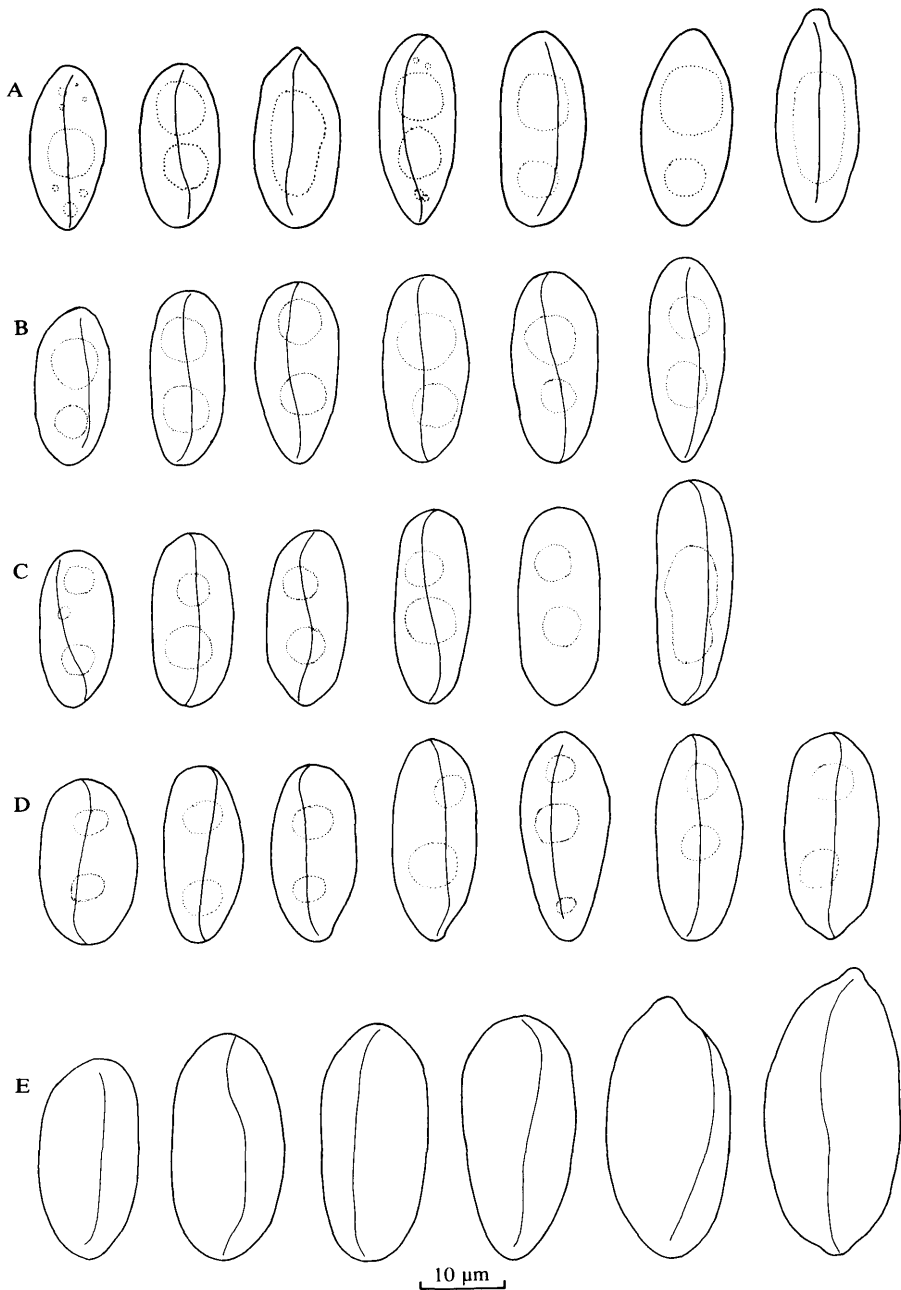


Fig. 125. *Hypoxylon mammatum*. Spores. A. GM 704. B. GM 5882. C. GM 8462. D. Type. E. Herb. Romell No. 15218, on *Populus tremula*.

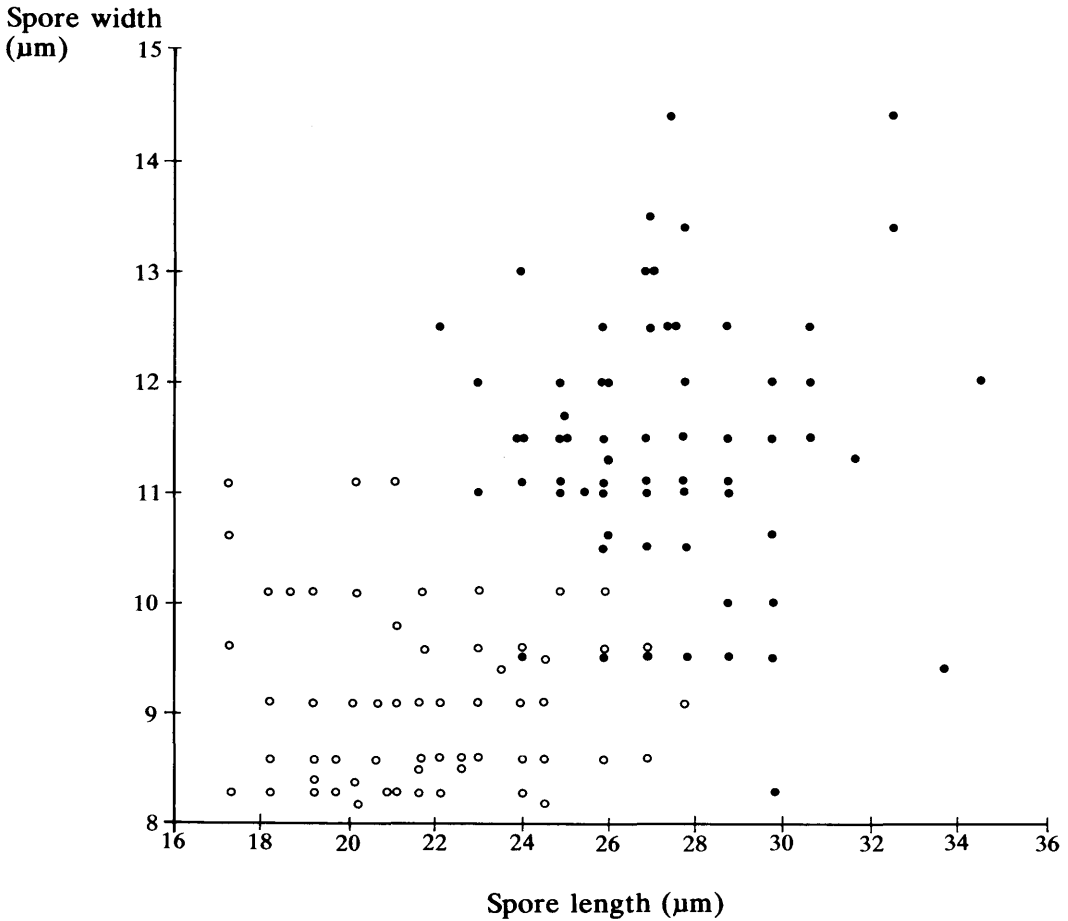


Fig. 126. Scatter diagram illustrating the variation in spore length and spore width in *Hypoxylon mammatum* collected from *Salix* spp. (open symbols) and *Populus tremula* (filled symbols).

pen samples in the present paper.

We have no reliable reports of the pathogenic form of *Hypoxylon mammatum* in the Nordic countries (see below), but the spore sizes from the Scandinavian aspen samples (mean 27.2 x 11.5 µm) agree with those given for the pathogenic form by Bier (1940), Gruenhagen (1945), and French et al. (1969). The fungus on the different aspen species and hybrids (cf. Berbee & Rogers 1964) seems to be a distinct strain of *H. mammatum* s. lat., which acts both as a primary saprophyte and a pathogen. The pathogenic capabilities seem to some extent to be correlated with climatical conditions, but other important factors are obviously also involved (see, e.g. Manion & Griffin 1986).

An array of mycologists, plant pathologists, and contributors trained in other disciplines have been drawn to the problems with the *Hypoxylon* canker disease of aspen since Povah

(1924) published the first report on the subject, but there are still many unsolved problems. Further study of the biological relationships and pathogenic capabilities of *H. mammatum* from various sources is needed, according to Manion & Griffin (1986), to understand this highly variable fungus.

**Hosts.** Only found on the large trees *Salix caprea* ssp. *caprea* (5 coll.), and ssp. *caoetanea* (1 coll.), *S. pentandra* (12 coll.), and on *S. myrsinifolia* agg., *S. myrsinifolia* ssp. *borealis* (1 coll.), and ssp. *myrsinifolia* (12 coll.). The size of the trees seems to be important for *Hypoxylon mammatum*, but a few samples were found on the medium and low shrubs *S. phylicifolia* and *S. hastata* ssp. *hastata* in Troms (cf. Mathiassen 1989: 60). Its total absence on *S. pentandra* and *S. caprea* agg. in Troms is interesting, and probably not incidental.

*Hypoxylon mammatum* is found on *Betula*, *Populus*, *Salix* and *Sorbus* in Fennoscandia, with *Salix* as the main host in the central and northern areas, but it is also common on *Sorbus*. *Betula* is a secondary host. Granmo et al. (1989) also considered *Populus* as a primary host in the Nordic countries, but it must be emphasized that the many registered *Populus* finds are restricted to South Sweden only. *Hypoxylon mammatum* has not so far been found on *Populus* in Norway or Finland (see Material examined), and the northernmost, verifiable find on *Populus* in Sweden is from the Uppsala area in Uppland (see below). *Hypoxylon mammatum* s. lat. has a wide saprophytic host range, but a restricted pathogenic range.

**Ecology.** *Hypoxylon mammatum* is a corticolous species, always found in, or erumpent through bark. Most frequently found on stems about 1.5-2.5 m above the ground.

In the Swedish SB area, it was frequently found together with *Diatrype bullata*. They were typically growing close together on the same twigs or branches, more rarely on stems, but occupying different niches; *Hypoxylon mammatum* always below *D. bullata*. I have no explanation to this ecological phenomenon.

*Hypoxylon mammatum* seems to be an early invader (or perhaps a latent invader), but I still regard it as a primary saprophyte on *Salix*. It has a broad ecological amplitude, as previously suggested (Mathiassen 1989), and it seems to be an important *Salix*-decaying fungus in central and northern Scandinavia. It is an important pathogen on *Populus*, but I have never found it as a pathogen on *Salix*. However, *H. mammatum* has been associated with canker in *Salix* in Wales (cf. Granmo et al. 1989: 74, 82), and one particular sample, that "resembled" a canker forming *H. mammatum*, was recently found on *Salix* in central Sweden by T. Læssøe (Kew, in litt. 1991). In such cases it is however very difficult to decide whether the pathogenic appearances are mainly due to other fungi, or to the pathogenic capabilities of *H. mammatum* on *Salix* only. Further study of the pathogenic capabilities of the isolates from these samples are necessary before conclusions are made. French et al. (1969) found that the isolates from willow initially produced cankers on aspen, but these were eventually callused over. No synnemata or stromata developed.

Vleugel found *Hypoxylon mammatum* (sub *H. holwayi* Ellis) on "*Populus tremula*" in north-central Sweden as early as in 1898 (see Material examined), and it is strange that he later (Vleugel 1908: 369) only mentioned the sample he found on *P. tremula* in June 1906. However, the substrate in his 1898 sample (S) actually appeared to be *Salix* sp., such that I do not fully rely on his 1908 report. This particular sample is important, as it was found considerably north of the other Swedish *Populus* samples, and I look forward to examining the wood anatomy, and to measure the asci and spores. It is preserved at UME, but due to the present rearrangement of the UME herbarium, I have unfortunately not received this sample yet.

**Distribution.** Rather common in central Scandinavia, but it was not found in the Norwegian section of the transect at all. The investigation clearly indicates that *Hypoxylon*

*mammatum* tends towards being continental, and that it becomes more frequent towards the east. It is common in Finland, and particularly in northern Norway, and the many collections from Sweden are either found in the interior, continental areas, or in the eastern parts of the country (cf. Granmo et al. 1989: Fig. 23, Mathiassen 1989). The record from *Salix* in Wales (Granmo et al. 1989), and the presence of the fungus in the southern part of England (Læssøe in litt. 1991) do not fit with its distributional pattern on *Salix* in Fennoscandia. It is previously mentioned from Sweden and Finland by Wahlenberg (1826), Karsten (1882), Vleugel (1908), and Nannfeldt (1969) considered it as very common in central and northern Sweden.

*Hypoxyton mammatum* s. lat. has a wide saprophytic distribution, but a restricted pathogenic distribution. Its distributional pattern on *Populus* is very interesting. The pathogenic form is found in the continental areas of central Europe, and in the central parts of the Soviet Union, east to Novosibirsk (Pinon 1979). Further to the north, the fungus is saprophytic. In the Nordic countries it is only known from South Sweden, although *Populus tremula* is common all over Fennoscandia. The same pattern is found in North America, where the geographic range of the pathogenic form also is more restricted than that of the host or the fungus. According to Manion & Griffin (1986), the pathogenic form is prevalent throughout the northeast, the Great Lakes region, and the northwestern prairies. The incidence is fairly low in the central Rocky Mountains, but the disease is noticeably absent in the northern Rocky Mountains and in Alaska, despite an abundance of aspen and collection of the fungus. *Populus tremuloides* is the dominant tree species on 2.4 million acres in Alaska (French et al. 1969: 223).

This strengthens my hypothesis that the climatical conditions are perhaps the most important factor in the regulation of the pathogenic capabilities. One simple test is to inoculate isolates of the pathogenic form from central Europe on aspen trees in southern, central, and northern Scandinavia, and also inoculate isolates of the saprophyte on aspen in South Sweden on aspen trees within the distribution area of the pathogenic form in central Europe.

I have scanned through a lot of publications on *Hypoxyton* canker, but I have not seen this method mentioned or tested.

**Material examined** (in addition to the cited type and exsiccatae). **Norway:** Sine loc., dat. et nom. coll., det. A. Granmo (O). Sine loc. et dat. coll. *Sorbus aucuparia* A. Blytt, det. A. Granmo (O). Op: Etnedal: Haug 20 Aug 1932 *Sorbus aucuparia* A. Hagen, det. T. Læssøe & A. Whalley (O). Ringeby: Ringeby s. dat. *Sorbus* sp. A. Blytt, det. A. Granmo (O). Tr: Lyngen: Lyngseidet 2 Aug 1973 *Salix* sp. A. & I. Granmo 208/73 (BG). **Fi:** Tana: Tana bru pr. Seidajokka 8 Aug 1973 *Salix* sp. 3 coll. A. Granmo 269-271/73 (BG). **Sweden:** Ög: Ödeshög: Ödeshög 23 Jul 1889 *Populus tremula* L. Romell (UPS). - V. Tollstad, Alvastra 1 Aug 1889 *P. tremula* L. Romell, Herb. Romell no. 15626 "*Hypoxyton holwayi*" (S). Nrk: Kumla: Kumla s. dat. *Populus tremula* L. Romell, Herb. Romell no. 15218 (S). Örebro: St. Mellösa 2 Aug 1927 "*P. tremula*" R. Johansson & E. Julin (UPS), & ibid. 10 May 1948 *P. tremula* R. Morander (UPS). Sdm: Enköping: Vallby 1845 *P. tremula* M.A. Lindblad, det. J.A. Nannfeldt (UPS), & ibid. M.A. Lindblad "*Hypoxyton pruinaum*" (S). Nacka: Saltsjö-Duvnäs 9 May 1918 L. Romell, Herb. Romell no. 15630 "*Hypoxyton holwayi*" (S). Nyköping: Östra bergen 4 May 1923 *Populus tremula* R. Morander (UPS). Värmdö: Rågskär pr. Bullerö 8 May 1968 S. Lundberg "stat. conid." (UPS). Sdm?: Pr. Stockholm "Ad Holmiam." 18 Jun 1892 *P. tremula* H. Hesselman (C, LD, S, UPS). Upl: "Bogesundlandet" 10 Apr 1966 *P. tremula* S. Lundberg "stat. conid., cf. *H. mammatum*" (UPS), & ibid. 3 May 1966 *P. tremula* S. Lundberg (UPS). Ekerö: Ekerö 26 Jun 1966 *P. tremula* S. Lundberg "stat. conid." (UPS). Norrtälje: Häverö 6 Aug 1894 *P. tremula* M. Romell, Herb. Romell no. 15159 "*Hypoxyton holwayi*" (S). Stockholm, Ulvsunda 16 Jun 1901 L. Romell, Herb. Romell no. 15628 "*Hypoxyton holwayi*" (S). Täby: Näsby Oct 1912 L. Romell, Herb. Romell no. 15629 "*Hypoxyton holwayi*" (S). - Täby 18 Apr 1911 *Populus tremula* 2 coll. T. Vestergren (S). Uppsala: Dalby NW of Hässelborg 20 Feb 1987 *P. tremula* K. & L. Holm 4388f "stat. conid." (UPS). - Kiplingeberg 28 May 1968 *P. tremula* K. & L. Holm "stat. conid." (UPS). - Uppsala Sep 1884 *P. tremula* K. Starbäck (S, UPS), ibid. 1885 *P. tremula* K. Starbäck "*Hypoxyton pruinaum*" (S), & ibid. 12 Apr 1885 *Populus tremula* L. Romell, Herb. Romell no. 15941 "*Hypoxyton holwayi*" (S). - Uppsala Näs, Lurbo 22 Apr 1967 *Populus tremula* K. & L. Holm "stat. conid." (UPS). - Vassunda E of Källbo 20 Apr 1968 *P. tremula*

K. & L. Holm "stat. conid." (UPS). Hls: Ängersjö: Ängersjö 5 May 1900 *Sorbus aucuparia* M. Östman, det. A. Granmo (BG). Ång: Kramfors: Almsjönäs N of Norr-Almsjön CR 98,50 3 Aug 1987 *Salix myrsinifolia* ssp. *myrsinifolia* GM 5671, 5672, 5677. Sollefteå: Lillsele W of Ångermanälven XL 76,03 30 Jul 1990 *S. myrsinifolia* ssp. *myrsinifolia* GM 8460, 8462, 8470. Örnsköldsvik: Örnsköldsvik N of Sundåsen CR 17,83 1 Aug 1987 *S. myrsinifolia* ssp. *borealis* GM 5502. - Örnsköldsvik Västerås CR 20,82 2 Aug 1987 *S. pentandra* GM 5594, 5597. - Vågefjärden Vikbotten CR 12,89 2 Aug 1987 *S. myrsinifolia* ssp. *myrsinifolia* GM 5609. - Arnäs E of Älvsjösjön CR 25-26,90 4 Aug 1987 *S. caprea* ssp. *caprea* GM 5721, 5722a, *S. myrsinifolia* ssp. *myrsinifolia* GM 5713. - Vågefjärden E of Norrvåge CR 12-13,88 8 Jul 1988 *S. myrsinifolia* ssp. *myrsinifolia* GM 5924, *S. pentandra* GM 5913a. - Haffstafjärden N of Billsta CR 25,75 9 Jul 1988 *S. caprea* ssp. *caprea* GM 6050, 6089, 6102, *S. myrsinifolia* ssp. *myrsinifolia* GM 6026, 6030, 6033, 8 Jul 1988 *S. pentandra* GM 5934, 5937, 5939, 5943, 5974. Jmt: Östersund: Andersön VL 70,00 12 Aug 1982 *S. caprea* ssp. *caprea* GM 2358, & ibid. *Sorbus aucuparia* leg. A. Granmo & G. Mathiassen GM 2356, 2363 (TROM). Vb: Skellefteå: Skellefteå 1898 "*Populus tremula*" = *Salix* sp. J. Vleugel "*Hypoxylon holwayi*" (S). Umeå: Brännland 22 May 1976 *Salix* sp. O. Eriksson (UME 29109). - Umeå, "nedom kyrkan", prob. at the Ume River near the church 27 May 1901 *Salix myrsinifolia* C.P. Laestadius, det. O.E. Eriksson (UME 29211), & ibid. 4 Jun 1901 C.P. Laestadius, det. O.E. Eriksson (UME 29212). - Sörfors 22 Sep 1986 *Salix* sp. O. Eriksson (UME 29210). Nb: Haparanda: Ylikoski 24 May 1957 "= *Salix* sp." O. Lönnqvist no. 276b (UPS). - Luleå: Sandön 23 Aug 1915 *Sorbus aucuparia* J. Lind, det. A. Whalley (C). ÅsL: Vilhelmina: Strömnäs 19 Jun 1927 *Sorbus aucuparia* G. Nilsson (UPS). - Vilhelmina N of Gubbseforsen WM 67,79 7 Jul 1988 *Salix caprea* ssp. *sericea* GM 5882. Sollefteå: Junsele Pustviken E of the road WL 66,96 4 Aug 1989 *S. pentandra* GM 8076, 8079. - Junsele WL 65,94 5 Aug 1989 *S. pentandra* GM 8101. Åsele: Gavsele W of Ångermanälven XL 99,10 30 Jul 1990 *S. pentandra* GM 8434. TL: Kiruna: Abisko 16 Aug 1903 *S. phyllifolia* T. Vestergren (UPS). Finland: Pohjois-Savo, Kupio 3 Jul 1903 "*Populus tremula*" = *Salix* sp. O.A.F. Lönnbohm (TUR). Koillismaa, Posio, Mäntyjärvi 10 km N of hill Parvavaara 2 Jul 1955 "*Populus tremula*" = *Salix* sp. T. Ahti B463, det. T. Læssøe (H). Canada: Shelburne N.H., Sept 1891 *Populus grandidentata* "*Hypoxylon holwayi*" (S).

### *Hysterographium elongatum* (Wahl.) Corda

Icon. fung. 5: 77 (1842) - *Hysterium elongatum* Wahl., Fl. lapp.: 523 (1812) - Syntype prop.: Finland, Lapponia Kemensis ad Ivalojoensuu, 16 Aug 1802, *Salix caprea*, G. Wahlenberg (UPS!, vide infra) - Anamorph: *Hysteropycnis confluens* Hilitzer, Hilitzer (1929: 129).

Refr. descr.: Zogg 1943: 348, Mathiassen 1989: 60. Refr. illustr.: Mathiassen 1989: Fig. 50.

Exsic.: Lundell & Nannf., F. suc. 291, 2264, 2265 (C).

Figs 47-49, 127, 129, 138.

**Description.** *Ascomata* 0.8-2.2(-3.7) x 0.3-0.6(-1.1) mm, hysterothecioid, elongate, straight or curved, erumpent superficial, mostly scattered, opens by a long slit, surface usually longitudinally striate, carbonized, black. *Asci* 156-204 x 26.9-36 µm, mean 178.5 x 31.8 µm (n = 78), clavate, rather short-stiped. *Pseudoparaphyses* 1-2.4 µm diam., septate, branched, anastomosing. *Ascospores* (35.8-)37.4-56(-66.5) x (12-)13.4-20.7(-22) µm, mean 46.8 x 16.5 µm, Q = 2.9 (n = 385), broadly ellipsoid, slightly curved, (8-)9-12(-14)-septate, with several longitudinal septa, constricted at median first-formed septum, less so at the other septa. Verruculose, orange brown to dark reddish brown, biseriate.

**Nomenclatural note.** Wahlenberg (1812: 523) found *Hysterographium elongatum* "in ramis denudatis *Salicis caprae* passim". Therefore, we have no guarantee that the type collection (UPS) cited above is the holotype. No particular collection was mentioned by him, but the material is original, and was undoubtedly among the collections on which the original description was based. It is therefore proposed here as syntype of *H. elongatum*. A closer examination of the material Wahlenberg collected in 1802 is necessary before an appropriate lectotype can be selected.

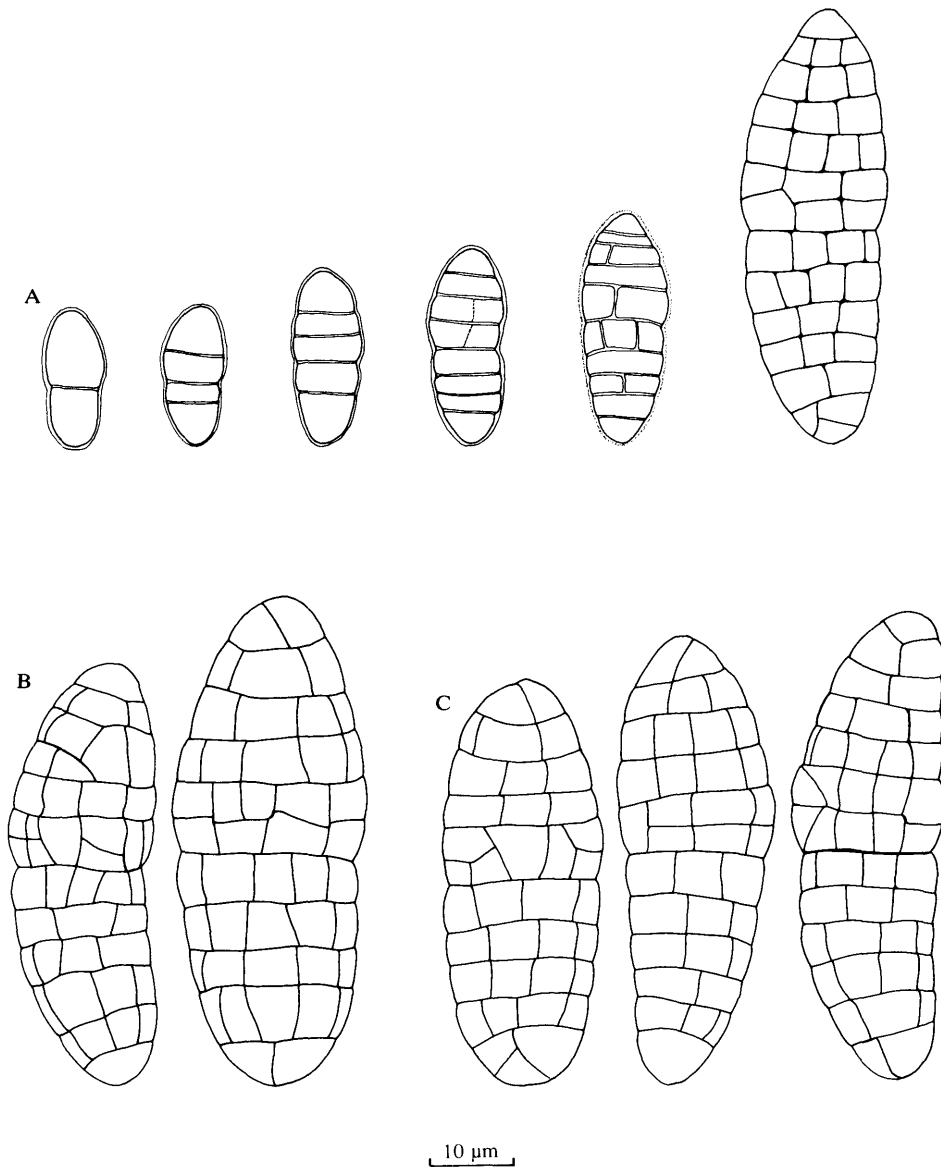
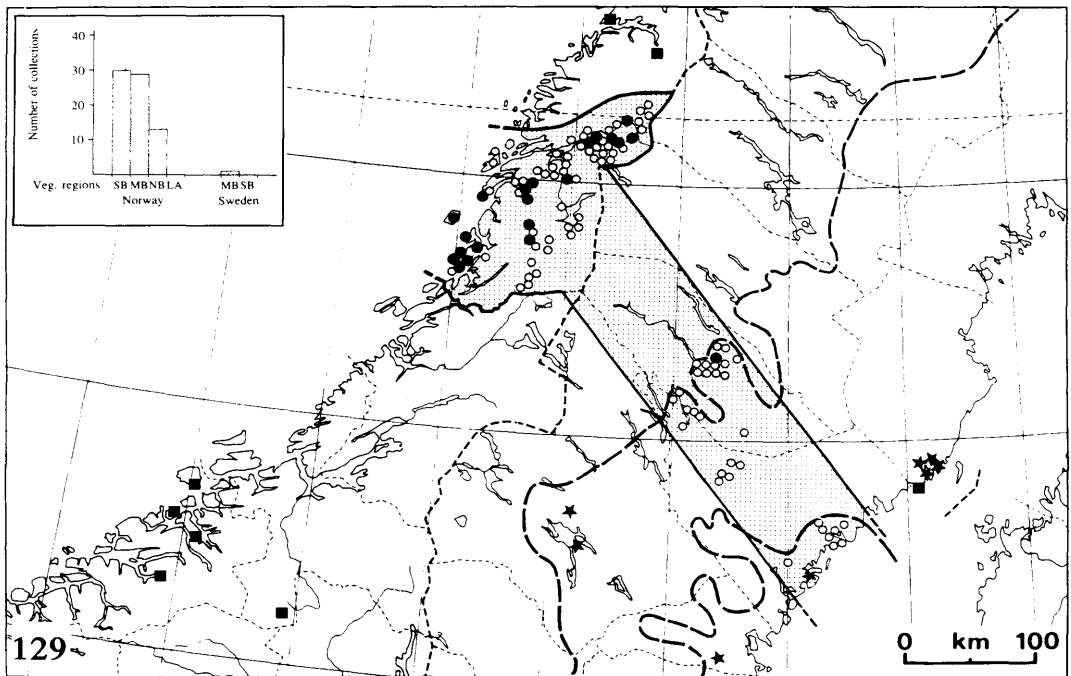
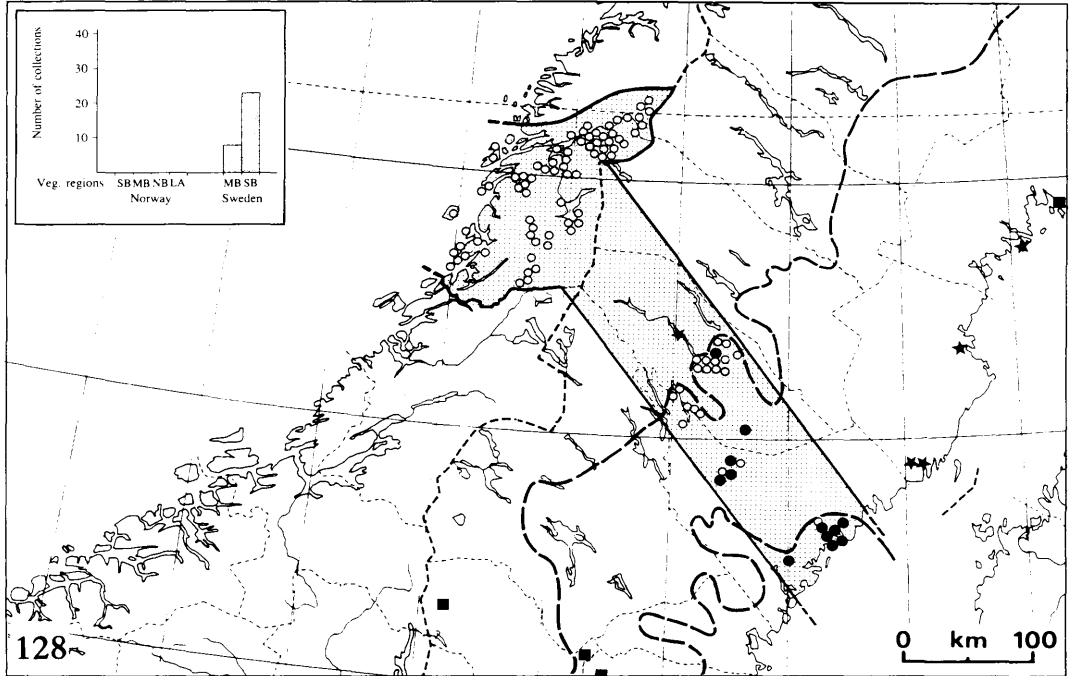


Fig. 127. *Hysterographium elongatum*. Spores. A. Spores in different stages of development. GM 3198. B. GM 1014. C. Type.

**Taxonomic notes.** Barr (1990b) has actually accepted Zogg's (1962) synonymizing of *Hysterographium elongatum* with *H. fraxini* (Pers. : Fr.) De Not., but these taxa represent, in my opinion, two separate species (cf. Mathiassen 1989: 62). Even Fries (1819: 94) pointed out that *H. elongatum* was easy to separate from *H. fraxini*. Barr (1987) includes the Hysteriaceae





Figs 128-129. Distribution maps. Fig. 128. *Hypoxylon mammatum*. Fig. 129. *Hysteroglyphium elongatum*. Legend on p. 24.

among the Pleosporales, while Eriksson & Hawksworth (1990d) include it among the Dothideales.

**Hosts.** Only found on the large trees *Salix caprea* ssp. *caprea* (1 coll.), and ssp. *sericea* (30 coll.), *S. pentandra* (30 coll.), and on *S. myrsinifolia* agg., *S. myrsinifolia* ssp. *borealis* (5 coll.), and ssp. *myrsinifolia* (7 coll.). In Troms it was most frequent on *S. myrsinifolia* agg., with *S. caprea* ssp. *sericea* and *S. pentandra* as secondary hosts. However, *Hysterographium elongatum* was actually more frequent on *S. caprea* ssp. *sericea* in Troms than the collected samples indicated (cf. Mathiassen 1989: 61-62), and this agrees well with the present investigation. It is interesting to notice that, in Nordland, *H. elongatum* also turned out to be just as frequent on *S. pentandra* as on *S. caprea* ssp. *sericea*. In Scandinavia found on *Acer*, *Alnus*, *Betula*, *Corylus*?, *Fagus*, *Lonicera*, *Populus*, *Salix* and *Sorbus*, with *Salix* as the primary host in the north, and with *Populus* in the south. Also reported on *Quercus*, *Rhamnus* and *Rosa* (Zogg 1943).

**Ecology.** Predominantly lignicolous, most frequently found on dead branches. Often found on rather dry substrate, but also able to sporulate on decayed, moist substrate. However, *Hysterographium elongatum* is undoubtedly a primary saprophyte. The size of the trees, and the substrate seem to be important for *H. elongatum* on *Salix*.

**Distribution.** Very common in the Norwegian section of the transect. Its distributional pattern is very distinct; frequent in SB and MB, less frequent in NB, and not found in LA. This agrees well with my investigation from Troms (Mathiassen 1989: Tab. 4). Here I regarded it as common, but it becomes undoubtedly more frequent southwards. In the Swedish section of the transect it appeared to be very rare. Only one sample was found in MB, and none in SB. This seems to be a true distributional pattern for *Hysterographium elongatum* on *Salix* in the continental areas in north-central Sweden. However, *H. elongatum* has previously been found on *Salix* along the Swedish east coast, where it is rather common, but more often found on other hosts. When supplied with information on the previous known samples, the present investigation clearly indicates that *H. elongatum* tends towards being oceanic in its distribution in central and northern Scandinavia. With regard to distribution, the many samples from the Norwegian SB and MB regions are important, and I expect *H. elongatum* to be considerably more common further south in Norway than the previously collected samples indicate. It is common in southern Sweden, diminished gradually towards the north, and is very rare in the northern continental areas. Fries (1819) observed it on decorticated branches of several different hosts in Sweden, and he obviously regarded it as common. It is also reported from north-central Sweden by Vleugel (1908), and from the Uppsala area by Eliasson (1897). It is rather common in Finland.

Its oceanic ability and preference for particular vegetation regions may indicate that *Hysterographium elongatum* has particular temperature requirements, but I think its absence in LA in Nordland and Troms are mainly due to substrate preferences, and to the distribution of the hosts. *Hysterographium elongatum* has actually been found in alpine areas up to 2600 m a.s.l. (cf. Zogg 1943).

**Material examined** (in addition to the cited type and exsiccatae). **Norway:** Sine loc., dat. et nom. coll. (C). No: Sømna: Sømna N of Berg UN 69.70.53 26 Jun 1986 *Salix myrsinifolia* ssp. *borealis* GM 2883, 2889, *S. pentandra* GM 2866. - Sømna E of Sørbotnet UN 70.51 27 Jun 1986 *S. caprea* ssp. *sericea* GM 2977, 2982. - Sømna N of Vik near Knyk UN 69.47-48 4 Jul 1987 *S. caprea* ssp. *sericea* GM 4752. - Sømna S of Våg UN 66.40 6 Jul 1987 *S. pentandra* GM 4826, 4828, 4832, 4833, 4839, 4844, 4847, 4878, 4879, 4880, 4881, 4884, 4886. Brønnøy: Sømna Akselberg UN 83.55 29 Jun 1986 *S. caprea* ssp. *caprea* GM 3078, *S. myrsinifolia* ssp. *borealis* GM 3093. - Brønnøysund Mossem UN 73.67 30 Jun 1986 *S. pentandra* GM 3195b, 3198, 3199, 3200a. Vega: Vega W of Rørøy PT 37.84-85 30 Jun 1986 *S. myrsinifolia* ssp. *myrsinifolia* GM 3149, 3151. Alstahaug: Tjøtta S of Kråkvikvatnet UP 81.04 25 Jun 1986 *S. pentandra* GM 2786. Vefsn: Fustvatnet S of Straum VP 27,12

10 Jul 1987 *S. myrsinifolia* ssp. *myrsinifolia* GM 5129c, 5130, 5133. - Mjåvatnet near Sandvik VP 27,14 10 Jul 1987 *S. pentandra* GM 5140, 5167, 5168, 5170. - Mosjøen S of Kulstad VP 18,06 28 Jul 1989 *S. myrsinifolia* ssp. *myrsinifolia* GM 7830, 7837. Grane: Grane S of Grane church VN 26,74 3 Jul 1986 *S. pentandra* GM 3445, 3446, 3454, 3469, 3473, 3474, 3475. - Trofors at Båfjellmoen VN 25,68 27 Jul 1989 *S. caprea* ssp. *sericea* GM 7766. Hemnes: Bryggfjelldalen Innerdalen VP 51-52,21 13 Jul 1987 *S. caprea* ssp. *sericea* GM 5210, 5211, 5214. Rana: Virvassdalen near Verdal WP 08,62 21 Jul 1989 *S. caprea* ssp. *sericea* GM 7550, 7555, 7556, 7557, 7559, 7562. - Dunderlandsdalen near Storvollen VP 96-97,76 22 Jul 1989 *S. caprea* ssp. *sericea* GM 7581, 7582, 7588, 7590, 7595. - Skuggei at Holmen VP 68-69,57 23 Jul 1989 *S. myrsinifolia* ssp. *borealis* GM 7644, 7651. - Grønfjelldalen E of Rundmoen VP 92,54 24 Jul 1989 *S. caprea* ssp. *sericea* GM 7667, 7673, 7675, 7676. - Grønfjelldalen S of Grønfjell VP 83,60 26 Jul 1989 *S. caprea* ssp. *sericea* GM 7741, 7742, 7746. - Skonseng near Seljehaugen VP 71,59-60 1 Aug 1989 *S. caprea* ssp. *sericea* GM 7951, 7953, 7954, 7958. **Sweden:** Sm: Oskarshamn: Jungfrun Isl. 7 Jun 1915 *Acer platanoides* 2 coll. G.E. du Rietz & H. Osvald (H). Upl: Tierp: Norrby 1857 5 coll. E.P. Fries (C, H). Uppsala: 1856 E.P. Fries (H) Mpd: Sundsvall: Högåsen 6 Sep 1931 E. Eriksson, det F. Petrak (S). Ång: Kramfors: Omneberget 11 Aug 1984 *Betula* sp. R. Moberg 6565 (UPS). Jmt: Krokum: Västerberg VL 50,40 11 Aug 1982 *Populus tremula* GM 2335 (TROM). Östersund: Andersön VL 70,00 12 Aug 1982 *P. tremula* GM 2359 (TROM). Vb: Umeå: Umeå Nov 1907 *Alnus* sp. J. Vleugel, det. J. Lind (C). - Böle Nov 1907 *Alnus* sp. J. Vleugel (S). - Böle 5 Jun 1910 *Salix pentandra* J. Vleugel (S). - Sørfor 8 Oct 1983 *Salix* sp. O. Eriksson "*Hystero-graphium fraxini*" (UME 28570).- Umeå Mariehem 10 May 1973 *Populus tremula* Å. Strid 13377, det. G. Mathiassen (S). ÅsL: Vilhelmina: Vilhelmina N of Gubbselforsen WM 67,79 7 Jul 1988 *Salix caprea* ssp. *sericea* GM 5883. TL: Kiruna: Abisko 1 Jul 1927 *Salix phylicifolia* J.A. Nannfeldt 728 (UPS), & *ibid.* 24 Jul 1927 *S. phylicifolia* J.A. Nannfeldt 679 (UPS). - Abisko, Njakatjaveck 19 Jun 1948 *Populus?* J.A. Nannfeldt, A. Pilat & G. Sandberg (UPS). From Lappland "e Lapponia" s. dat. *Salix* sp. Herb. E. Fries (UPS). **Finland:** Nylandia Elimä s. dat. C.S. Tigerstedt, det. J. Lind (C).

***Keissleriella holmiorum* G. Mathiassen sp. nov.**

Refr. descr.: Mathiassen 1989: 62 (sub *Keissleriella* cf. *cladophila*). Refr. illustr.: Mathiassen 1989: Fig. 51 (sub *K. cladophila*).

*Stromata clypeoida*, 30-45 µm crassa, satis varia. *Pseudothecia plus minusve globosa*, (200-)350-540 µm diam., sparsa vel gregulata, partim vel omnino in clypeum immersa. Papilla non prominens, sed setis fuscis, rectis vel paulum undulatis, septis carentibus, parietes crassos praebentibus, 25-70 x 3-4 µm magnis dense tecta. *Peridium variae crassitudinis, in pseudothecii dense congestis 12-18 µm, cetera 25-40 µm crassum. Asci 106-152 x 9.5-12.4 µm magni, media magnitudine 130.8 x 10.7 µm, cylindrici vel anguste clavati, breviter stipitati, bitunicati, apice incrassati, octospori. Paraphysoides 1.5-2 µm diam., ramificatae, anastomosantes, septatae. Ascosporae (13-)14-19.6(-21.5) x (5.3-)5.6-8(-8.3) µm magnae, media magnitudine 16.5 x 6.7 µm, subellipsoides vel obovoides, bicellulares, ad septa constrictae, hyalinae contento granulati, unam seriem formantes. (Pycnidia ad 270 µm diam., plus minusve globosa, nigra, sparsa vel gregaria. Conidiophora 30-60 x 2-3 µm magna, ramificata, septata, hyalina. Conidia 3.5-4.5 x 1-1.5 µm magna, oblonge ellipsoidea, unicellularia, hyalina).*

Type: Norway: Tr: Nordreisa: Straumfjordbotten Tretten EC 04,43 20 Jul 1981 *Salix myrsinifolia* ssp. *borealis* mostly on bark GM 861 (TROM - holotype). Etymology: *Holmiorum* refers to Kerstin and Lennart Holm, University of Uppsala, Sweden.

Figs 50-52, 130, 132, 139.

**Description.** *Stromata* clypeoid, 30-45 µm thick, variably developed. *Pseudothecia* (200-)350-540 µm diam., ± globose, scattered to gregarious in groups, partly to completely immersed in wood or bark. Papilla not prominent, but densely covered with straight or somewhat flexuous non-septate, thick-walled, dark brown setae, 25-70 x 3-4 µm. *Peridium* varying in thickness: 12-18 µm when the pseudothecia grow close together, otherwise 25-40 µm, consisting of small, thick-walled and somewhat flattened cells, basal tissue composed of larger, thin-walled, isodiametric cells. *Asci* 106-152 x 9.5-12.4 µm, mean 130.8 x 10.7 µm (n = 54), cylindrical (to slenderly clavate), short-stiped, bitunicate, thickened at the apex, with

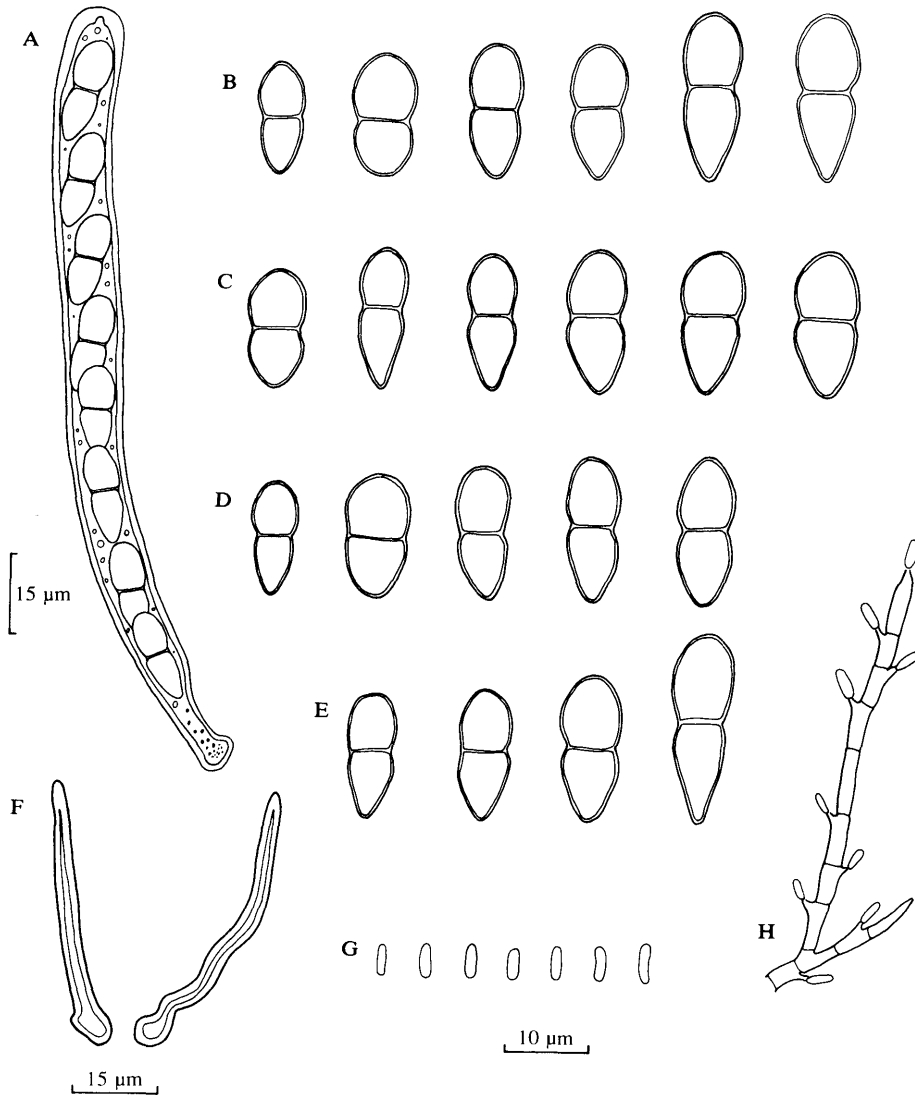


Fig. 130. *Keissleriella holmiorum*. A. Ascus. GM 931. B-E. Spores. B. GM 931. C. GM 3414. D. GM 3754. E. GM 5673. F. Setae. GM 931. G. Conidia. GM 2179. H. Apical part of a conidiophor. GM 2179.

8, uniseriate ascospores. *Paraphysoids* 1.5-2 µm diam., septate, branched, anastomosing. *Ascospores* (13-)14-19.6(-21.5) x (5.3-)5.6-8(-8.3) µm, mean 16.5 x 6.7 µm,  $Q = 2.5$  (n = 420), ± ellipsoid to obovate, two-celled, constricted at the septum, hyaline with granular content. (*Pycnidia* up to 270 µm diam., ± globose, black, scattered to gregarious. *Conidiophores* 30-60 x 2-3 µm, branched, septate, hyaline. *Conidia* 3.5-4.5 x 1-1.5 µm,

oblong-ellipsoid, one-celled, hyaline).

**Nomenclatural and taxonomic notes.** *Keissleriella holmiorum* was previously treated by me as *K. cf. cladophila* (Mathiassen 1989: 62). The type material of *K. cladophila* was not examined, and the determination was based on the examined collections from other herbaria and on the descriptions given by Bose (1961), Müller & von Arx (1962), and Sivanesan (1984). I also considered important that *Salix* was also given as substrate for *K. cladophila*. However, *K. cladophila* was actually misinterpreted by Bose (1961), and his error was subsequently adopted by Müller & von Arx (1962) and Sivanesan (1984). Bose (1961) is also the source of information that *K. cladophila* grows on *Salix*. I have examined the particular samples that Bose refers to in his publication, and they did not represent *K. cladophila*.

*Keissleriella holmiorum* is easy to separate from *K. cladophila*. There are several differences between these two taxa, e.g. the substrate, and the size of the spores and asci, but the most striking distinction is the lack of setae in *K. cladophila* (cf. Niessl 1875: 199, Holm 1957: 140). I have also examined the type collections of *K. aesculi* (v. Höhnel) v. Höhnel (FH), *K. genistae* (Fuckel) Müller (G), and *K. sambucina* (Rehm) v. Höhnel (S), but they were all different from *K. holmiorum*. Recently K. & L. Holm (in litt. 1990, 1991) drew my attention to *Sphaeria salicaria* Karst. and *Didymella salicis* Grove, but these species do not fit with my material. I have seen the type material of *S. salicaria* (H), but not succeeded in tracing the type material of *D. salicis*. However, the collections preserved as *D. salicis* in the British herbaria represented *Cryptodiaporthe salicella*. The description of *D. salicis* (cf. Saccardo 1886) fits very well with *C. salicella*, but it is possible that the type material represents a separate species, as *D. salicis* was accepted by Cannon et al. (1985).

The anamorph (*Dendrophoma* sp.) grows in close connection with the pseudothecia, but the spores were not cultured to confirm the anamorph-teleomorph relationship. I have thus enclosed the description of the anamorph in parenthesis.

Several samples from the Swedish SB region deviated from *Keissleriella holmiorum* by only having larger spores. The spores overlap in size, but the average spore sizes are different. These samples are very interesting, but intentionally not included in the present paper.

*Keissleriella* is closely related to *Massarina*, and differs mainly in having a setose papilla. Both genera are now included in the Lophiostomataceae (Eriksson & Hawksworth 1990d). However, these two genera are far from each other according to Barr's classification system (cf. Barr 1987, 1990a). *Massarina* is included in Lophiostomataceae among the Pleosporales (hamathecium of pseudoparaphyses), while *Keissleriella* is included in Melanommataceae among the Melanommatales (hamathecium of paraphysoids). The hamathecium in both *Keissleriella* (at least *K. holmiorum*) and *Lophiostoma* consists, in my opinion, of paraphysoids.

**Hosts.** Found on all the examined *Salix* species; *S. caprea* ssp. *caprea* (23 coll.), and ssp. *sericea* (19 coll.), *S. glauca* ssp. *glauca* (3 coll.), *S. lapponum* (1 coll.), *S. myrsinifolia* ssp. *borealis* (20 coll.), and ssp. *myrsinifolia* (39 coll.), *S. pentandra* (22 coll.). Shows no preference for any particular *Salix* species, but it is very infrequent on *S. glauca* ssp. *glauca* and *S. lapponum*, which agree well with the investigation from Troms (Mathiassen 1989). However, in Troms it showed preference for *S. myrsinifolia* agg., and was not found on *S. pentandra* or on *S. caprea* agg. *Keissleriella holmiorum* is so far only found on *Salix*.

**Ecology.** Frequently found on both wood and bark, but it has preference for decorticated wood. It fits well among the primary saprophytes, and has a broad ecological amplitude.

**Distribution.** Very common, and distributed throughout the transect. As in Troms (Mathiassen 1989), it was found in all the vegetation regions, except in LA. Its temperature requirements seems to be more important than the distribution of the hosts. *Keissleriella*

*holmiorum* is, according to K. & L. Holm (in litt. 1991), rather common in the Uppsala area in Sweden, and I expect it to be common all over Fennoscandia, except in the alpine areas.

**Material examined** (in addition to the cited type). **Norway:** No: Sømna: Sømna N of Berg UN 69-70,53 27 Jun 1986 *Salix pentandra* GM 2924a, 2925a. - Sømna N of Vik near Knyk UN 69,47-48 4 Jul 1987 *S. caprea* ssp. *sericea* GM 4754. - Sømna S of Vennesund UN 61-62,35 5 Jul 1987 *S. caprea* ssp. *sericea* GM 4770. Grane: Majavatn E of Stortjønna VN 22,22 1 Jul 1986 *S. caprea* ssp. *caprea* GM 3270, 3272a. - Svenningdalen Fløtnes VN 25,66 3 Jul 1986 *S. caprea* ssp. *sericea* GM 3410, 3411, 3412, 3413, 3414, 3415, 3416, 3417, *S. myrsinifolia* ssp. *myrsinifolia* GM 3402, 3403, 3404a, 3405, 3406, 3407, 3408. - Grane S of Grane church VN 26,74 3 Jul 1986 *S. myrsinifolia* ssp. *myrsinifolia* GM 3459, 3481b, *S. pentandra* GM 3447d, 3448b, 3471a. Hattfjelldal: Røssvatnet Krutåga VN 61,85 7 Jul 1987 *S. myrsinifolia* ssp. *myrsinifolia* GM 4924, 4949, 4958. - S of Røssvatnet Bjørkåsen VN 57,81 8 Jul 1987 *S. myrsinifolia* ssp. *borealis* GM 4999a, 5010, 5014. - Røssvatnet near Grubben VN 60,82 9 Jul 1987 *S. myrsinifolia* ssp. *borealis* GM 5075, 5078, 5080, 5086, 5089. Hemnes: Finneidfjord N of Neset VP 45,43 31 Jul 1989 *S. caprea* ssp. *sericea* GM 7886. - Bjerka E of Vallabotnet VP 47,36 31 Jul 1989 *S. lapponum* GM 7923. Rana: Nedre Jarntlia VP 67,57 7 Aug 1987 *S. caprea* ssp. *sericea* GM 5835a, *S. myrsinifolia* ssp. *borealis* GM 5803a, 5805, 5807b, 5812, 5820a, 5821, 5822b. - Virvassdalen near Verdøl WP 08,62 21 Jul 1989 *S. myrsinifolia* ssp. *myrsinifolia* GM 7571. - Dunderlandsdalen near Storvollen VP 96-97,76 22 Jul 1989 *S. caprea* ssp. *sericea* GM 7589b. - Dunderlandsdalen Grotjørnengen VP 93,72 22 Jul 1989 *S. myrsinifolia* ssp. *myrsinifolia* GM 7599a. - Plurdalen Tappeskard VP 85,55 25 Jul 1989 *S. myrsinifolia* ssp. *borealis* GM 7722. - Skonseng near Seljehaugen VP 71,59-60 1 Aug 1989 *S. pentandra* GM 7948a. - Gruben N of Englia VP 65,55 20 Jul 1990 *S. pentandra* GM 8188b, 8193, 8195, 8218, 8229. Tr: Bardu: Storalen near Bruhaugen CB 93,44 15 Jul 1981 *Salix phylicifolia* GM 653. Salangen: Skårvikdalen XS 13,45 11 Jul 1981 *S. myrsinifolia* ssp. *borealis* GM 367. Tromsø: Tromsdalen Storsteinen DC 22,26-27 17 Sep 1982 3 coll. *S. lanata* ssp. *lanata* x ssp. *glandulifera* GM 2068, *S. myrsinifolia* ssp. *myrsinifolia* GM 2003, 2038a. Storfjord: Signaldalen near Rognli DB 64,67 15 Jun 1982 10 coll. *S. lapponum* GM 2134a, *S. myrsinifolia* ssp. *borealis* GM 2152, 2155, 2156, 2157, 2169b, 2170, *S. myrsinifolia* ssp. *myrsinifolia* GM 2177, 2179, 2180a. Nordreisa: Reisadalen near Punta EC 17,10 19 Jul 1981 2 coll. *S. myrsinifolia* ssp. *borealis* GM 796, 803b. - Straumfjordbotn Tretten EC 04,43 20 Jul 1981 *S. myrsinifolia* ssp. *borealis* GM 855a. - Reisadalen Bergmo EC 11,25 21 Jul 1981 *S. myrsinifolia* ssp. *borealis* GM 931. - Reisadalen near Snemyr EC 04,37 6 Sep 1982 *S. myrsinifolia* ssp. *borealis* GM 1903. Reisadalen Josedalen EC 09,15-16 6 Sep 1982 2 coll. *S. myrsinifolia* ssp. *borealis* GM 1938, 1940. Kvænangen: Badderer EC 39,50 5 Sep 1982 3 coll. *S. myrsinifolia* ssp. *borealis* GM 1845, 1847, *S. myrsinifolia* ssp. *myrsinifolia* GM 1861. **Sweden:** Upl: Uppsala: Jerusalem 6 Jan 1980 s. cfr. *caprea* K. & L. Holm 1897a, det. G. Mathiassen "*Keissleria* cf. *cladophila*" (UPS), & ibid. 5 Mar 1984 *S. caprea* K. & L. Holm 3037c "*Didymella* sp." (TROM). Ång: Kramfors: Almsjönäs N of Norr-Almsjön CR 98,50 3 Aug 1987 *S. caprea* ssp. *caprea* GM 5683, *S. myrsinifolia* ssp. *myrsinifolia* GM 5668a, 5669a, 5673, 5675a, 5676, 5679, 5680a, 5681a. Sollefteå: Junsele Pustviken W of the road WL 66,95-96 4 Aug 1989 *S. pentandra* GM 8033a, 8036a, 8038a. - Junsele Pustviken E of the road WL 66,96 4 Aug 1989 *S. pentandra* GM 8074. - Lillsele W of Ångermanälven XL 76,03 30 Jul 1990 *S. myrsinifolia* ssp. *myrsinifolia* GM 8458, 8459, 8461, 8464, 8467, 8471. - Lillsele E of Ångermanälven XL 76,03 31 Jul 1990 *S. myrsinifolia* ssp. *myrsinifolia* GM 8481a, 8481d, 8482, 8485. Örnsköldsvik: Örnsköldsvik N of Sundåsen CR 17,83 2 Aug 1987 *S. caprea* ssp. *caprea* GM 5574, *S. myrsinifolia* ssp. *borealis* GM 5489, 5503. - Arnäs E of Älvsjösjön CR 25-26,90 4 Aug 1987 *S. caprea* ssp. *caprea* GM 5719, 5723a, *S. pentandra* GM 5756, 5758. - Haffstafjärden N of Billsta CR 25,75 8 Jul 1988 *S. caprea* ssp. *caprea* GM 5958a, 5959, 5962, 5966, 9 Jul 1988 GM 6012, 6015a, 6017, 6018a, 6019, 6047, 6061, 6066, 6084a, 6087, 6096b, 6097a, 8 Jul 1988 *S. myrsinifolia* ssp. *myrsinifolia* GM 5986a, 5993, *S. pentandra* GM 5945a, 6001a. Jmt: Krokong: Västerberg: VL 50,40 11 Aug 1982 *S. caprea* ssp. *caprea* GM 2338 (TROM). ÅsL: Dorotea: N of Ormsjön along Stutvattenbäcken WM 49,45 11 Jul 1988 *S. caprea* ssp. *sericea* GM 6184b, 6186a, 6187a, *S. pentandra* GM 6166, 6168a. - Ormsjön near Lövstrand WM 40,48 11 Jul 1988 *S. myrsinifolia* ssp. *borealis* GM 6202b, 6210a. - W of Dorotea WM 26,66 12 Jul 1988 *S. myrsinifolia* ssp. *myrsinifolia* GM 6229, 6231, 6233. Vilhelmina: Vilhelmina Lövåsen WM 62,83 8 Jul 1986 *S. caprea* ssp. *sericea* GM 3751, 3754, 3791, *S. myrsinifolia* ssp. *myrsinifolia* GM 3769a, 3778a. - W of Bäksjön L. Annevare WM 81,98 29 Jul 1987 *S. glauca* ssp. *glauca* GM 5335a. - Vilhelmina WM 66,80 30 Jul 1987 *S. caprea* ssp. *caprea* GM 5383a. - SE of Siksjön along Siksjöbäcken WM 68,88 30 Jul 1987 *S. glauca* ssp. *glauca* GM 5398, 5402. - Bäsksele E of Vojmån WM 68,89 30 Jul 1987 *S. pentandra* GM 5431a. U.S.A.: North Dakota: Kulm 1 Jun 1913 *Salix* sp. J.F. Brenckle 574 "*Melanopsamma salicaria* f. *fallax*" F. Petrak, Pilzherbarium Nr. 39940 (W). - Lenes Farm Dec 1913 *Salix* sp. J.F. Brenckle "*Melanopsamma salicaria*" F. Petrak, Pilzherbarium Nr. 39308 (W).

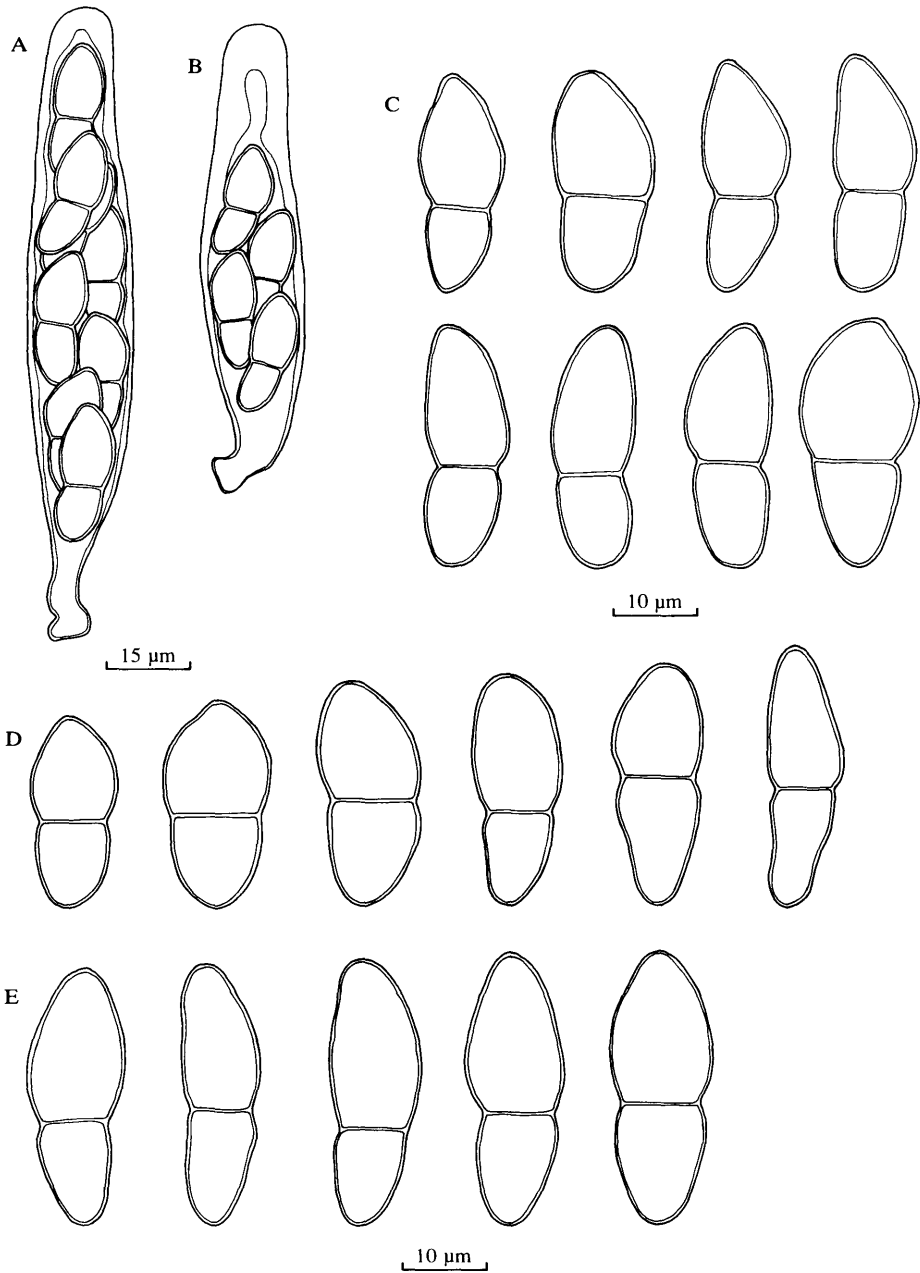
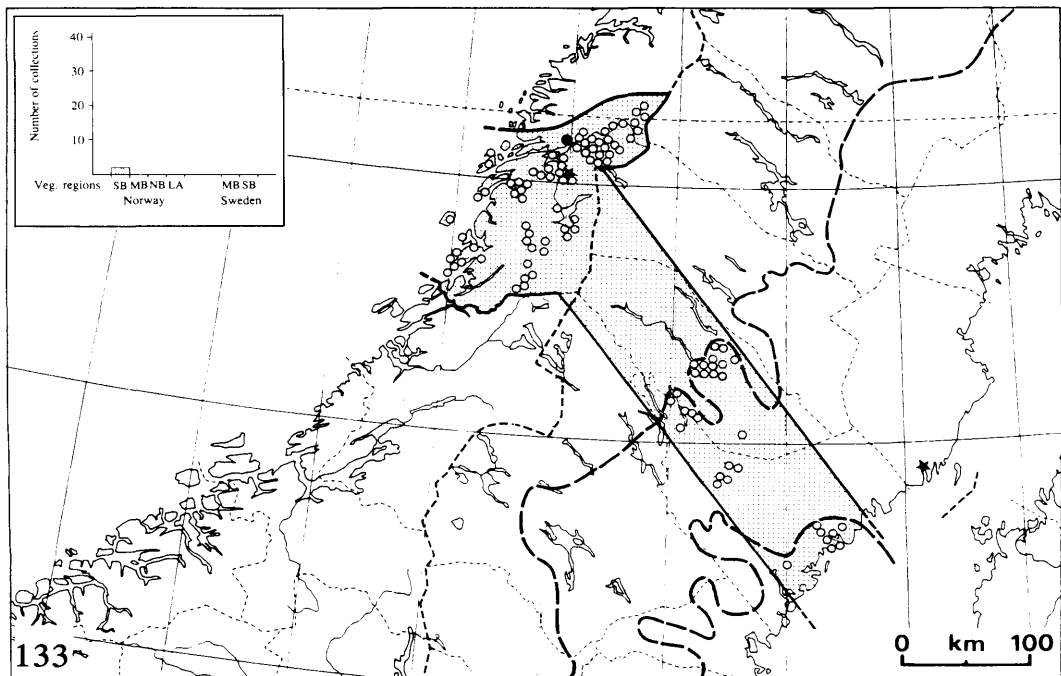
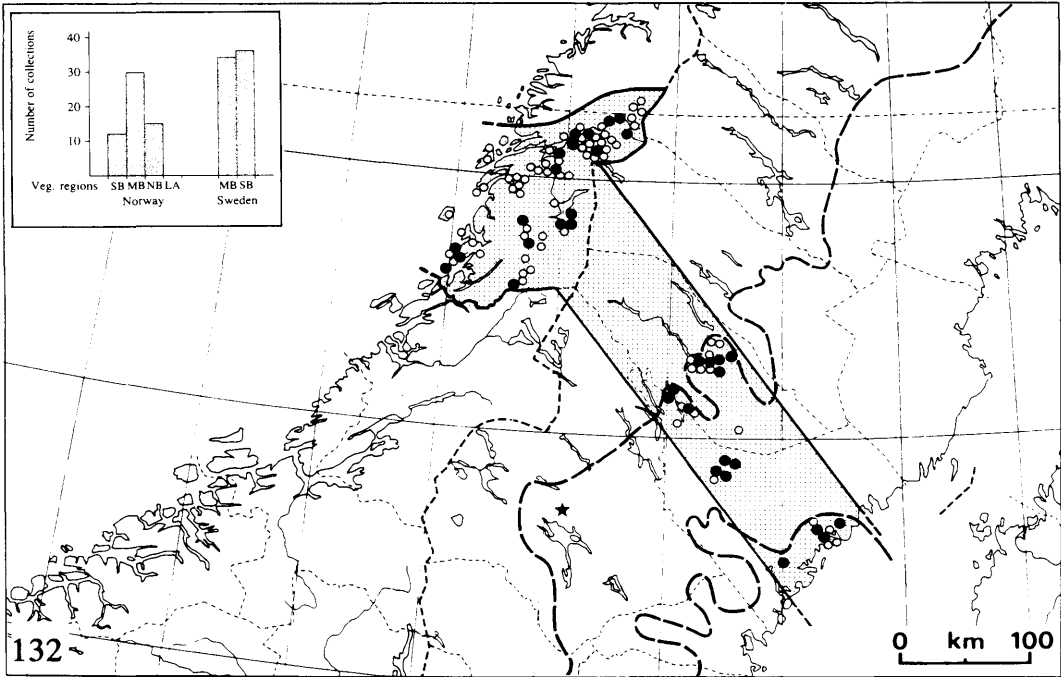


Fig. 131. *Kirschsteiniothelia aethiops*. A. Ascus with eight spores. GM 5792. B. Ascus with four spores. GM 5792. C-E. Spores. C. GM 5792. D. GM 275. E. Type.



Figs 132-133. Distribution maps. Fig. 132. *Keissleriella holmiorum*. Fig. 133. *Kirschsteiniothelia aethiops*. Legend on p. 24.



***Kirschsteiniothelia aethiops* (Berk. & Curtis) D. Hawksw.**

Bot. J. Linn. Soc. 91: 185 (1985) - *Sphaeria aethiops* Berk. & Curtis, Grevillea 4: 143 (1876) - Type: U.S.A., New York, on old logs, M.A. Curtis 4414 (K, holo! fide Hawksworth 1985a) - *Amphisphaeria applanata* (Fr.) Ces. & De Not., Comm. Soc. Critt. Ital. 1: 223 (1863, n.v.) - Other synonyms; see Hawksworth (1985a) - Anamorph: *Dendryphiopsis atra* (Corda) S. Hughes, Can. J. Bot. 31: 655 (1953).

Refr. descr.: Hawksworth 1985a: 185, Mathiassen 1989: 63. Refr. illustr.: Sivanesan 1984: Fig. 299, Hawksworth 1985a: Figs 2-15.

Figs 53-55, 131, 133, 140.

**Description.** *Pseudothecia* 300-600  $\mu\text{m}$  diam., hemispherical to conical, erumpent superficial, scattered to gregarious, black, papilla not prominent. *Asci* 81-132 x 14.4-21.6  $\mu\text{m}$ , mean 108.4 x 18.7  $\mu\text{m}$  (n = 32), basal, subcylindrical, short-stiped, 4- or 8-spored. Ectotunica burst very easily, and the asci stretches to 150-180  $\mu\text{m}$  in length. *Pseudoparaphyses* 1.5-3.5  $\mu\text{m}$  diam., septate, branched, anastomosing. *Ascospores* 22.1-32.4(-32.6) x (8-)8.1-13.3(-13.4)  $\mu\text{m}$ , mean 27.8 x 10.3  $\mu\text{m}$ ,  $\bar{Q} = 2.7$  (n = 87), slipper-shaped in outline, often slightly curved, two-celled, constricted at the septum, verruculose, olive-brown, uni-biseriate.

**Taxonomic notes.** Barr (1987) includes the Pleosporaceae among the Pleosporales, while Eriksson & Hawksworth (1990d) include it among the Dothideales.

**Hosts.** Only found on *Salix caprea* ssp. *sericea* (2 coll.) in the present investigation, but it has a wide range of hosts (cf. Mathiassen 1989: 65).

**Ecology.** *Kirschsteiniothelia aethiops* seems to be a lignicolous species. It must be considered as a secondary saprophyte, as suggested earlier (Mathiassen 1989: 14), but the samples are too few to justify any further ecological discussion.

**Distribution.** Very rare, and only found in the Norwegian section of the transect. It seems to be rare all over Scandinavia, and it is not known from Finland. However, Hawksworth (1985a) pointed out that it was probably widespread in temperate regions.

**Material examined** (in addition to the cited type). **Norway:** No: Hemnes: Bjerka 14 Oct 1972 *Alnus incana* Å. Strid 13189, det. G. Mathiassen (S). Rana: Store Alteren VP 54,55 6 Aug 1987 *Salix caprea* ssp. *sericea* GM 5792, 5792a. **Sweden:** Vb: Umeå: Brännland 26 Jul 1976 *Alnus incana* O. Eriksson (UME 29201).

***Leptosphaeria tollens* G. Mathiassen sp. nov.**

"*Leptosphaeria hendersoniae* (Fuckel) Holm," Symb. Bot. upsal. 14(3): 26 (1957), sensu auct. plur., non *Leptosphaeria hendersoniae* (Ellis) Berl., Icon. fung. 1: 53 (1894) - "*Melanomma cinereum* (Karst.) Sacc.", Syll. fung. 2: 108 (1883), sensu auct. plur., non *Melanomma cinereum* (Fuckel) Sacc., Michelia 1: 344 (1878).

Refr. descr.: Holm 1957: 26, Mathiassen 1989: 65 (sub *Leptosphaeria hendersoniae*). Refr. illustr.: Mathiassen 1989: Fig. 54 a-c (sub *L. hendersoniae*).

Exsic.: Rehm, Asc. 1138 (S).

*Pseudothecia* 250-400(-500)  $\mu\text{m}$  diam., globularia vel hemisphaerica, saepe e lateribus collabentia, saepe partim vel omnino coalescentia, gregaria, per corticem erumpentia vel in ligno superficialia, nitenter atra, papillis plerumque non prominentibus, ostiis periphysibus cinctis. Peridium 40-55  $\mu\text{m}$  crassum, compactum, textura plus minusve angulari, e cellulis fuscis, 5-8  $\mu\text{m}$  diam., parietibus crassis formatum, pars basalis 90-140  $\mu\text{m}$  crassa tamen e cellulis 9-13  $\mu\text{m}$  diam. formata, textura angulari. *Asci* 103-135 x 11.4-14.4  $\mu\text{m}$  magni, media magnitudine 115.6 x 12.6  $\mu\text{m}$ , cylindrici (vel clavati), breviter stipitati, bitunicati, octospori. *Pseudoparaphyses* 2-4  $\mu\text{m}$  diam., septatae, ramificatae, anastomosantes. *Ascospores* (15.9-)20.2-27(-30) x (6-)6.7-9.2(-9.6)  $\mu\text{m}$  magnae, media magnitudine 23.2 x 7.7  $\mu\text{m}$ , oblongae vel ellipsoides, maximam diametrum super medium attingentes, 3(-4-5)-septis divisae, constrictae, laete fulvescentes, unam seriem vel duas formantes.

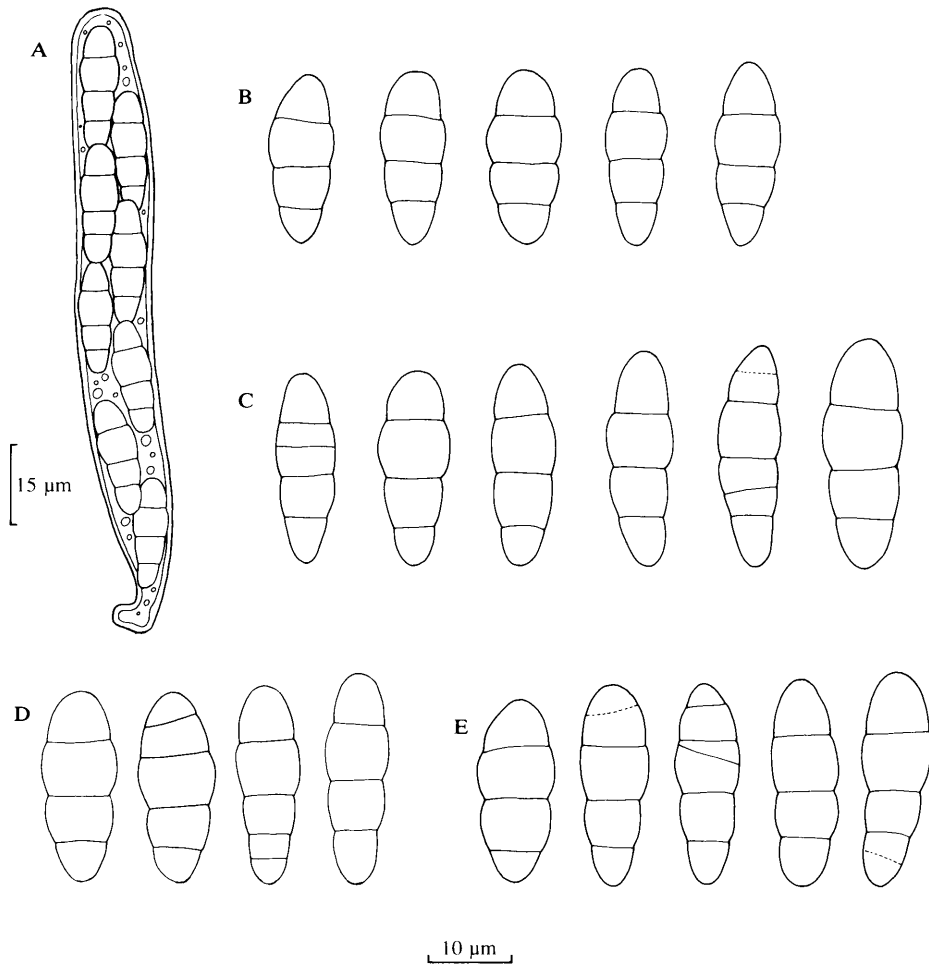
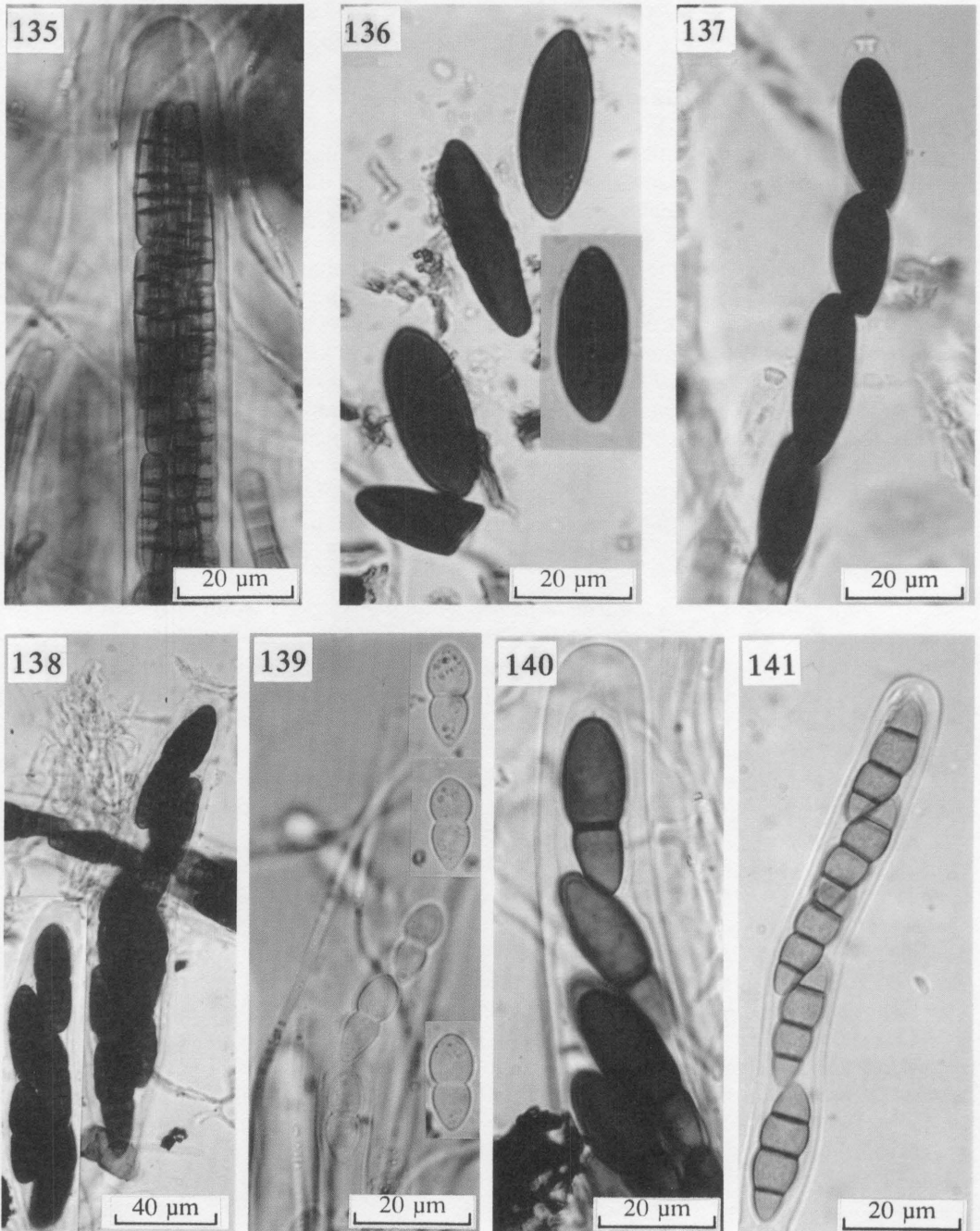


Fig. 134. *Leptosphaeria tollens*. A. Ascus with eight spores. GM 429b. B-E. Spores. B. GM 5826a. C. GM 5389a. D. GM 290. E. Type.

Type: Finland, Ostrob. austr., Vaasa, 12 Aug 1867, *Salix caprea*, P.A. Karsten No. 3277 (H - holotype!).  
 Etymology: Tollens = lifting. On bark, the ascomata lift and split the periderm as they grow.

Figs 56-58, 134, 141, 143.

**Description.** *Pseudothecia* 250-400(-550) µm diam., globose to hemisphaerical, often laterally collapsing, and often partly or completely coalescent, gregarious, erumpent through bark or superficial on wood, shiny black, papilla usually not prominent, ostiolum periphysate. *Peridium* 40-55 µm thick, compact, consisting of thick-walled, brown cells, 5-8 µm diam., ± *textura angularis*, basal tissue 90-140 µm thick, consisting of large cells, 9-13 µm diam., *textura angularis*. *Asci* 103-135 x 11.4-14.4 µm, mean 115.6 x 12.6 µm (n = 72), cylindrical (-clavate), short-stiped. *Pseudoparaphyses* 2-4 µm diam., septate, branched, anastomosing. *As-*



Figs 135-141. Photographs of type collections. Fig. 135. *Glyphium grisonense* (TROM). Fig. 136. *Hypoxylon macrosporum* (H). Fig. 137. *Hypoxylon mammatum* (UPS). Fig. 138. *Hysterographium elongatum* (UPS). Fig. 139. *Keissleriella holmiorum* (TROM). Fig. 140. *Kirschsteiniotelia aethiops* (K). Fig. 141. *Leptosphaeria tollens* (H).

*cospores* (15.9-)20.2-27(-30) x (6-)6.7-9.2(-9.6)  $\mu\text{m}$ , mean 23.2 x 7.7  $\mu\text{m}$ ,  $\bar{Q} = 3.0$  (n = 520), oblong-ellipsoid, widest above the middle, 3(-4-5)-septate, constricted, greyish to light yellowish-brown, uni-biseriate.

**Nomenclatural and taxonomic notes.** Fuckel's (1870: 172) original description of *Cucurbitaria hendersoniae* Fuckel does not fit *Leptosphaeria hendersoniae* sensu Holm (1957), and the species was not to be found in the type collection of *C. hendersoniae* (G!).

After a thorough investigation, I am now convinced that Fuckel's (1870) description represents a *Discostroma* species, probably *D. corticola* (Fuckel) Brockmann. The anamorph found on the type collection seems to be *Sporocadus lichenicola* Corda (syn.: *Hendersonia lichenicola* (Corda) Lév.), the anamorph of *D. corticola*, and the conidia agree with those drawn by Fuckel himself (1870: Fig. 43a, and in sched.). *Sporocadus* Corda is a later name for *Seimatosporium* Corda according to Shoemaker & Müller (1964) and Sutton (1977), but the genus was retained for non-appendaged species by Brockmann (1976).

Also the shape and sizes of both asci and spores (Fuckel 1870: 172, Fig. 43b, and in sched.) fit well with *Discostroma corticola*. The ascus drawn by Brockmann (1976: Fig. 10a), and the one drawn by Fuckel in sched. are almost identical. However, Fuckel's (1870) description of the perithecia as "caespitosis" does not fit *D. corticola*. The only reasonable explanation is that he observed this character on perithecia belonging to another species. This is very likely, because other pyrenomycete species were actually present in the type collection of *Cucurbitaria hendersoniae*, e.g. *Melanomma sanguinarum* (Karst.) Sacc. and *Cucurbitaria* sp.

In addition, the name *Leptosphaeria hendersoniae* (Fuckel) Holm is illegitimate (Art. 64) and cannot be used as it is a later homonym of *L. hendersoniae* (Ellis) Berlese (cf. Berlese 1894: 53). *Leptosphaeria hendersoniae* sensu Holm (1957) has not been described by other mycologists, and it is therefore described in the present paper as *L. tollens* sp. nov. Karsten used the epithet "tollens" tentatively in sched. for the first sample he found of this species (Rasnavolok, in 1861), and it is therefore resumed here.

Earlier (Mathiassen 1989: 65), I erroneously assigned *Melanomma cinereum* (Karst.) Sacc. as a synonym of *Leptosphaeria hendersoniae*. Karsten (1873) did not describe *Sphaeria cinerea*, but quoted Fuckel's name which he obviously misinterpreted. Fuckel's (1870) *S. cinerea* is *Metasphaeria corticola* (Fuckel) Sacc., according to Berlese (1894: 129), which is synonymous with *Discostroma corticola* (cf. Brockmann 1976). However, Karsten's description (1873: 91, sub *Sphaeria cinerea* Fuckel) represents *L. hendersoniae* (= *L. tollens*), and not *D. corticola*.

Barr (1987) includes the Leptosphaeriaceae among the Pleosporales, while Eriksson & Hawksworth (1990d) have it among the Dothideales.

**Hosts.** Found on all the examined *Salix* species; *S. caprea* ssp. *caprea* (3 coll.), and ssp. *sericea* (2 coll.), *S. glauca* ssp. *glauca* (8 coll.), *S. lapponum* (2 coll.), *S. myrsinifolia* ssp. *borealis* (9 coll.), and ssp. *myrsinifolia* (12 coll.), *S. pentandra* (10 coll.). Shows no preference for any particular *Salix* species, but as in Troms (Mathiassen 1989), it is most frequent on *S. myrsinifolia* agg., with *S. pentandra* as the "secondary" host. It also seems to be rather frequent on *S. glauca* ssp. *glauca*, but these samples were all found in the same locality. It was not found at all on this substrate in Troms. So far *Leptosphaeria tollens* has only been found on *Salix*.

**Ecology.** Frequently found on both wood and bark on dead twigs, but has some preference for bark. It seems to fit well among the primary saprophytes, as suggested earlier (Mathiassen 1989: 14), but it also seems to be partly parasitic, as it is able to sporulate on

fresh, living substrate. Its ecological amplitude seems to be slightly broader than previously suggested (Mathiassen 1989).

**Distribution.** Rather common, and distributed all along the transect. Found in all the vegetation regions, except LA, but is considerably more frequent in the Swedish section of the transect, particularly in the continental MB region, than in the Norwegian section. This could indicate a continental preference, but *Leptosphaeria tollens* is also found in typical oceanic localities in both Nordland and Troms (cf. Mathiassen 1989: Fig. 62).

Only a few samples of *Leptosphaeria tollens* have been made in Sweden and Finland, but I expect it to be rather common all over Fennoscandia. Karsten (1873: 91) reported it from southern and central Finland, and from the Soviet Union.

**Material examined** (in addition to the cited type and exsiccata). **Norway:** He: Stor-Elvdal: Koppang ca. 5 Aug 1977 *Salix aurita* R. Langnes "*Melanomma pulvis-pyrius*" (NPPI). NT: Verran: Verrastranda 24 Jul 1977 *Salix caprea* R. Langnes "*Melanomma pulvis-pyrius*" (NPPI). - Verrastranda Storenget 30 Jul 1977 *S. alba* R. Langnes "*Melanomma pulvis-pyrius*" (NPPI). No: Sømna: Sømna S of Vennesund UN 61-62,35 5 Jul 1987 *Salix caprea* ssp. *sericea* GM 4803. Brønnøy: W of Nebbåsen UN 85,51 28 Jun 1986 *S. myrsinifolia* ssp. *myrsinifolia* GM 3023, 3024. Grane: Svenningdalen Fløtnes VN 25,66 3 Jul 1986 *S. myrsinifolia* ssp. *myrsinifolia* GM 3407b. - Trofors at Båfjellmoen VN 25,68 27 Jul 1989 *S. myrsinifolia* ssp. *myrsinifolia* GM 7786. Dønna: Dønna E of Rølvåg UP 87,43 24 Jun 1986 *S. pentandra* GM 2619. Hattfjeldal: Røssvatnet Krutåga VN 61,85 7 Jul 1987 *S. lapponum* GM 4889a, *S. myrsinifolia* ssp. *myrsinifolia* GM 4911a, 4949b. - Røssvatnet near Grubben VN 60,82 9 Jul 1987 *S. myrsinifolia* ssp. *borealis* GM 5077a, 5087. Rana: Nedre Jamtla VP 67,57 7 Aug 1987 *S. myrsinifolia* ssp. *borealis* GM 5810, 5811a, 5813, 5826a. - Dunderlandsdalen Oppdalheia VP 83,62 22 Jul 1989 *S. lapponum* GM 7618a. Tr: Kvæfjord: Gullsfjordbotn WS 29,02 5 Jul 1981 *Salix myrsinifolia* ssp. *myrsinifolia* GM 155. Harstad: Sørvik-Sørvikfjellet WS 60,20-61,19 7 Jul 1981 3 coll. *S. myrsinifolia* ssp. *borealis* GM 209, *S. pentandra* GM 223, 224. Bjarkøy: Sandsøy Nordstrand-Veten WS 67,50 6 Jul 1981 2 coll. *S. myrsinifolia* ssp. *myrsinifolia* GM 204b, 205. Gratangen: Gratangsbøt along Meelva XR 09-10,19 8 Jul 1981 3 coll. *S. myrsinifolia* ssp. *myrsinifolia* GM 279a, 286, 290. Målselv: Dividalen near Åsen DB 37,54 16 Jul 1981 *S. caprea* ssp. *sericea* GM 696. Sørreisa: N of Rabbås CB 28,66 14 Jul 1981 2 coll. *S. hastata* ssp. *hastata* GM 555, *S. myrsinifolia* ssp. *myrsinifolia* GM 559. Tranøy: N of Vangsvik XS 09,77 12 Jul 1981 2 coll. *S. lapponum* GM 421, *S. myrsinifolia* ssp. *borealis* GM 418. - Vangsvik XS 09,76 12 Jul 1981 *S. myrsinifolia* ssp. *myrsinifolia* GM 429b. Torsken: Gryllefjordbotn WS 83-84,96 12 Jul 1981 *S. myrsinifolia* ssp. *myrsinifolia* GM 479. Tromsø: Tromsøya Folkeparken DC 19,26 12 Aug 1981 *S. myrsinifolia* ssp. *borealis* GM 1065. - Tromsdalen Storsteinen DC 22,26-27 13 Sep 1982 7 coll. *S. lanata* ssp. *lanata* x ssp. *glandulifera* GM 2066, *S. myrsinifolia* ssp. *borealis* GM 2013, 2017, 2020, 2045, *S. myrsinifolia* ssp. *myrsinifolia* GM 2042, 2043. Storfjord: Signaldalen near Rognli DB 64,67 15 Sep 1982 2 coll. *S. myrsinifolia* ssp. *borealis* GM 2141b, *S. pentandra* GM 2181b. Nordreisa: Straumfjordbotn Tretten EC 04,43 20 Jul 1981 2 coll. *S. myrsinifolia* ssp. *borealis* GM 855, 856. - Kvænangsfjellet EC 20,54 6 Sep 1982 *S. myrsinifolia* ssp. *borealis* GM 1897a. Without locality: s. dat. *Salix* S.C. Sommerfelt (?) No. 458 "*Metasphaeria cinerea*" (cf. Rostrup (1904: 24)) (O). **Sweden:** Nr: Kumla 14 Aug 1885 *Salix caprea* L. Romell "*Melanomma hendersoniae*" det. L. Holm (S). Upl: Uppsala 1 Apr 1894 *Salix* sp. L. Romell "*Melanomma hendersoniae*" det. L. Holm (S). - Carolinaparken 1 May 1894 "an berindeten *Salix*-åsten" L. Romell "*Melanomma hendersoniae*" det. L. Holm (S). Ång: Kramfors: Almsjönäs N of Norr-Almsjön CR 98,50 3 Aug 1987 *S. myrsinifolia* ssp. *myrsinifolia* GM 5680. Sollefteå: Lillele E of Ångermanälven XL 76,03 31 Jul 1990 *S. myrsinifolia* ssp. *myrsinifolia* GM 8479, 8489. Strömsund: 1 km S of Fågelsta WM 22,62-63 12 Jul 1988 *S. pentandra* GM 6255a, 6257a, 6259, 6265c. Örnsköldsvik: Örnsköldsvik N of Sundåsen CR 17,83 1 Aug 1987 *S. caprea* ssp. *caprea* GM 5537, 5538a, 2 Aug 1987 GM 5573, 1 Aug 1987 *S. myrsinifolia* ssp. *borealis* GM 5501, 5505, 2 Aug 1987 *S. myrsinifolia* ssp. *myrsinifolia* GM 5562a, 5568. - Haffstafjärden N of Billsta CR 25,75 8 Jul 1988 *S. myrsinifolia* ssp. *myrsinifolia* GM 5988. - Haffstafjärden SE of Gala CR 27,74 10 Jul 1988 *S. pentandra* GM 6127b. ÅsL: Dorotea: Ormsjön near Lövstranden WM 40,48 11 Jul 1988 *S. myrsinifolia* ssp. *borealis* GM 6202. Vilhelmina: SE of Siksjön along Siksjöbacken WM 68,88 30 Jul 1987 *S. glauca* ssp. *glauca* GM 5388, 5389a, 5391, 5398a, 5401, 5405, 5414, 5415a. - Vilhelmina N of Gubbselforsen WM 67,79 7 Jul 1988 *S. caprea* ssp. *sericea* GM 5884. - Bäcksele E of Vojmán WM 68,89 30 Jul 1987 *S. pentandra* GM 5425, 5427, 30 Jul 1990 GM 8386, 8396. **Finland:** Tav. austr., Tammela Mustiala 23 May 1872 *Salix viminalis* P.A. Karsten No. 3278 "*Melanomma cinereum*, *Cucurbitaria hendersoniae*" (H). **Soviet Union:** Rasnavolok 28 Jun 1861 *Salix* sp. P.A. Karsten No. 3276 "*Sphaeria cinerea*" (H). **West-Germany:** Rehm: Ascomyceten No. 1138: *Melanomma cinereum*, Südbayern Oberammergau Aug 1893 "an durren Aesten von *Salix nigricans*"

Schnabel "*Melanomma hendersoniae*" det. L. Holm (S). **Austria:** Sonntagberg Mar 1913 *Salix caprea* Strasser  
 "*Melanomma hendersoniae*" det. L. Holm (S). **Italy:** Riva Valdobbia 2 coll. 4 Apr 1897 *Salix elaeagnos* Carestia  
 "*Melanomma hendersoniae*" det. L. Holm & 16 Apr 1899 *Salix alba* Carestia "*Melanomma hendersoniae*" (S).

***Lophiostoma compressum*** (Pers. : Fr.) Ces. & De Not.

Comm. Soc. critt. ital. 1: 219 (1863) - *Sphaeria compressa* Pers. : Fr., Syst. mycol. 2: 470 (1823); Pers., Syn. meth. fung.: 56 (1801) - *Platystomum compressum* (Pers. : Fr.) Trev., Bull. Soc. r. Bot. Belg. 16: 16 (1877) - *Lophidium compressum* (Pers.) Sacc., Mich. 1: 340 (1878) - Type: Herb. Persoon (Herb. Lugd. Bat.) no. 910.270-358 (L. lecto! fide Chesters & Bell 1970a) - *Lophiostoma angustatum* (Pers. : Fr.) Fuckel, Symb. mycol.: 158 (1870) - *Sphaeria angustata* Pers. : Fr., Syst. mycol. 2: 470 (1823); Pers., Syn. meth. fung.: 55 (1801) - Type: Sweden, Femsjö, Fries (UPS, lecto! fide Holm & Holm 1988).

Refr. descr.: Eriksson 1981: 131, Holm & Holm 1988: 15, Mathiassen 1989: 78. Refr. illustr.: Holm & Holm 1988: Fig. 50, Mathiassen 1989: Fig. 77.

Exsic.: Fr., Scl. suec. 89 (UPS).

Figs 59-61, 142, 144, 154.

**Description.** *Pseudothecia* 550-800(-1050)  $\mu\text{m}$  diam., globose, immersed-erumpent, scattered or rather densely crowded, with a prominent, flattened papilla, often Y-shaped, ostium lined with periphyses. *Asci* 115-184 x 13-17.3  $\mu\text{m}$ , mean 149.5 x 15  $\mu\text{m}$  (n = 78), cylindrical-clavate, short-stiped. *Paraphysoids* (1-)1.5-2(-3)  $\mu\text{m}$  diam., septate, branched, anastomosing. *Ascospores* (19-)19.5-29.8(-33.6) x (7.7-)8-10.9(-16.6)  $\mu\text{m}$ , mean 24.3 x 9.2  $\mu\text{m}$ ,  $\bar{Q} = 2.7$  (n = 490), variable in shape and septation, mostly oblong-ellipsoid, usually with 3-5(-8) transverse septa and (0-)1-3(-5) segments with 1(-2) longitudinal septa, constricted, brown, mostly obliquely uniseriate.

**Taxonomic notes.** Mostly due to its muriform spores, *Lophiostoma compressum* was previously treated by me as *Platystomum compressum* (Mathiassen 1989: 78). However, I was aware of the close relationship between *Platystomum* and *Lophiostoma* (l.c., p. 23), and *Platystomum* is in the present paper treated as a synonym of *Lophiostoma*. As mentioned above, Barr (1987) retained *Platystomum* as distinct from *Lophiostoma*. She included *Platystomum* within Platystomaceae among the Melanommatales, while Eriksson & Hawksworth (1990d) still include it within Lophiostomataceae among the Dothideales.

*Lophiostoma compressum* is very variable, particularly in shape and septation of the spores. It is difficult to stipulate its natural variation, due to the occurrence of intergradiate forms. The species is certainly closely allied to *L. macrostomoides*, as pointed out by Holm & Holm (1988: 15), and the intergradiate forms "combining" these two species have often been identified as *L. pseudomacrostomum* Sacc. They also pointed out that *L. curtum* was probably related to *L. compressum*, but the peridium in this species is more similar to the "*Lophiotrema*-type" than the "*Lophiostoma*-type". However, the present investigation clearly indicates that *L. compressum* is more diverse in Scandinavia than previously suggested (Holm & Holm 1988, Mathiassen 1989). If spore sizes, host preferences and distributional patterns are considered, the material on *Salix* actually seems to consist of two separate "forms". *Lophiostoma compressum* ought to be thoroughly reexamined, and I have therefore not tried to divide this material into two groups. Examination of collections preserved in European and Scandinavian herbaria is necessary, and more field work in Scandinavia is obviously needed. Cultural studies and DNA work should also be considered.

**Hosts.** Found on all the examined *Salix* species, but shows particular preference for *S. pentandra* (58 coll.); *S. caprea* ssp. *caprea* (19 coll.), and ssp. *sericea* (23 coll.), *S. glauca* ssp.

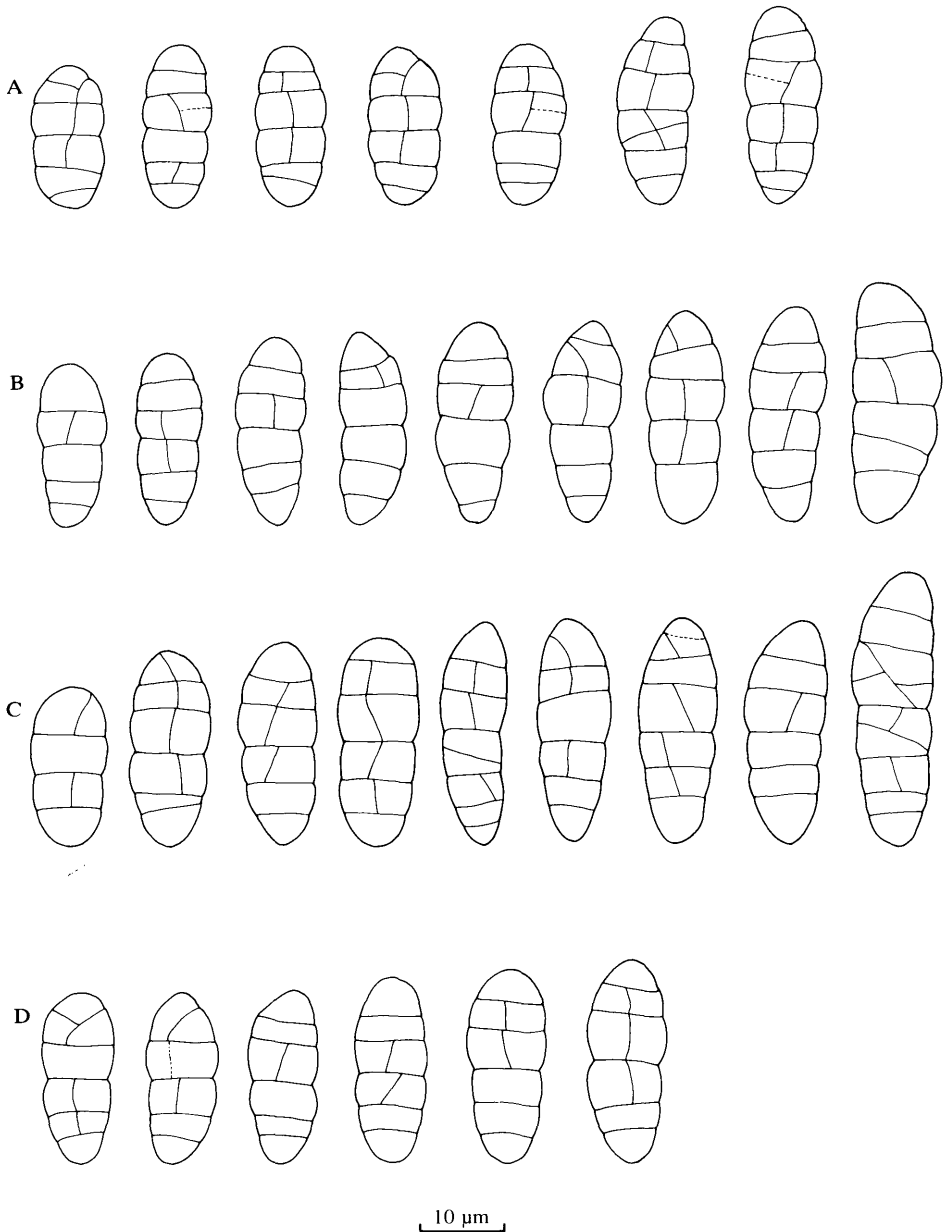
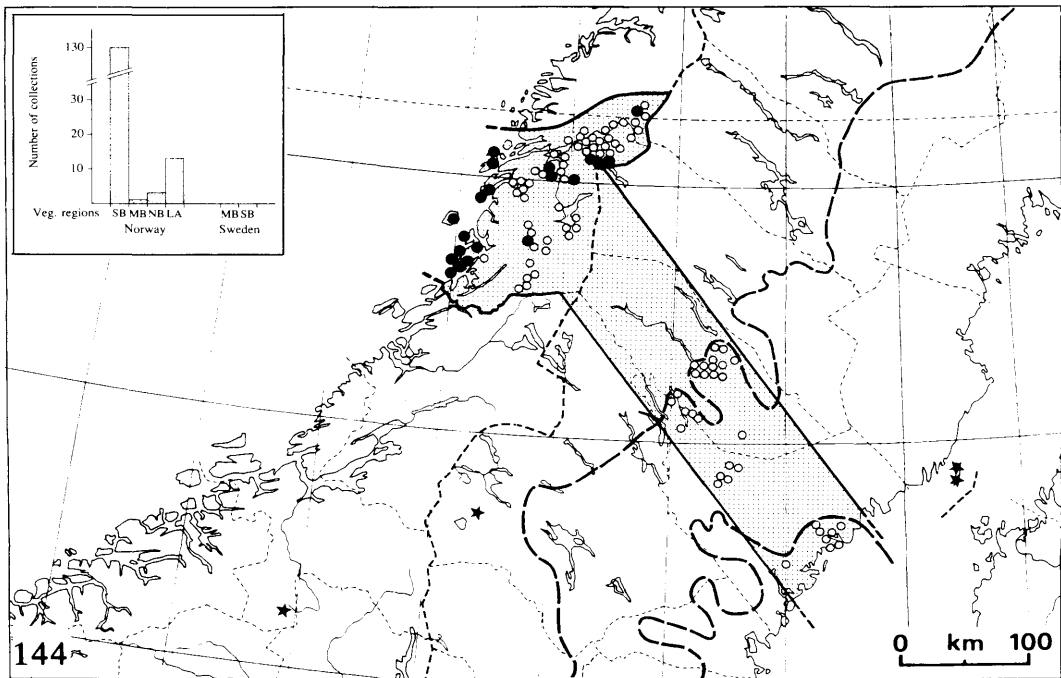
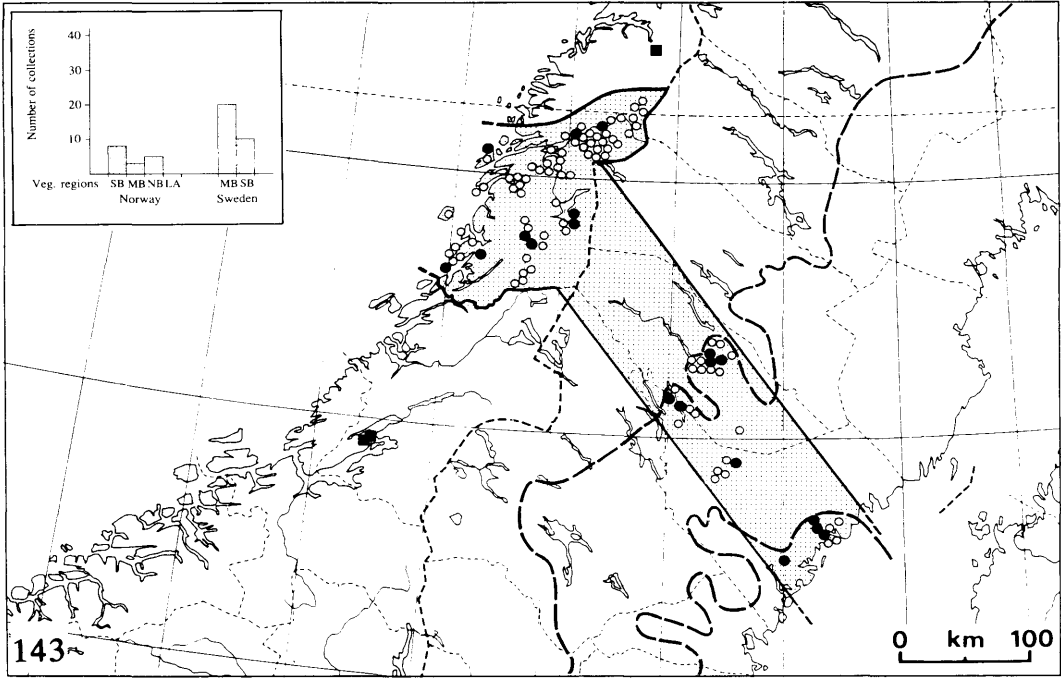


Fig. 142. *Lophiostoma compressum*. Spores. A. GM 5257. B. GM 7779. C. GM 4787. D. Type.

*glauca* (11 coll.), *S. lapponum* (5 coll.), *S. myrsinifolia* ssp. *borealis* (13 coll.), and ssp. *myrsinifolia* (18 coll.). This distributional pattern does not fit that from Troms at all, where



Figs 143-144. Distribution maps. Fig. 143. *Leptosphaeria tollens*. Fig. 144. *Lophiostoma compressum*. Legend on p. 24.



it showed particular preference for *S. glauca* ssp. *glauca* and *S. lanata* ssp. *lanata*. I don't think this is incidental. Only a few samples were found on *S. myrsinifolia* agg. in Troms, and it was not found at all on *S. pentandra* and on *S. caprea* agg. (cf. Mathiassen 1989: 78). *Lophiostoma compressum* has a wide range of hosts.

**Ecology.** Frequently found on both wood and bark, but it has some preference for naked wood. It fits well among the primary saprophytes, and has a rather broad ecological amplitude.

**Distribution.** Found in all the vegetation regions, but only in the Norwegian section of the transect. With a total of 147 registered samples, it is natural to consider *Lophiostoma compressum* as very common in this area. However, 130 of these samples were found in SB, in all of the more typical oceanic localities along the coast. This distributional pattern is indeed very peculiar, but I don't think it is incidental. At present, I have no other reasonable explanation than that *L. compressum* in central and northern Scandinavia actually consists of two different "forms", or strains on *Salix*. One "form" is distributed in oceanic SB areas, and the other one mainly distributed in more continental NB and LA areas. This is only an assumption, but it seems reasonable as they have different distributions, hosts and spore sizes. If the MB, NB and LA area in Nordland is compared with the investigation from Troms (Mathiassen 1989), the distributional patterns are almost identical, both with regard to vegetation regions and hosts. The NB and LA areas in Sweden were unfortunately not investigated, but I expect this "form" to be just as common in these areas as in Norway. It probably occurs in (MB) NB and alpine areas all along the Kjølén Mountains in Scandinavia, and it seems to become more frequent towards the north.

With regard to distribution, the 130 samples from the Norwegian SB region are important, and I therefore expect this "form" to be considerably more common further to the south in Norway than the previously known samples of *Lophiostoma compressum* indicate, probably with a main oceanic distribution. However, *L. compressum* is very common in South Sweden, and rather common in Finland. Holm & Holm (1988: 15) considered *L. compressum* and *Lophiotrema nucula* to be the most common of the Lophiostomataceae on frondose wood. In Sweden, this is correct only for the southern part of the country, because *L. compressum* is so far only known with a few samples from two localities in north-central Sweden. It has not been found in the northern parts. *Lophiostoma compressum* has previously been mentioned from Sweden by several authors, e.g. Fries (1818), Wahlenberg (1826), Starbäck (1889b, 1890), Eliasson (1895, 1928, 1929a, 1929b), Vestergren (1896), Vleugel (1908), Nannfeldt (1969), and Holm & Holm (1988), but only by Vleugel (1908) from north-central Sweden.

The results of this investigation are very interesting, both ecologically and geographically, but more investigations are necessary to understand this familiar species better.

**Material examined** (in addition to the cited types and exsiccata). **Norway:** Sine loc. & nom. coll. *Salix* sp. "*Lophiostoma macrostomoides*" (C). ST: Oppdal: Stølgjerdet 24 Aug 1985 *Populus tremula* K. & L. Holm 3768c "*Platystomum compressum*" (TRH). No: Sømna: Sømna N of Berg UN 69-70,53 26 Jun 1986 *Salix myrsinifolia* ssp. *borealis* GM 2869a, 2873, 2874, 2876A, 2877, 2878, 2884a, 2885a, 2894a, 2895, 2896a, 2898a, 2899b. *S. pentandra* GM 2857, 2861, 2862, 2863, 2864, 2865, 2866a, 2868, 27 Jun 1986 GM 2907, 2908, 2909, 2911, 2912, 2914, 2915a, 2916, 2917, 2919, 2924, 2925, 2927, 2928, 2934, 2936. - Sømna E of Sørbotnet UN 70,51 27 Jun 1986 *S. caprea* ssp. *sericea* GM 2977a, 2980, 2985. - Sømna N of Vik near Knyk UN 69,47-48 4 Jul 1987 *S. caprea* ssp. *sericea* GM 4740, 4742, 4744a, 4745, 4746, 4748, 4753, 4754a, 4755. - Sømna S of Vennesund UN 61-62,35 5 Jul 1987 *S. caprea* ssp. *caprea* GM 4783, 4784, 4787, 4788, 4790, 4791, 4793, 4796, 4797, 4801, *S. caprea* ssp. *sericea* GM 4758, 4761, 4766, 4771, 4804, 4805, 4807, 4809, 4810, 4813. - Sømna S of Våg UN 66,40 6 Jul 1987 *S. pentandra* GM 4825, 4828a, 4829, 4833a, 4838, 4840, 4842, 4843, 4846, 4877, 4886a. Brønnøy: Sømna Akseberg UN 83,55 29 Jun 1986 *S. caprea* ssp. *caprea* GM 3080. - Brønnøysund Mossem UN 73,67 30 Jun 1986 *S. myrsinifolia* ssp. *myrsinifolia* GM 3208, 3209, 3210, 3211, 3212, 3213a, 3214, 3217, *S. pentandra* GM 3193, 3194, 3195, 3196, 3197, 3200, 3201, 3202, 3203, 3204, 3205, 3206, 3207. Vega: Vega W of Rørøy PT 37,84-85 30 Jun 1986 *S. myrsinifolia* ssp. *myrsinifolia* GM 3149a, 3150, 3152, 3153, 3154,

3156a, 3157, *S. pentandra* GM 3127. Alstahaug: Offersøya N of Vågen UP 84,07 25 Jun 1986 *S. myrsinifolia* ssp. *myrsinifolia* GM 2753a, 2756b, 2762. - Tjøtta S of Kråkvikvatnet UP 81,04 25 Jun 1986 *S. pentandra* GM 2789a, 2790, 2792, 2794, 2797. Grane: Trofors at Båfjellmoen VN 25,68 27 Jul 1989 *S. caprea* ssp. *sericea* GM 7779. Dønna: Dønna E of Rølvåg UP 87,43 24 Jun 1986 *S. caprea* ssp. *caprea* GM 2632, 2637, 2645, *S. pentandra* GM 2614, 2615, 2616b, 2617b, 2621. - Dønna N of Hildselvvatnet UP 89,34 24 Jun 1986 *S. caprea* ssp. *caprea* GM 2698, 2701a, 2702, 2703a, 2705. Hemnes: Korgfjellet SE of Ørtinden VP 41,27 20 Aug 1986 *S. lapponum* GM 4492. - Bryggfjeldalen Sjurfinnheimen VP 53,20-21 13 Jul 1987 *S. glauca* ssp. *glauca* GM 5276, *S. lapponum* GM 5257. - Korgfjellet S of Ørtinden VP 40-41,27 14 Jul 1987 *S. glauca* ssp. *glauca* GM 5306, 5309, 5309c. Rana: Saltfjellet N of Stødi WP 15,83 19 Aug 1986 *S. lapponum* GM 4461, 4467, 4477. - Plurdalen Kaldvatnet W of Revet VP 89,47 25 Jul 1989 *S. glauca* ssp. *glauca* GM 7709, 7712, 7713. - Umkartet SE of Umkarttjønnå VP 80-81,40 25 Jul 1989 *S. glauca* ssp. *glauca* GM 7738. - Umkartdalen S of Store Umkarttuva VP 79,42 2 Aug 1989 *S. glauca* ssp. *glauca* GM 7964, 7967, 7968. Sweden: Vg: Vänersborg: Halleberg 6 Sep 1892 *Viburnum opulus* A.G. Eliasson (C). Jmt: Åre: Åreskutan VL 00,30 13 Aug 1982 *S. lapponum* GM 2370 (TROM), & ibid. *S. lanata* ssp. *lanata* GM 2373 (TROM). Vb: Umeå: Holmön pr. Umeå Jul 1906 *Salix* sp. 2 coll. J. Vleugel (S, C). - Holmön pr. Umeå Jun 1909 *Salix* sp. J. Vleugel "*Lophiostoma macrostomoides*" (C).

### *Lophiostoma curtum* (Fr.) Ces. & De Not.

Comm. Soc. critt. ital. 1: 219 (1863, "*L. curta*") - *Lophium curtum* Fr., K. svenska Vetensk.-Akad. Handl. 1818 (1818: 113) - *Sphaeria curta* (Fr. : Fr.) Fr., Syst. mycol. 2: 470 (1823) - *Lophidium curtum* (Fr.) Sacc., Michelia 1: 340 (1878) - Holotype prop.: Sweden, Östergötland, lignum, "*Sphaeria curta* Fr.! Misit Acharius ex Ostrog.", scr. Fries (UPS!, vide infra) - *Mytilostoma deflectens* Karst., Meddn Soc. Fauna Flora fenn. 5: 36 (1879) - *Lophidium deflectens* (Karst.) Sacc., Syll. fung. 2: 712 (1883) - Lectotype prop.: Finland, Tav. austr., Tammela Mustiala 24 Sep 1872 *Salix pentandra*, Karsten no. 2641 (H!, vide infra) - *Mytilostoma subcompressum* Karst., Meddn Soc. Fauna Flora fenn. 5: 36 (1879) - *Lophidium subcompressum* (Karst.) Sacc., Syll. fung. 2: 712 (1883) - Type: Finland, Tav. austr., Tammela Mustiala, 20 May 1866, *Alnus incana*, Karsten (H, Herb. Karst. 2716 lecto! proposed by Holm & Holm 1988: 16).

Refr. descr.: Holm & Holm 1988: 16, Mathiassen 1989: 80. Refr. illustr.: Holm & Holm 1988: Figs 5, 6, 54, Mathiassen 1989: Fig. 78.

Figs 62-64, 145, 147, 155.

**Description.** *Pseudothecia* 300-450(-600) µm diam., globose to somewhat elongated, immersed-erumpent, usually crowded, papilla flattened, ostiolum lined with periphyses. Wood surface often blackened. Asci 108-144 x 8.6-11.2 µm, mean 123.8 x 9.9 µm (n = 102), cylindrical, short-stiped. *Paraphysoids* 1-2 µm diam., septate, branched, anastomosing, rather abundant. *Ascospores* (14-)14.5-21.1(-23) x (4.9-)5.5-8(-8.6) µm, mean 17.8 x 6.6 µm,  $\bar{Q} = 2.7$  (n = 352), subclavate or narrowly obovoid, variable in septation, generally with 3-5(-6) transverse septa and (0-)1-2(-4) segments with a longitudinal septum, constricted, light ochre brown to brown, obliquely uniseriate.

**Nomenclatural notes.** Fries (1818: 113) did not mention any particular collection, but described *Lophium curtum* as rare. Later (1823: 471) he described it as "Perennis", and pointed out that he had seen it alive ("v.v."). However, I agree with Holm & Holm (1988: 16) that it seems permissible to designate the collection preserved in Herb. Fries (cited above) as holotype. It is therefore proposed here as holotype.

As correctly pointed out by Holm & Holm (1988: 16), *Mytilostoma deflectens* is now represented by only one sample in Herb. Karsten, but it is not improbable that Karsten also found another, or perhaps other samples in Mustiala in 1872 (now destroyed, cf. Karsten 1879). It is therefore correct to designate the particular collection cited above as lectotype.

**Taxonomic notes.** Mostly due to its muriform spores, I earlier included *Lophiostoma*

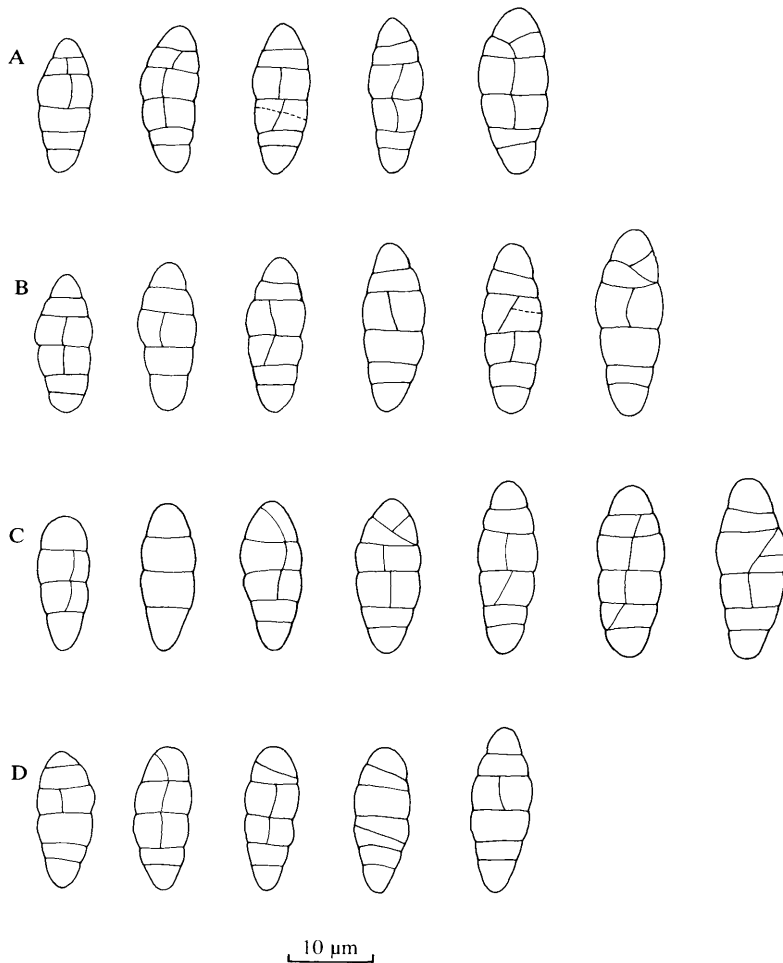


Fig. 145. *Lophiostoma curtum*. Spores. A. GM 7830a. B. GM 3505. C. GM 968. D. Type.

*curtum* in *Platystomum* (Mathiassen 1989: 80), but I now accept this genus as synonymous with *Lophiostoma*. *Lophiostoma curtum* is distinct from *L. compressum*, and they are easily separated on both size and shape of the ascomata, papillae, asci, spores, and the peridial structure.

*Lophiostoma curtum* is variable, particularly in spore septation. In collection GM 5892 only a few longitudinal septa were observed. This collection could probably be considered as an intergradient equivalent to *L. pseudomacrostromum*, but with some reservations, I have included this particular collection in *L. curtum*. The hamathecium appears to be more vigorous than in, e.g. *L. compressum*, as the ramification distances of the filaments are generally rather short. The hamathecium must, in my opinion, be considered as consisting of paraphysoids.

*Lophiostoma curtum* is an important species within the Lophiostomataceae, as it has muriform spores, cylindrical asci, and a peridial structure which is more similar to the

"*Lophiotrema*-type" than the "*Lophiostoma*-type". Therefore, the borderline between *Lophiostoma* and *Lophiotrema* seems to be more diffuse than previously suggested by Holm & Holm (1988). These authors discussed the history and typification of *L. curtum*, *L. deflectens* and *L. subcompressum* thoroughly.

**Hosts.** Found on all the examined *Salix* species; *S. caprea* ssp. *caprea* (6 coll.), and ssp. *sericea* (6 coll.), *S. glauca* ssp. *glauca* (11 coll.), *S. lapponum* (13 coll.), *S. myrsinifolia* ssp. *borealis* (9 coll.), and ssp. *myrsinifolia* (36 coll.), *S. pentandra* (23 coll.). It is most frequent on *S. myrsinifolia* agg., as in Troms (Mathiassen 1989), but more equally distributed on the other hosts, and it shows no preference for any particular *Salix* species. Its relatively high frequency on *S. pentandra* is interesting, because it was not found on this *Salix* species in Troms at all. I have no reasonable explanation to this, but the same tendency was also found for several other species, e.g. *Antostomella melanotes*, *Diatrype bullata*, *Hypoxylon mammatum* and *Keissleriella holmiorum*. *Lophiostoma curtum* is so far known from *Alnus*, *Betula* and *Salix* (cf. Holm & Holm 1988: 17, Mathiassen 1989: 82).

**Ecology.** Frequently found on both bark and wood, but no samples in the present investigation were found on bark only. It prefers decorticated wood, and it is just as frequent on stems as on twigs. If the results from Troms (Mathiassen 1989) are also taken into account, it is found on bark only, and on stromata of *Hypoxylon mammatum*, on living twigs or stems, on dead, dry twigs, and on rotten, rather decayed stems, stumps and twigs. It is probably a primary saprophyte but, with its wide ecological amplitude, it is difficult to assign it to one particular group. Although it is often found associated with other fungi, and in a few cases on other fungi, I don't think it is correct to regard *Lophiostoma curtum* as a hypersaprophyte.

**Distribution.** Found in all the vegetation regions, but it is considerably more common in the Swedish section of the transect than in the Norwegian section. Holm & Holm (1988: 17) considered it as rare in South Sweden, at least in the Uppsala area, and suggested that it probably had a northern distribution. This agrees well with the present investigation, and that from Troms (Mathiassen 1989), and in central and northern Scandinavia it seems to become more frequent towards the east and north, with a continental preference. However, with so many finds in the MB and SB regions in north-central Sweden, I expect it to be also common south of the transect area in Sweden.

Prior to this investigation, *Lophiostoma curtum* was only known, as far as I know, from North Norway, and from a few localities in Sweden, Finland, and the Kola area in the Soviet Union. Its main distribution seems to be in northern Fennoscandia. In Sweden, previously mentioned by Fries (1818, 1823, 1849), Starbäck (1887, 1890), and Holm & Holm (1988).

**Material examined** (in addition to the cited types). **Norway:** No: Vefsn: Mosjøen S of Kulstad VP 18,06 28 Jul 1989 *Salix myrsinifolia* ssp. *myrsinifolia* GM 7830a, 7839a. Grane: Grane S of Grane church VN 26,74 3 Jul 1986 *S. caprea* ssp. *sericea* GM 3505. - Grane S of Grane church VN 26,74 28 Jul 1989 *S. pentandra* GM 7804. - Trofors at Båfjellmoen VN 25,68 27 Jul 1989 *S. caprea* ssp. *sericea* GM 7776. Hattfjelldal: Hattfjelldal S of Øståsen VN 54,77 8 Jul 1987 *S. myrsinifolia* ssp. *myrsinifolia* GM 4970. - S of Røssvatnet Bjørkåsen VN 57,81 8 Jul 1987 *S. caprea* ssp. *sericea* GM 4998, *S. myrsinifolia* ssp. *borealis* GM 5004a, 5005a. - Røssvatnet near Grubben VN 60,82 9 Jul 1987 *S. lapponum* GM 5062, *S. myrsinifolia* ssp. *borealis* GM 5070. Rana: Rana-dalen Stokkalia WP 11-12,76 21 Jul 1989 *S. glauca* ssp. *glauca* GM 7516. - Virvassdalen near Verdøl WP 08,62 21 Jul 1989 *S. caprea* ssp. *sericea* GM 7553, *S. myrsinifolia* ssp. *myrsinifolia* GM 7570, 7572. - Dunderlandsdalen Grotjønnenget VP 93,72 22 Jul 1989 *S. myrsinifolia* ssp. *myrsinifolia* GM 7600, 7600a, 7603. - Skugghei at Holmen VP 68-69,57 23 Jul 1989 *S. myrsinifolia* ssp. *borealis* GM 7650. - Plurisdalen Tappeskard VP 85,55 25 Jul 1989 *S. myrsinifolia* ssp. *borealis* GM 7719, 7721. Saltidal: Saltfjellet near Sukkertoppen WP 15,87 20 Jul 1989 *S. lapponum* GM 7490, 7496. **Sweden:** Ång: Sollefteå: Junsele Pustviken W of the road WL 66,95-96 4 Aug 1989 *S. pentandra* GM 8008. - Junsele Pustviken E of the road WL 66,96 4 Aug 1989 *S. pentandra* GM 8064, 8073, 8075, 8080, 8082, 8083. - Junsele WL 65,94 5 Aug 1989 *S. pentandra* GM 8098, 8103. - Lillsele W of Ångermanälven XL 76,03 30 Jul 1990 *S. myrsinifolia* ssp. *myrsinifolia* GM 8456. Örnköldsvik: Örnköldsvik-

vik N of Sundåsen CR 17,83 1 Aug 1987 *S. myrsinifolia* ssp. *borealis* GM 5481, 5484, 2 Aug 1987 *S. myrsinifolia* ssp. *myrsinifolia* GM 5566a, 5569. - Vågefjärden Vikbotten CR 12,89 2 Aug 1987 *S. myrsinifolia* ssp. *myrsinifolia* GM 5606, 5607, 5608, 5610, 5611, 5615a. - Arnäs E of Älvsjösjön CR 25-26,90 4 Aug 1987 *S. myrsinifolia* ssp. *myrsinifolia* GM 5711, 5712, 5715, 5716, *S. pentandra* GM 5760. - Vågefjärden E of Norrvåge CR 12-13,88 8 Jul 1988 *S. pentandra* GM 5892, 5892a, 5895, 5906, 5908, 5909. - Haffstafjärden N of Billsta CR 25,75 9 Jul 1988 *S. caprea* ssp. *caprea* GM 6043, 6045, 6050a, 6092, 6094, 6096, 9 Jul 1988 *S. myrsinifolia* ssp. *myrsinifolia* GM 5986, 5992, 9 Jul 1988 GM 6029, 6032, 8 Jul 1988 *S. pentandra* GM 5980. ÅsL: Dorotea: Ormsjön near Lövstrand WM 40,48 11 Jul 1988 *S. myrsinifolia* ssp. *borealis* GM 6209. Vilhelmina: Djupdal WM 59,65 5 Jul 1986 *S. caprea* ssp. *sericea* GM 3601a. - E of Djupdal Svältmyran WM 60,71 6 Jul 1986 *S. lapponum* GM 3708, 3721. - Vilhelmina Lövåsen WM 62,83 8 Jul 1986 *S. caprea* ssp. *sericea* GM 3793, *S. myrsinifolia* ssp. *myrsinifolia* GM 3763a, 3780. - SE of Siksjön along Siksjöbacken WM 68,88 30 Jul 1987 *S. glauca* ssp. *glauca* GM 5400, 5408, 5412. - Bäsksele E of Vojmån WM 68,89 30 Jul 1987 *S. glauca* ssp. *glauca* GM 5461, 5462, 5464. - W of Lövliden near Lillån WM 70,73 13 Jul 1988 *S. myrsinifolia* ssp. *myrsinifolia* GM 6295, 6296, 6300, 6301, 6302, 6307a, 6310, 6311a, 6316. - Storsole W of Vojmån WM 86,85 29 Jul 1990 *S. lapponum* GM 8315, 8321, 8326. - Storsole E of Vojmån WM 86,85 29 Jul 1990 *S. glauca* ssp. *glauca* GM 8349, 8349b, 8360, 8363. Åsele: Gavsele W of Ångermanälven XL 99,10 30 Jul 1990 *S. lapponum* GM 8448, 8449, 8450, 8451, 8452, *S. pentandra* GM 8433, 8438, 8441, 8443, 8444. **Finland:** "Fennia" s. dat. & nom. coll. *Salix* sp. (PAD).

### *Lophiostoma macrostomoides* (De Not.) Ces. & De Not.

Comm. Soc. critt. ital. 1: 219 (1863) - *Sphaeria macrostomoides* De Not., Mem. Accad. Sci. Torino ser. 2. 13: 111 (1854, n. v.) - Type: Italy, pr. Milano, 16 Oct 1838, *Salix alba*, De Notaris (RO, holo! = Erb. critt. ital. II: 543).

Refr. descr.: Chesters & Bell 1970a: 45, Holm & Holm 1988: 18, Mathiassen 1989: 68. Refr. illustr.: Chesters & Bell 1970a: Fig. 14, Holm & Holm 1988: Figs 47-49.

Exsic.: Erb. critt. ital. II: 543 (RO).

Figs 65-67, 146, 148, 156.

**Description.** *Pseudothecia* 550-900 µm diam., ± globose, immersed-erumpent, scattered, with a prominent papilla and an often obtuse crest, ostiolum lined with periphyses. *Asci* 109-168 x 14.4-18.5 µm, mean 138.3 x 16.6 µm (n = 45), clavate, 8-spored, occasionally 4-spored, but then with large, abnormal spores. *Paraphysoids* 1-1.5(-3) µm diam., septate, branched, anastomosing, abundant. *Ascospores* (24-)24.9-39.4(-41.3) x (6.7-)7-9.8(-11.5) µm, mean 32 x 8.2 µm,  $\bar{Q}$  = 3.9 (n = 160), variable in shape and septation, generally ellipsoid or oblong-ellipsoid, often slightly curved, (4-)5-7(-8)-septate, constricted, verrucose, brown, biseriate.

**Taxonomic notes** The spores in *Lophiostoma macrostomoides* are variable, even within the same ascoma, and it is difficult to stipulate its natural spore variation. Several "forms" obviously occur, approaching, e.g. *L. caulium*, *L. quadrinucleatum*, and even *L. compressum* (cf. Holm & Holm 1988: 19, Mathiassen 1989: 68). The delimitation towards these species were thoroughly discussed by Holm & Holm (1988: 19), and is therefore not further commented upon here. However, I kept the material on *Salix* separated in four closely related groups for a long time, but I now only accept the material from two of these groups as *L. macrostomoides*. These specimens are in accordance with the interpretation accepted by Holm & Holm (1988).

The circumscription of *Lophiostoma macrostomoides* is very problematic, and more investigation is needed. Holm & Holm (1988: 19) were inclined to treat it as a variety within the *caulium* complex, but they pointed out that "... our keeping it at specific rank is partly a concession to the established practice". The type collection (RO) agreed well with my

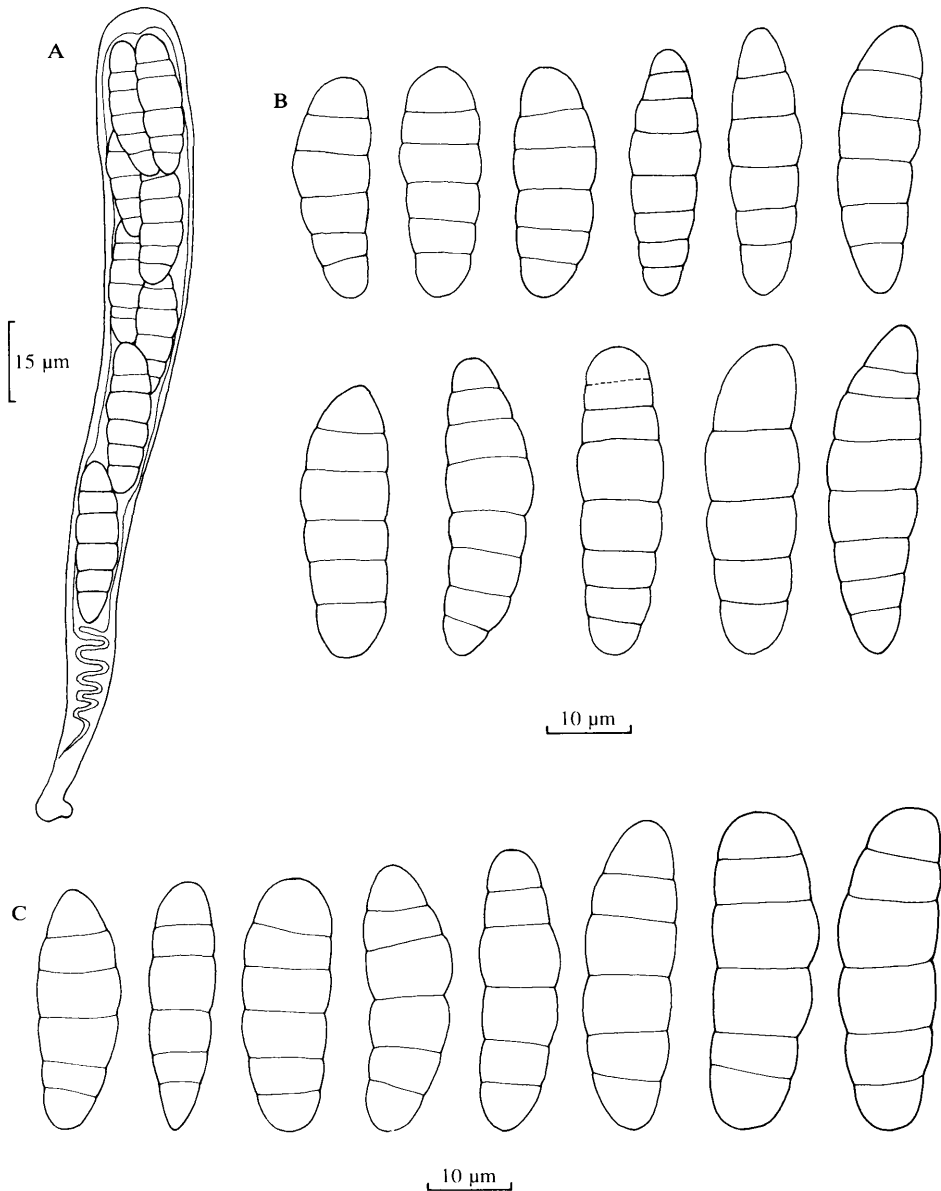
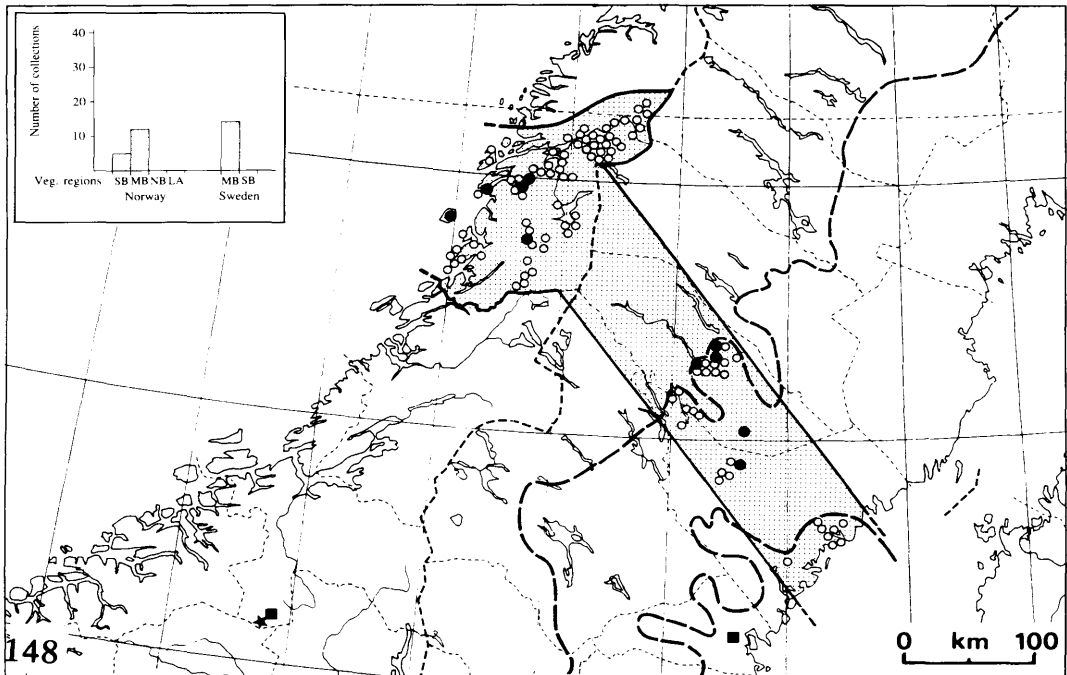
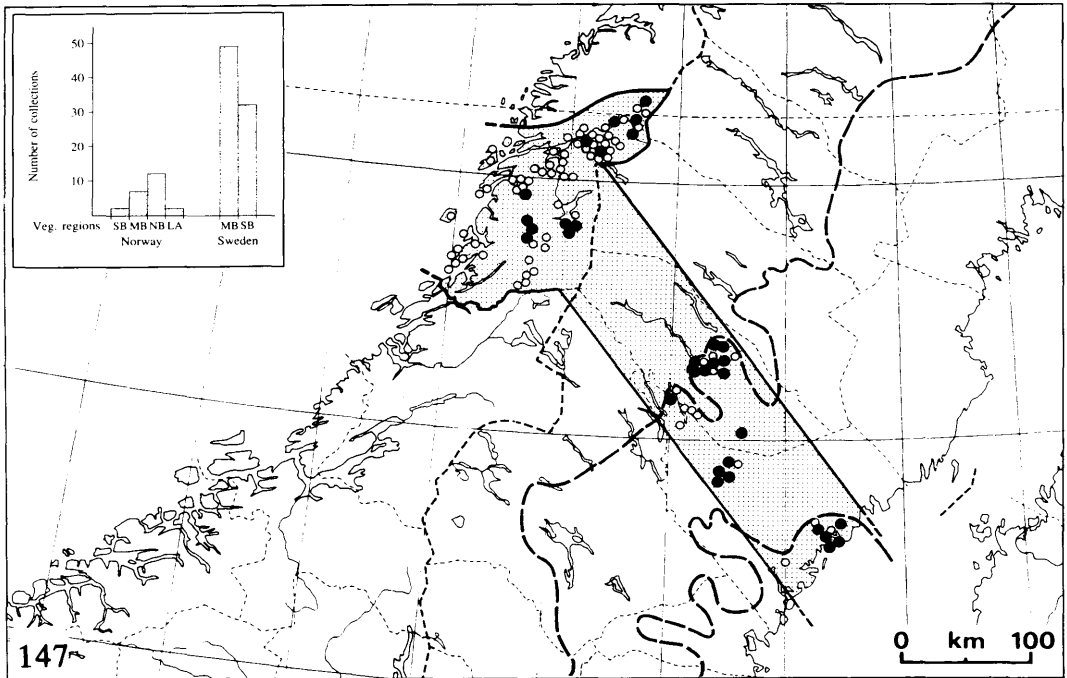


Fig. 146. *Lophiostoma macrostomoides*. A. Ascus with eight spores. GM 2763. B-C. Spores. B. GM 8324. C. Type.

material, but the majority of the spores were often slightly broader, and had generally fewer ((4-)5(-6)) septa.

**Hosts.** Found on *Salix caprea* ssp. *sericea* (1 coll.), *S. glauca* ssp. *glauca* (2 coll.), *S.*



Figs 147-148. Distribution maps. Fig. 147. *Lophiostoma curtum*. Fig. 148. *Lophiostoma macrostomoides*. Legend on p. 24.

*lapponum* (8 coll.), *S. myrsinifolia* ssp. *myrsinifolia* (15 coll.), *S. pentandra* (5 coll.). Most frequent on *S. myrsinifolia* ssp. *myrsinifolia*, but no particular pattern is evident. *Lophiostoma macrostomoides* has a wide host range (cf. Holm & Holm 1988: 19-20, Mathiassen 1989: 68), but it seems to be most frequent on *Salix* and *Populus*.

**Ecology.** Found both on wood and bark, but prefers decorticated wood. It fits well among the primary saprophytes, but is also able to sporulate on rather decayed substrate. Almost 40% of the samples were found near ground level.

**Distribution.** Only found in the two MB regions within the transect, and in the Norwegian SB region. It is not very common, but most frequent in the MB regions. Found both in oceanic and continental localities, but the distributional pattern within the vegetation regions may be incidental because, in Troms (Mathiassen 1989), it was also found in pure LA.

In Troms, I found it to be very rare, but it becomes more frequent towards the south. Holm & Holm (1988: 19) reported several finds from southern Sweden, and one find from the central part of the country (Mpd). Vleugel's (1911) report on this species from north-central Sweden (Vb., near Umeå), turned out to be *Lophiostoma compressum* (C). *Lophiostoma macrostomoides* is infrequent in Finland.

**Material examined** (in addition to the cited type and exsiccata). **Norway:** ST: Oppdal: Kongsvoll 14 Jul 1965 *Salix* sp. O. Eriksson (UME 29172). No: Vega: Vega W of Rørøy PT 37,84-85 30 Jun 1986 *S. myrsinifolia* ssp. *myrsinifolia* GM 3155, 3156b. Alstahaug: Offersøya N of Vågen UP 84,07 25 Jun 1986 *S. myrsinifolia* ssp. *myrsinifolia* GM 2756, 2763, 2764. Vefsn: Fustvatnet S of Straum VP 27,12 10 Jul 1987 *S. myrsinifolia* ssp. *myrsinifolia* GM 5126, 5127, 5131, 5134. - Mjåvatnet near Sandvik VP 27,14 10 Jul 1987 *S. glauca* ssp. *glauca* GM 5146, 5150, *S. lapponum* GM 5163, *S. pentandra* GM 5138, 5141b, 5142, 5164a. Grane: Trofors at Båfjellmoen VN 25,68 27 Jul 1989 *S. myrsinifolia* ssp. *myrsinifolia* GM 7783. **Sweden:** Upl: Uppsala s. dat. P.A. Karsten No. 2754 (H). Ång: Sollefteå: Lillsele E of Ångermanälven XL 76,03 31 Jul 1990 *S. myrsinifolia* ssp. *myrsinifolia* GM 8476. Åsl: Vilhelmina: Vilhelmina N of Gubbselforsen WM 67,79 7 Jul 1988 *S. caprea* ssp. *sericea* GM 5881. - W of Lövliden near Lillån WM 70,73 13 Jul 1988 *S. myrsinifolia* ssp. *myrsinifolia* GM 6301a, 6307, 6323, 6339. - Storlele W of Vojmån WM 86,85 29 Jul 1990 *S. lapponum* GM 8324, 8326a, 8341, 8342, 8344. Åsele: Gavsele W of Ångermanälven XL 99,10 30 Jul 1990 *S. lapponum* GM 8446, 8447, *S. pentandra* GM 8437.

### *Lophiostoma quadrinucleatum* Karst.

Mycol. fenn. 2: 85 (1873) - Type: Finland, Tav. austr., Tammela Mustiala, 25 Jul 1869, *Rhamnus frangula*, Karsten (H, holo! in sched.). Synonyms; see Chesters & Bell 1970a: 35, Holm & Holm (1988: 21-22).

Refr. descr.: Holm & Holm 1988: 21, Mathiassen 1989: 68. Refr. illustr.: Mathiassen 1989: Fig. 61a, b.

Figs 68-70, 149, 151, 157.

**Description.** *Pseudothecia* 400-600(-700) µm diam., globose, immersed-erumpent, scattered or more often crowded, papilla prominent, with an often sharp crest, ostiolum lined with periphyses. *Asci* 109-166 x 13.2-18.2 µm, mean 135.6 x 16.2 µm (n = 56), clavate. *Paraphysoids* 1-1.5(-3) µm diam., septate, branched, anastomosing, abundant. *Ascospores* (20-) 21-29(-31) x (6.7-)7-9.8(-10.5) µm, mean 24.5 x 8.3 µm,  $\bar{Q} = 3.0$  (n = 480), variable, but mostly broadly ellipsoid, often slightly curved, 3(-4-5)-septate, constricted, verruculose, brown, guttulate, mostly biseriate.

**Taxonomic notes.** As pointed out by Holm & Holm (1988: 22), the circumscription of *Lophiostoma quadrinucleatum* is not clear, and intergraduate forms approaching *L. macrostomoides* do occur (see also Mathiassen 1989: 69).

My interpretation of *Lophiostoma quadrinucleatum* is exactly the same as previously



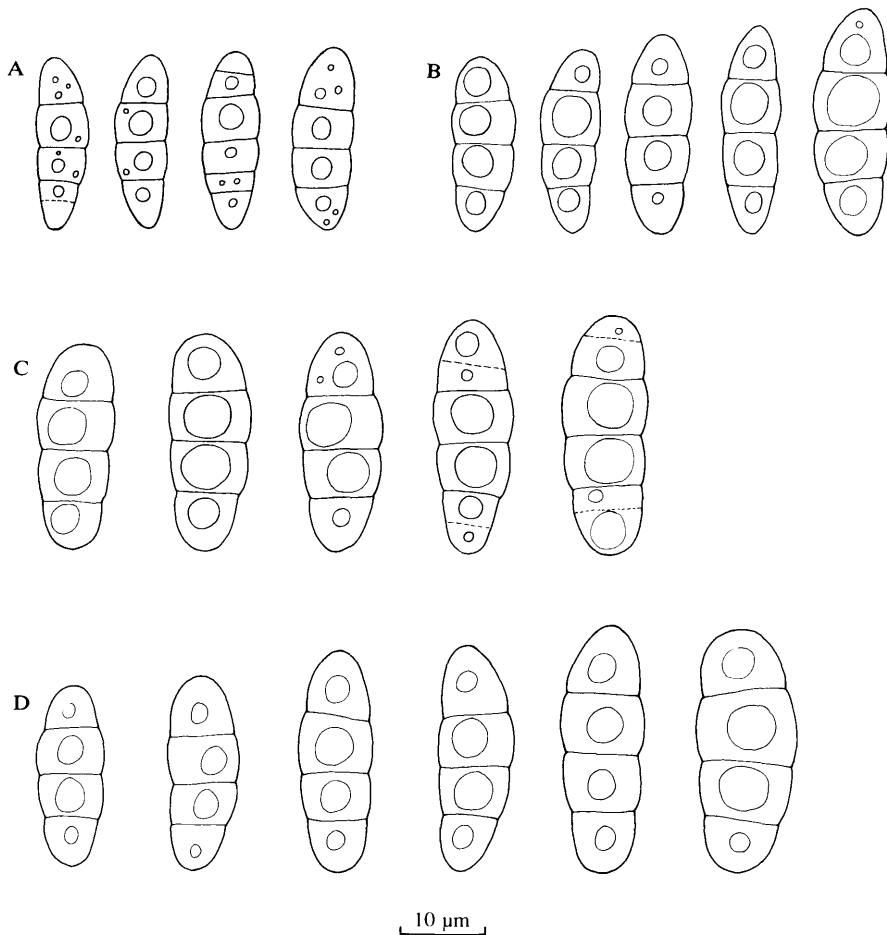


Fig. 149. *Lophiostoma quadrinucleatum*. Spores. A. GM 2125. B. GM 7511a. C. GM 640. D. Type.

reported from Troms (Mathiassen 1989: 68), and the samples found in the present investigation show the same spore variability. The material can be divided in two different groups on spore characters and distribution. Both groups are distributed all along the transect, but the group with "normal" spores is most frequent in the SB regions, and the other one, with a majority of somewhat smaller spores, is most frequent in NB in Norway and MB in Sweden. They have overlapping spore sizes and shape, but the average spore sizes are different. Although the differences between the smallest and the largest spores are pronounced, there seems to be a gradual increase in spore size. In addition, as some samples have a majority of intermediate spore sizes, I have decided to treat all the samples listed below (see Material examined) as *L. quadrinucleatum*. However, we know too little about its natural variation, and it is possible that the small spored group ought to be described as a variety of *L. quadrinucleatum*. The circumscription is thus provisional, and more field work and laboratory

experiments are necessary. The synonymy, and some aberrant forms are thoroughly discussed by Holm & Holm (1988: 22).

*Lophiostoma compressum*, *L. macrostomoides* and *L. quadrinucleatum* may be confused with each other macroscopically as they all have similar ascomata sizes, but as a rule, they can be distinguished with some certainty, using a hand lens, on the morphology of the papilla. Both *L. compressum* and *L. quadrinucleatum* usually have a strong compressed crest, and the distinction between the crest and the papilla is often diffuse. As a rule, the crest in *L. compressum* is long (ad 0.9 mm) and often Y-shaped, generally with a slightly flat or convex upper edge. The papilla, or crest in *L. quadrinucleatum* is shorter (ad 0.4 mm), with a generally rounded upper edge. *Lophiostoma macrostomoides* is different in having a prominent, more or less elliptical papilla, with an often obtuse crest. The aspect is reminiscent of *L. curtum*, but larger in all respects.

**Hosts.** Found on all the examined *Salix* species; *S. caprea* ssp. *caprea* (5 coll.), and ssp. *sericea* (6 coll.), *S. glauca* ssp. *glauca* (13 coll.), *S. lapponum* (6 coll.), *S. myrsinifolia* ssp. *borealis* (14 coll.), and ssp. *myrsinifolia* (7 coll.), *S. pentandra* (6 coll.). Shows no preference for one particular *Salix* species, and the same tendency was observed in Troms (Mathiassen 1989). However, *Lophiostoma quadrinucleatum* was too infrequent on *Salix* in Troms to justify any further discussion, or comparison of the distribution on the hosts between these two areas.

*Lophiostoma quadrinucleatum* is only known from *Acer*, *Populus*, *Prunus*, *Rhamnus* and *Salix* (Holm & Holm 1988: 22, Mathiassen 1989: 69). The samples from *Berberis vulgaris*, *Betula* sp. and *Crataegus "oxyacantha"* cited by Holm & Holm (1988: 22) are all aberrant forms.

**Ecology.** In Troms (Mathiassen 1989: 15), I regarded *Lophiostoma quadrinucleatum* as a lignicolous species, but this is not correct. In the present investigation, it was found both on wood and bark, but it had some preference for decorticated wood. It seems to fit well among the primary saprophytes, but it has a broader ecological amplitude than previously suggested (Mathiassen 1989).

**Distribution.** Rather common, throughout the transect. Found in all the vegetation regions, but it was more frequent in the Norwegian section than in the Swedish section. In Norway it is frequent in SB and NB, and infrequent in MB and LA. This distributional pattern is very peculiar, and it seems to be due to the different distributional patterns of the two groups mentioned above. The results of this investigation are interesting, both taxonomically and geographically, and in future field work, which is obviously necessary, other *Salix* species and tree genera should be thoroughly investigated.

As suggested by Holm & Holm (1988: 22), *Lophiostoma quadrinucleatum* seems to be a northern species. It is rare in South Sweden, and in Finland.

**Material examined** (in addition to the cited type). **Norway:** No: Dønna: Dønna E of Rølvåg UP 87,43 24 Jun 1986 *Salix caprea* ssp. *caprea* GM 2640b, *S. pentandra* GM 2616. - Dønna N of Hildselvvatnet UP 89,34 24 Jun 1986 *S. caprea* ssp. *caprea* GM 2700, 2709. Sømna: Sømna N of Berg UN 69-70,53 27 Jun 1986 *S. pentandra* GM 2910a. - Sømna S of Vennesund UN 61-62,35 5 Jul 1987 *S. caprea* ssp. *sericea* GM 4803a. Brønnøy: W of Nebbåsen UN 85,51 28 Jun 1986 *S. myrsinifolia* ssp. *myrsinifolia* GM 3023a. - Sømna Akselberg UN 83,55 29 Jun 1986 *S. myrsinifolia* ssp. *borealis* GM 3086a, 3088b, 3090, 3093a, 3094a, 3095b, 3096, 3098a. - Brønnøysund Mossem UN 73,67 30 Jun 1986 *S. myrsinifolia* ssp. *myrsinifolia* GM 3208a, 3209a, 3211a, 3212a, *S. pentandra* GM 3206a. Grane: Majavatn E of Stortjønna VN 22,22 1 Jul 1986 *S. lapponum* GM 3264, 3265, 3267, 3268. Hattfjelldal: Hattfjelldal S of Øståsen VN 54,77 8 Jul 1987 *S. myrsinifolia* ssp. *myrsinifolia* GM 4972. - S of Røssvatnet Bjørkåsen VN 57,81 8 Jul 1987 *S. caprea* ssp. *sericea* GM 4998a, *S. glauca* ssp. *glauca* GM 5029, *S. myrsinifolia* ssp. *borealis* GM 5000a, 5003a, 5058a. - Røssvatnet near Grubben VN 60,82 9 Jul 1987 *S. myrsinifolia* ssp. *borealis* GM 5080b, 5081a. Hemnes: Korgfjellet S of Ørntinden VP 40-41,27 14 Jul

1987 *S. glauca* ssp. *glauca* GM 5309g. - Tustervatnet S of Tustervatn VP 50,00 14 Jul 1987 *S. myrsinifolia* ssp. *borealis* GM 5322. Rana: Randalen Stokkalia WP 11-12,76 21 Jul 1989 *S. glauca* ssp. *glauca* GM 7511a, 7518. - Randalen 2 km S of Bolna WP 10,73 21 Jul 1989 *S. caprea* ssp. *sericea* GM 7542a. - Grønfejldalen near Lappsætra VP 95,51 24 Jul 1989 *S. glauca* ssp. *glauca* GM 7662, 7666. - Plurdalen Kaldvatnet W of Revet VP 89,47 25 Jul 1989 *S. glauca* ssp. *glauca* GM 7699, 7702a, 7704a. - Gruben N of Englia VP 65,55 20 Jul 1990 *S. pentandra* GM 8188a, 8201. - Saltfjellet Arctic Circle WP 15,82 25 Jul 1990 *S. glauca* ssp. *glauca* GM 8293a. Sweden: Ång: Kramfors: Almsjönäs N of Norr-Almsjön CR 98,50 3 Aug 1987 *S. myrsinifolia* ssp. *myrsinifolia* GM 5675. Örnsköldsvik: Haffstafjärden N of Billsta CR 25,75 9 Jul 1988 *S. caprea* ssp. *caprea* GM 6018, 6064. - Haffstafjärden SE of Gala CR 27,74 10 Jul 1988 *S. pentandra* GM 6127c. ÅsL: Vilhelmina: Djupdal WM 59,65 5 Jul 1986 *S. caprea* ssp. *sericea* GM 3584a, 3586c, 3597a. - W of Bäsksjön L. Annevare WM 81,98 29 Jul 1987 *S. glauca* ssp. *glauca* GM 5361a. - Storlele W of Vojmån WM 86,85 29 Jul 1990 *S. lapponum* GM 8341a, 8343. - Storlele E of Vojmån WM 86,85 29 Jul 1990 *S. glauca* ssp. *glauca* GM 8368, 8368a.

### *Lophiotrema boreale* Mathiassen

Sommerfeltia 9: 71 (1989) - Type: Norway: Tr: Harstad: Sørvik-Sørvikfjellet WS 60-61,19-20 7 Jul 1981 *Salix myrsinifolia* ssp. *myrsinifolia* GM 218 (TROM, holo!).

Refr. descr.: Mathiassen 1989: 71. Refr. illustr.: Mathiassen 1989: Fig. 64.

Figs 71-73, 150, 152, 158.

**Description.** *Pseudothecia* 140-270  $\mu\text{m}$  diam.,  $\pm$  globose, immersed-erumpent, scattered or crowded, papilla flattened, often indistinct, ostiolum lined with periphyses. Wood surface generally blackened. *Asci* 70-97 x 5.3-7.1  $\mu\text{m}$ , mean 81.4 x 6.1  $\mu\text{m}$  ( $n = 68$ ), cylindrical, short-stiped. *Paraphysoids* generally between 1-1.5  $\mu\text{m}$  diam., septate, branched, anastomosing. *Ascospores* 11.5-16.3(-17) x (3-)3.2-4.8  $\mu\text{m}$ , mean 14.2 x 3.9  $\mu\text{m}$ ,  $\bar{Q} = 3.6$  ( $n = 110$ ), ellipsoid-fusiform, slightly curved, two-celled, constricted, hyaline, guttulate, obliquely uniseriate, later on 4-celled, light brownish.

**Taxonomic notes.** *Lophiotrema boreale* was briefly described, illustrated and discussed by Holm & Holm (1988: 27) before it was effectively published. Unfortunately, only three of the eleven collections mentioned by them represent *L. boreale*, viz., the collection from Oppdal in Norway, and the two from Abisko in northern Sweden. The other eight collections

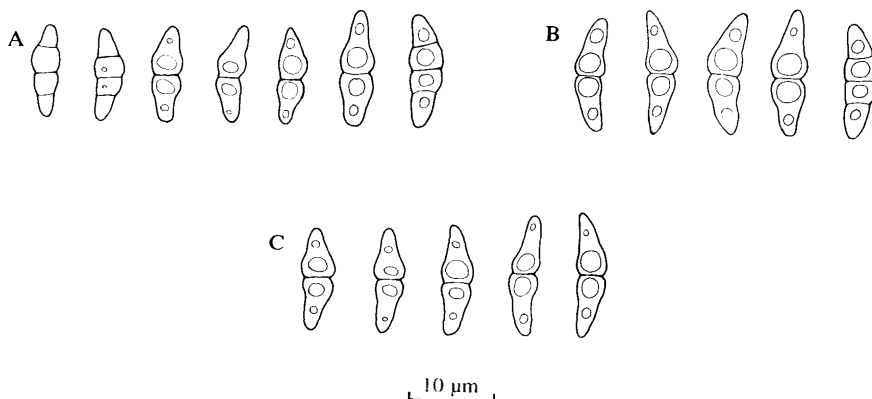
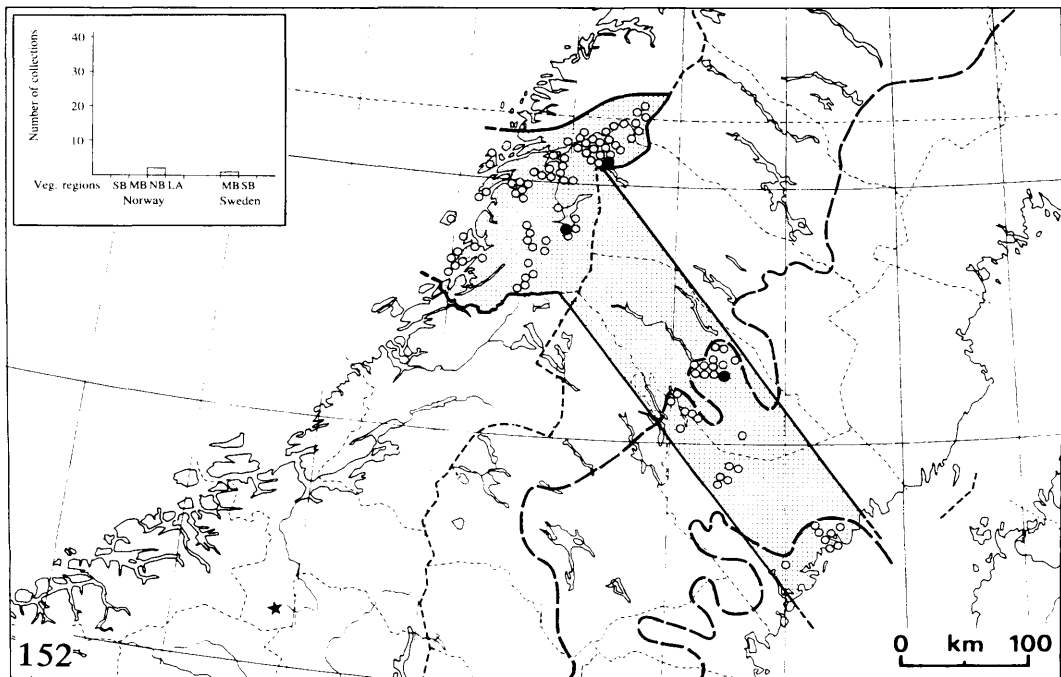
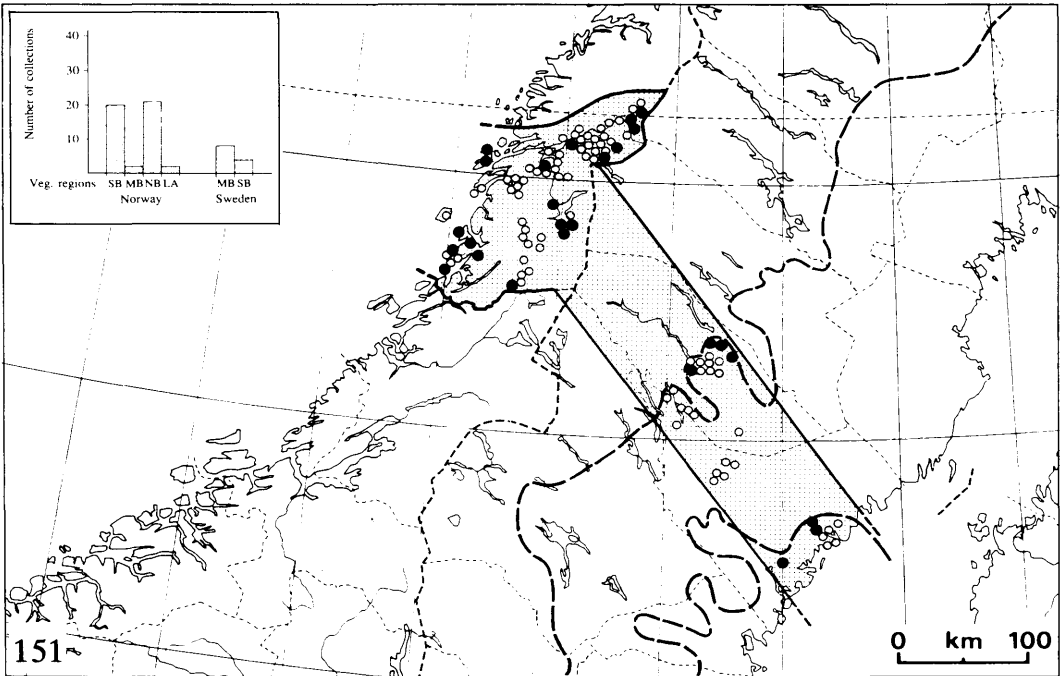


Fig. 150. *Lophiotrema boreale*. Spores. A. GM 7704. B. GM 207. C. GM 218 (type).



Figs 151-152. Distribution maps. Fig. 151. *Lophiostoma quadrinucleatum*. Fig. 152. *Lophiotrema boreale*. Legend on p. 24.

represent another *Lophiotrema* species. This species is similar to *L. boreale*, but distinctive by the shape and sizes of the spores (which actually remain 1-septate and lack the typical guttulae), and by the shape of the papilla. It seems to be undescribed. Only Fig. 33 (Holm & Holm 1988) represents *L. boreale*, while Figs 32, 109 represent the other taxon.

I still retain *Lophiotrema* as a separate genus within the Lophiostomataceae, but as pointed out above, the borderline between *Lophiostoma* and *Lophiotrema* seems to be more diffuse than previously suggested (cf. Holm & Holm 1988, Mathiassen 1989). For a long time I was inclined to include *Lophiotrema* in *Lophiostoma*, mainly because of the intermediate features in *L. curtum*, but more investigations are necessary. For the time being, I follow Holm & Holm (1988), and Eriksson & Hawksworth (1990d).

**Hosts.** Found on *Salix glauca* ssp. *glauca* (1 coll.), *S. myrsinifolia* ssp. *borealis* (1 coll.), and ssp. *myrsinifolia* (1 coll.). In Troms (Mathiassen 1989), it was only found on *S. myrsinifolia* agg., but *Lophiotrema boreale* is too infrequent in both areas to justify a discussion on host preferences. *Lophiotrema boreale* is known from *Alnus*, *Betula* and *Salix* (see Material examined).

**Ecology.** Predominantly lignicolous on both twigs and stems. Only found on rather decayed substrates, and it seems to fit well among the secondary saprophytes. This agrees well with the investigation from Troms (Mathiassen 1989: 14).

**Distribution.** As previously suggested (cf. Mathiassen 1989: 21), it is very likely that *Lophiotrema boreale* and *Hypoxylon macrosporum* have a similar distributional pattern in Scandinavia. *Lophiotrema boreale* seems to be continental, and all but one of the known samples are found in the MB, NB and NB-LA regions. One sample (sub *Zignoëlla*) from near Oslo in South Norway does not fit this pattern, and indicates that *L. boreale* has a wider distribution than *H. macrosporum*. However, the samples are too few to justify a further discussion on its distribution.

As pointed out above, *Lophiotrema boreale* fits well among the secondary saprophytes, but this kind of substrate (rotten stems or stumps, and dead, decayed, fallen twigs) were intentionally not included in the present investigation (see above). It is therefore probably more common in Scandinavia than the known samples indicate. More field work is necessary, and a systematic examination of decayed substrates should be included in future investigations.

**Material examined** (in addition to the cited type). **Norway:** O: Oslo: Bogstadåsen s. dat. & nom. coll. "*Zignoëlla* sp." (C). ST: Oppdal: Stølegga 24 Aug 1985 *Alnus incana* K. & L. Holm 3742b (UPS). No: Hattfjeldal: S of Røssvatnet Bjørkåsen VN 57,81 8 Jul 1987 *Salix myrsinifolia* ssp. *borealis* GM 5004b. Rana: Plurdalen Kaldvatnet W of Revet VP 89,47 25 Jul 1989 *S. glauca* ssp. *glauca* GM 7704. **Sweden:** ÅsL: Vilhelmina: Vilhelmina Lövåsen WM 62,83 8 Jul 1986 *Salix myrsinifolia* ssp. *myrsinifolia* GM 3763. TL: Kiruna: Abisko 1 Jul 1927 *Betula* sp. J.A. Nannfeldt 737, & 4 Jul 1928 J.A. Nannfeldt 1067, det. L. Holm (UPS).

### *Lophiotrema nucula* (Fr. : Fr.) Sacc.

Michelia 1: 338 (1878) - *Sphaeria nucula* Fr. : Fr., Syst. mycol. 2: 466 (1823); K. svenska Vetensk.-Akad. Handl. 1817 (1817: 266) - *Lophiostoma nucula* Ces. & De Not., Comm. Soc. critt. ital. 1: 120 (1863) - Type: Fr., Scl. succ. 238 (UPS, lecto! proposed by Holm & Holm 1988: 26) - *Lophiostoma duplex* Karst., Mycol. fenn. 2: 86 (1873) - *Lophiotrema duplex* (Karst.) Sacc., Michelia 1: 338 (1878) - Type: Finland, Mustiala, *Sorbus aucuparia*, Karsten (UPS, iso! fide Holm & Holm 1988: 26, = Karst., F. fenn. 970).

Refr. descr.: Leuchtmann 1985: 163, Holm & Holm 1988: 26, Mathiassen 1989: 73. Refr. illustr.: Leuchtmann 1985: Fig. 2b, Mathiassen 1989: Fig. 65.

Exsic.: Fr., Scl. succ. 238 (UPS) - Karst., F. fenn. 970 (UPS).

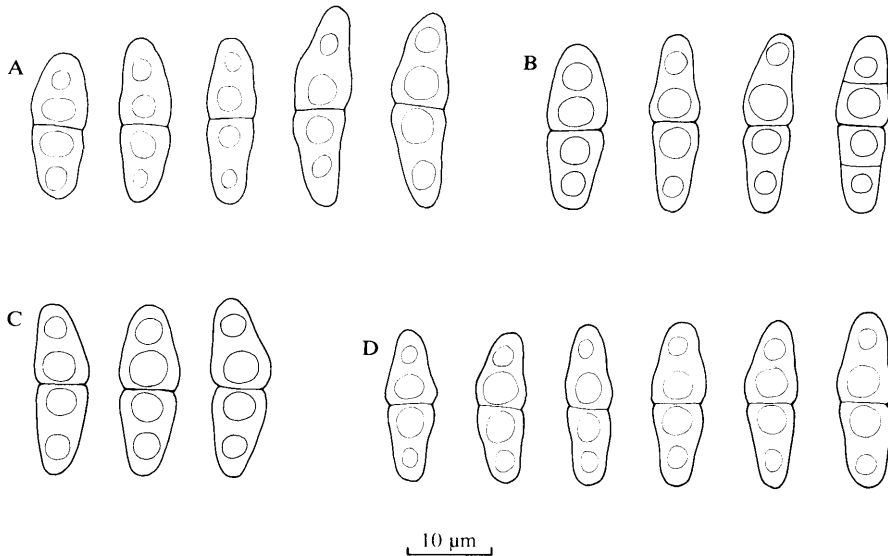


Fig. 153. *Lophiotrema nucula*. Spores. A. GM 8067. B. GM 323. C. GM 214. D. Type.

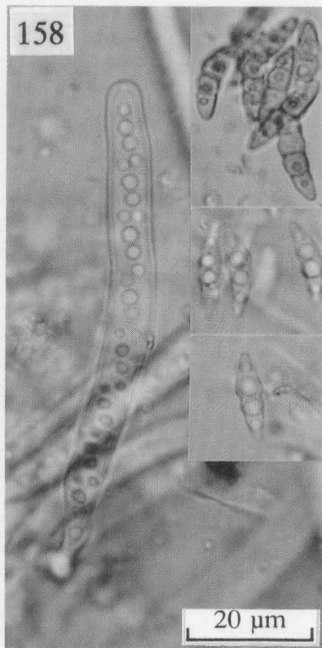
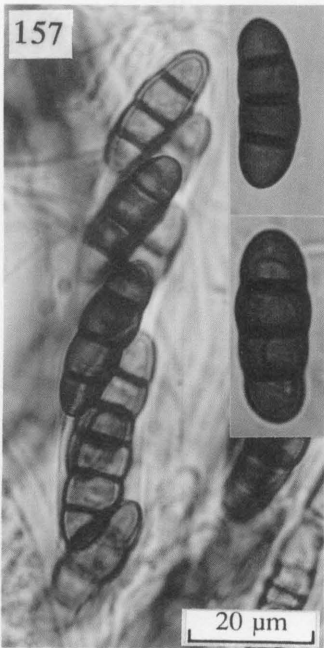
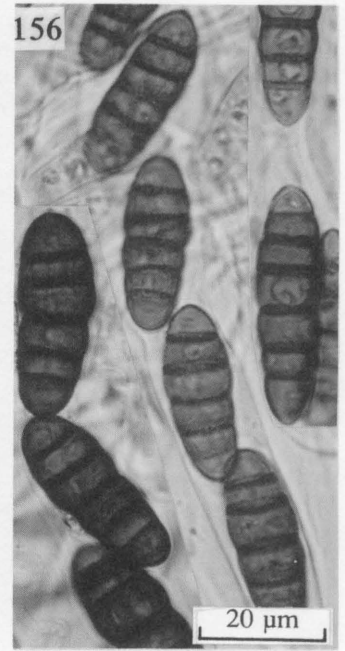
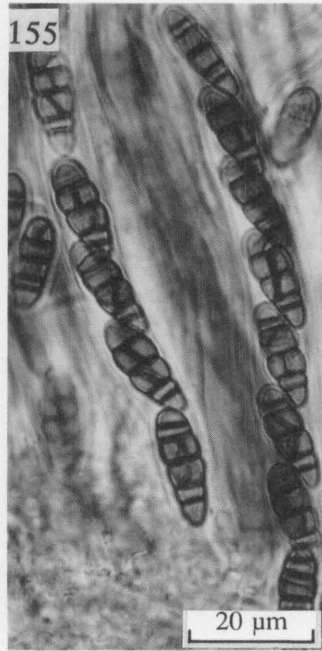
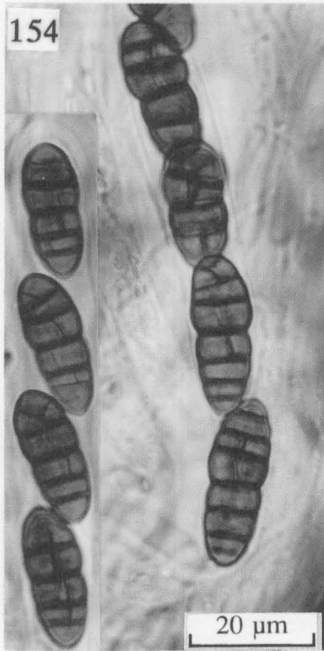
Figs 74-76, 153, 159, 161.

**Description.** *Pseudothecia* (200-)300-450  $\mu\text{m}$  diam., globose to somewhat elongated, immersed-erumpent, but often almost completely immersed, scattered or gregarious, papilla generally prominent, with a flattened crest, ostiolum lined with periphyses. Wood surface generally blackened. *Peridium* variable in thickness, generally 35-50  $\mu\text{m}$  thick, consisting of a thin outermost layer of *textura epidermoidea*, which gradually increases in thickness towards the papilla, an inner layer of thick-walled, slightly compressed cells,  $\pm$  *textura angularis*, and an innermost hyaline layer of thin-walled cells, *textura angularis*. Basal tissue thinner, generally consisting of somewhat compressed cells outermost, and an inner layer of variable texture,  $\pm$  *textura angularis*. *Peridium* generally somewhat thinner on bark. *Asci* 105-160 x 9-11.5  $\mu\text{m}$ , mean 133.6 x 10.3  $\mu\text{m}$  ( $n = 76$ ), cylindrical, short-stiped. *Paraphysoids* (0.7-)1-1.5(-2.5)  $\mu\text{m}$  diam., septate, branched, anastomosing, abundant. *Ascospores* (16.4-)17.3-24.1(-25) x (5-)5.5-7.2(-7.7)  $\mu\text{m}$ , mean 20.8 x 6.2  $\mu\text{m}$ ,  $\bar{Q} = 3.4$  ( $n = 220$ ), ellipsoid to oblong-ellipsoid, often slightly curved, two-celled, constricted, hyaline, guttulate, obliquely uniseriate, later on 4-celled, light brownish.

**Taxonomic notes.** *Lophiotrema nucula* is a distinct species, with rather uniform spores, but the ascomata often vary in shape and size, a variation that is evidently correlated to some extent with the substrate (Holm & Holm 1988: 26). Karsten (1873: 86) separated the corticolous *Lophiostoma nucula* and the lignicolous *L. duplex*, but they undoubtedly represent the same taxon.

The history and typification of *Lophiotrema nucula* were thoroughly discussed by Holm & Holm (1988: 26-27).

**Hosts.** Found on all the examined *Salix* species, except *S. lapponum*; *S. caprea* ssp. *caprea* (10 coll.), and ssp. *sericea* (50 coll.), *S. glauca* ssp. *glauca* (1 coll.), *S. myrsinifolia* ssp. *borealis* (7 coll.), and ssp. *myrsinifolia* (12 coll.), *S. pentandra* (11 coll.). Its high frequency on *S. caprea* agg. was very surprising, particularly as, in Troms, it was mainly



Figs 154-159. Photographs of type collections. Fig. 154. *Lophiostoma compressum* (L). Fig. 155. *Lophiostoma curtum* (UPS). Fig. 156. *Lophiostoma macrostomoides* (RO). Fig. 157. *Lophiostoma quadrinucleatum* (H). Fig. 158. *Lophiotrema boreale* (TROM). Fig. 159. *Lophiotrema nucula* (UPS).

found on *S. myrsinifolia* agg. (Mathiassen 1989). At present I have no reasonable explanation for this change in host preferences on *Salix* from north to south, but I find it very interesting. However, only one sample was found on *S. glauca* ssp. *glauca*. This is, so far, the only find on the medium shrubs on *Salix*.

In addition to the hosts mentioned by me earlier (Mathiassen 1989: 73), *Lophiotrema nucula* is also reported on *Crataegus douglasii* (Holm & Holm 1988: 26).

**Ecology.** Predominantly lignicolous, most frequent on dead twigs. *Lophiotrema nucula* is probably a primary saprophyte, but it is difficult to assign it to one particular group. More than 30% of the samples were found on decayed substrate, often near ground level, and it is able to exploit the substrate for a long time. The treated *Lophiotrema* species have affinities towards secondary saprophytism, but I don't know whether this is incidental or not. Neither Chesters & Bell (1970a), nor Holm & Holm (1988) discussed the ecology in particular for *L. nucula*.

**Distribution.** Common, and distributed throughout the transect. It is found in all the vegetation regions, except LA, and most frequent in the two MB regions. This agrees well with the investigation from Troms (Mathiassen 1989). Holm & Holm (1988: 26) suggested that *Lophiotrema nucula* was probably common and widespread over Scandinavia. It is quite common in northern Scandinavia, but seems to become more frequent towards the south. It is very common in South Sweden, and Holm & Holm (1988: 15) considered *L. nucula* to be one of the commonest Lophiostomataceae on frondose wood. Less than 10 samples are known from Finland.

In Sweden, previously mentioned by, e.g. Fries (1817, 1823, 1849), Starbäck (1887), and Holm & Holm (1988). Fries (1817: 266) considered *Lophiotrema nucula* as rare, while Starbäck (1887: 208) regarded it as quite common.

**Material examined** (in addition to the cited types and exsiccatae). **Norway:** No: Sømna: Sømna N of Berg UN 69-70.53 26 Jun 1986 *Salix myrsinifolia* ssp. *borealis* GM 2896. - Sømna E of Sørbotnet UN 70.51 27 Jun 1986 *S. caprea* ssp. *sericea* GM on coll. 2977b. Brønnøy: Sømna Akselberg UN 83.55 29 Jun 1986 *S. caprea* ssp. *caprea* GM 3084. *S. myrsinifolia* ssp. *borealis* GM 3088a. - Brønnøysund Mossem UN 73.67 30 Jun 1986 *S. pentandra* GM 3198b. Vefsn: Mosjøen W of Forsmoen VP 19.08 10 Jul 1987 *S. caprea* ssp. *sericea* GM 5113a. - Fustvatnet S of Straum VP 27.12 10 Jul 1987 *S. myrsinifolia* ssp. *myrsinifolia* GM 5129b, 5131c, 5134a. - Mosjøen S of Kulstad VP 18.06 28 Jul 1989 *S. myrsinifolia* ssp. *myrsinifolia* GM 7829a, 7839. Grane: Grane S of Grane church VN 26.74 3 Jul 1986 *S. pentandra* GM 3449, 3450, 3468a. - Trofors at Båfjellmoen VN 25.68 27 Jul 1989 *S. caprea* ssp. *sericea* GM 7764, 7765, 7767, 7770, 7771c, 7779a. Hemnes: Bjerka S of Sjøenget VP 47.37 31 Jul 1989 *S. pentandra* GM 7897. - Sørfjorden Grønvikneset VP 40.40 1 Aug 1990 *S. glauca* ssp. *glauca* GM 8527. Rana: Nedre Jamtli VP 67.57 7 Aug 1987 *S. myrsinifolia* ssp. *borealis* GM 5828a. - Dunderlandsdalen near Storvollen VP 96-97.76 22 Jul 1989 *S. caprea* ssp. *sericea* GM 7573, 7577, 7580a, 7581a, 7588a, 7589, 7591, 7595a. - Dunderlandsdalen Grotjørnengen VP 93.72 22 Jul 1989 *S. myrsinifolia* ssp. *myrsinifolia* GM 7596. - Skugghei at Holmen VP 68-69.57 23 Jul 1989 *S. myrsinifolia* ssp. *borealis* GM 7644a, 7647, 7648, 7651a. - Grønfjellidalen E of Rundmoen VP 92.54 24 Jul 1989 *S. caprea* ssp. *sericea* GM 7667a, 7669, 7673a, 7675a, 7676a, 7677. - Grønfjellidalen S of Grønfjell VP 83.60 26 Jul 1989 *S. caprea* ssp. *sericea* GM 7740, 7742a, 7744, 7745, 7747. - Skonseng near Seljehaugen VP 71.59-60 1 Aug 1989 *S. caprea* ssp. *sericea* GM 7957, 7959, 7960a. **Sweden:** Upl: Dalby: S of Jerusalem 4 May 1985 *S. cinerea* K. & L. Holm 3493b "*Lophiostoma nucula*" (TRH). Ång: Sollefteå: Junsele Pustviken E of the road WL 66.96 4 Aug 1989 *S. pentandra* GM 8066, 8067. - Junsele WL 65.94 5 Aug 1989 *S. pentandra* GM 8104. - Lillsele W of Ångermanälven XL 76.03 30 Jul 1990 *S. myrsinifolia* ssp. *myrsinifolia* GM 8456a. - Lillsele E of Ångermanälven XL 76.03 31 Jul 1990 *S. myrsinifolia* ssp. *myrsinifolia* GM 8484. Örnsköldsvik: Örnsköldsvik N of Sundåsen CR 17.83 2 Aug 1987 *S. myrsinifolia* ssp. *myrsinifolia* GM 5566b. - Vågefjärden Vikbotten CR 12.89 2 Aug 1987 *S. myrsinifolia* ssp. *myrsinifolia* GM 5615. - Arnäs E of Älvsjösjön CR 25-26.90 4 Aug 1987 *S. pentandra* GM 5739, 5742a. - Halfstafjärden N of Billsta CR 25.75 9 Jul 1988 *S. caprea* ssp. *caprea* GM 6090. Vb: Umeå: Brännland 22 May 1976 *Salix* sp. O. Eriksson (UPS). ÅsL: Dorotea: N of Ormsjön along Stutvattenbäcken WM 49.45 11 Jul 1988 *S. caprea* ssp. *sericea* GM 6184, 6185a, 6186b. - Dorotea along Bergvattenån WM 26.67 12



Jul 1988 *S. caprea* ssp. *sericea* GM 6287, 6288, 6289a, 6290. Vilhelmina: Djupdal WM 59.65 5 Jul 1986 *S. caprea* ssp. *caprea* GM 3553, 3555, 3556a, 3557a, 3558, 3561, 3563. *S. caprea* ssp. *sericea* GM 3569, 3570, 3571, 3576, 3578a, 3579, 3580a, 3582a, 3583a, 3584, 3586b, 3599, 3601. - Vilhelmina Lövåsen WM 62.83 8 Jul 1986 *S. myrsinifolia* ssp. *myrsinifolia* GM 3773, 3776. - Vilhelmina WM 66.80 30 Jul 1987 *S. caprea* ssp. *caprea* GM 5385. Åsele: Gavsele W of Ångermanälven XL 99,10 30 Jul 1990 *S. pentandra* GM 8445a. TL: Kiruna: Abisko 4 Sep 1946 *Salix* sp. L. Holm 578 *Lophiostoma duplex* (UPS). - Jukkasjärvi Abisko National park 20 Aug 1943 *S. borealis* R. Santesson (S).

### *Melanomma fuscidulum* Sacc.

Michelia 1: 450 (1878) - Type: Italy, Vittorio (Treviso), Oct 1873, *Sambucus nigra* (K! UPS! = Sacc., Myc. ven. 159, sub *Sphaeria*) - Anamorph: *Aposphaeria fuscidula* (Sacc.) Sacc., Syll. fung. 3: 173 (1884).

Refr. descr.: Holm 1957: 57, Hilber & Hilber 1978b: 22, Mathiassen 1989: 74. Refr. illustr.: Chesters 1938: Fig. 1j-p, Hilber & Hilber 1978b: Fig. 14a-c, Sivanesen 1984: Fig. 198a-d, Mathiassen 1989: Fig. 67.

Exsic.: Sacc., Myc. ven. 159 (K, UPS) - Syd., Myc. march. 4351 (UPS, sub *Melanomma hendersoniae*).

Figs 77-79, 160, 162, 173.

**Description.** *Pseudothecia* 300-500 µm diam., globose, immersed-erumpent, scattered or densely crowded, with a prominent, ± cylindrical neck, 150-500 µm long, ostiolum periphysate. *Asci* 57-98 x 9.6-12.5 µm, mean 79.9 x 11 µm (n = 47), clavate, short-stiped. *Paraphysoids* (0.7-)-1-1.5(-2) µm diam., septate, branched, anastomosing, abundant. *Ascospores* (13-)-13.5-19(-19.2) x (4.3-)-4.4-6.2(-6.5) µm, mean 15.8 x 5.4 µm,  $\bar{Q} = 2.9$  (n = 187), ± ellipsoid, slightly curved, 3-septate, constricted, olivaceous brown to brown, often guttulate, biseriata.

**Taxonomic notes.** The type collections of *Melanomma fuscidulum* (K, UPS) matched Saccardo's (1878: 450) original description perfectly, but these collections are actually immature. This is the reason why the collections from Troms (Mathiassen 1989) deviated from Saccardo's (1878, 1883: 99) descriptions in having larger ascomata, asci and spores.

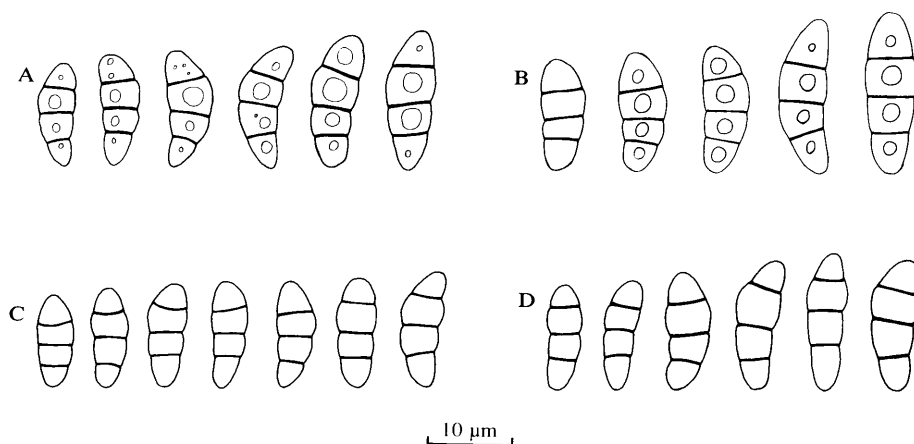
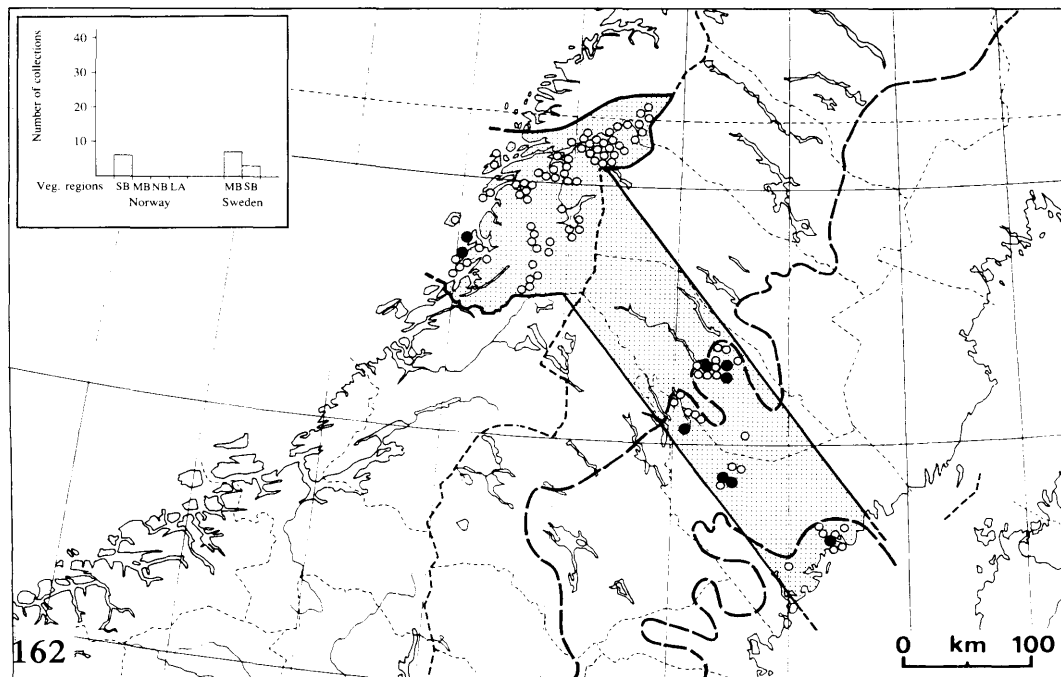
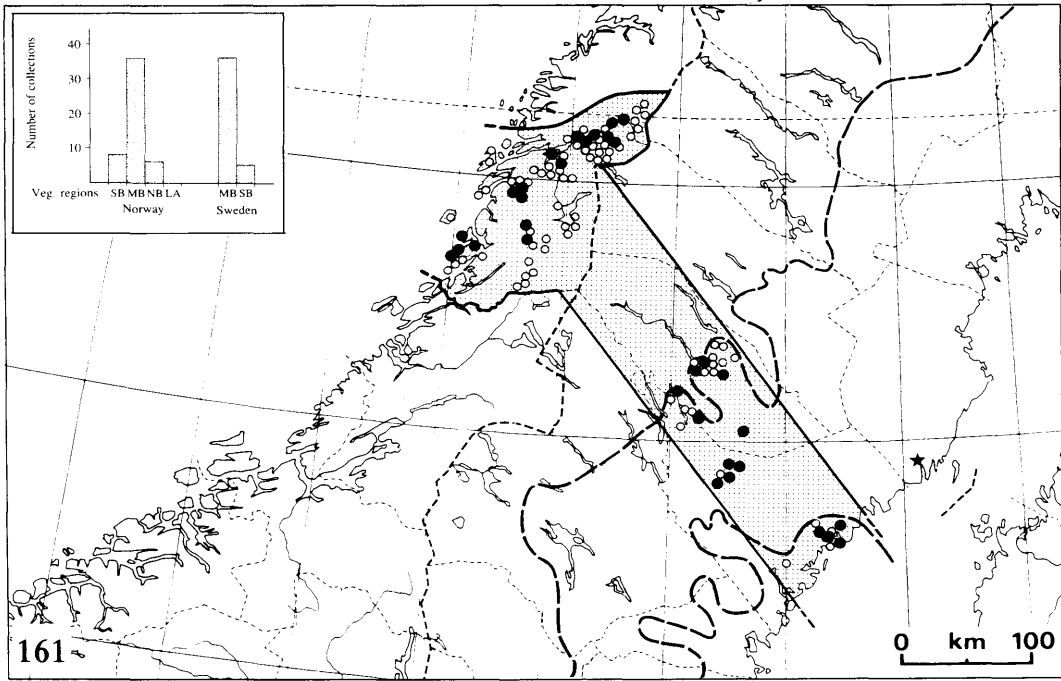


Fig. 160. *Melanomma fuscidulum*. Spores. A. GM 2869. B. GM 2079. C. Type (UPS). D. Type (K).



Figs 161-162. Distribution maps. Fig. 161. *Lophiotrema nucula*. Fig. 162. *Melanomma fuscidulum*. Legend on p. 24.

The spore sizes in the present investigation agree well with those from Troms (Mathiassen 1989), although the average spore sizes were slightly smaller. The differences are too small to justify a discussion on the importance of geographical variation (cf. Mathiassen 1989: 22), particularly as the examined collection from Sardinia (PAD) was also immature. However, the spore sizes from the British samples mentioned by Chesters (1938) were all somewhat smaller than those from the central and northern Scandinavian samples examined by me, but in another publication (Hilber & Hilber 1978b), spore sizes from central Europe agreed well with those from Troms. Thus it is difficult to state whether geographical variation in spore size is a characteristic feature for *Melanomma fuscidulum*. More investigations are necessary to sort this out.

Chesters (1938) studied the development of the hamathecium of *Melanomma fuscidulum* and *M. pulvis-pyrius* in detail. He introduced the term "trabeculae" (= paraphysoids) for the pre- and interascal filaments of these species, and this agrees with my observations. Barr (1987) includes the Melanommataceae among the Melanommatales, while Eriksson & Hawksworth (1990d) include it among the Dothideales.

**Hosts.** Found on *Salix caprea* ssp. *caprea* (1 coll.), and ssp. *sericea* (1 coll.), *S. lapponum* (1 coll.), *S. myrsinifolia* ssp. *borealis* (2 coll.), and ssp. *myrsinifolia* (7 coll.), *S. pentandra* (4 coll.). Most frequent on *S. myrsinifolia* agg., but as in Troms (Mathiassen 1989), it was not frequent enough to justify a discussion on host preferences. *Melanomma fuscidulum* has a wide range of hosts (cf. Mathiassen 1989: 74).

**Ecology.** Found on wood and bark, but has preference for decorticated wood on both twigs and stems. This agrees well with the few samples found in Troms (cf. Mathiassen 1989). It fits well among the primary saprophytes, but seems to have a broad ecological amplitude.

**Distribution.** *Melanomma fuscidulum* is not common in central Scandinavia, but it is considerably more frequent here than in Troms (cf. Mathiassen 1989), where it was found in one locality only. Within the transect area, it was only found in the two SB regions, and in the Swedish MB region. I therefore expect *M. fuscidulum* to be more common in the southern parts of Scandinavia than in the northern parts. About ten samples are known from South Sweden, and, as yet, none from Finland. Holm (1957) reported *M. fuscidulum* from Sweden, and from several other European countries.

**Material examined** (in addition to the cited type collections and exsiccatae). **Norway:** No: Sømna: Sømna N of Berg UN 69-70.53 26 Jun 1986 *Salix myrsinifolia* ssp. *borealis* GM 2869, 2877a. Brønnøy: Brønnøysund Mossem UN 73.67 30 Jun 1986 *S. myrsinifolia* ssp. *myrsinifolia* GM 3210a, 3213, 3216, 3218. **Sweden:** Ång: Sollefteå: Junsele Pustviken W of the road WL 66.95-96 4 Aug 1989 *S. pentandra* GM 8034a. - Junsele Pustviken E of the road WL 66.96 4 Aug 1989 *S. pentandra* GM 8069, 8070. Strömsund: Röström W of Röströmssjön WM 15.61 5 Aug 1989 *S. lapponum* GM 8130. Örnköldsvik: Örnköldsvik N of Sundåsen CR 17.83 2 Aug 1987 *S. myrsinifolia* ssp. *myrsinifolia* GM 5566, 5569a, 5571. ÅsL: Vilhelmina: Vilhelmina Lövåsen WM 62.83 8 Jul 1986 *S. caprea* ssp. *sericea* GM 3789a. - Vilhelmina WM 66.80 30 Jul 1987 *S. caprea* ssp. *caprea* GM 5383b. - Bäsksele E of Vojmån WM 68.89 30 Jul 1987 *S. pentandra* GM 5433. **Italy:** Sardinia pr. Sassari s. dat. *Pistacium lentiscus* leg. Saccardo? (PAD)

### *Melanomma pulvis-pyrius* (Pers. : Fr.) Fuckel

Symb. mycol.: 160 (1870) - *Sphaeria pulvis-pyrius* Pers. : Fr., Syst. mycol. 2: 458 (1823); Pers., Syn. meth. fung.: 86 (1801) - Type: Fr., Scl. succ. 120 (UPS, holol! fide Barr 1990a)"; Fckl., F. rhen. 937 (K! fide Chesters 1938)" - Anamorph: *Aposphaeria agminalis* (Sacc.) Sacc., Syll. fung. 3: 171 (1884).

Refr. descr.: Holm 1957: 54, Hilber & Hilber 1978a: 2, Mathiassen 1989: 75, Barr 1990a: 18. Refr. illustr.: Chesters 1938: Fig. 1a-h, Hilber & Hilber 1978a: Fig. 2, Sivanesan 1984: Fig. 199, Mathiassen 1989: Fig. 68.

Exsic.: Fr., Scl. succ. 120 (UPS) - Fckl., F. rhen. 937 (K).

Figs 80-82, 163, 165, 174.

**Description.** *Pseudothecia* (250-)300-450  $\mu\text{m}$  diam., subglobose to globose, superficial, generally densely gregarious in rather large groups, dull or shiny black, surface often rugged or sulcate, usually non-papillate. *Asci* 80-141 x 6.7-11.1  $\mu\text{m}$ , mean 112.2 x 8.9  $\mu\text{m}$  (n = 81), cylindrical, short-stiped. *Paraphysoids* 1-2  $\mu\text{m}$  diam., septate, branched, anastomosing, abundant. *Ascospores* (14-)14.4-20.2(-23) x (4.8-)5.3-7.4(-7.8)  $\mu\text{m}$ , mean 17.4 x 6.3  $\mu\text{m}$ ,  $Q = 2.9$  (n = 520) ellipsoid, often slightly curved, 3-septate, constricted at the middle, olivaceous grey to pale brown, often guttulate, obliquely uniseriate.

**Nomenclatural and taxonomic notes.** Holm (1957: 55) discussed the typification of *Melanomma pulvis-pyrius*, and suggested that it was natural to select Scl. succ. 120 (UPS) as the type. It is permissible to designate this material as the type, as no Persoonian material seem to be extant. Barr (1990a) designated this collection as the holotype but, in my opinion, it can only be regarded as a neotype. However, the material is typical and in good condition. Earlier, Chesters (1938: 119) assigned F. rhen. 937 (K) as the type. This material was in poor condition and consisted only of empty ascomata and old, germinating spores.

If compared with, e.g. *Lophiostoma compressum*, the hamathecium in *Melanomma pulvis-pyrius* is often more uniform within the whole locule, but the filaments are similar, and

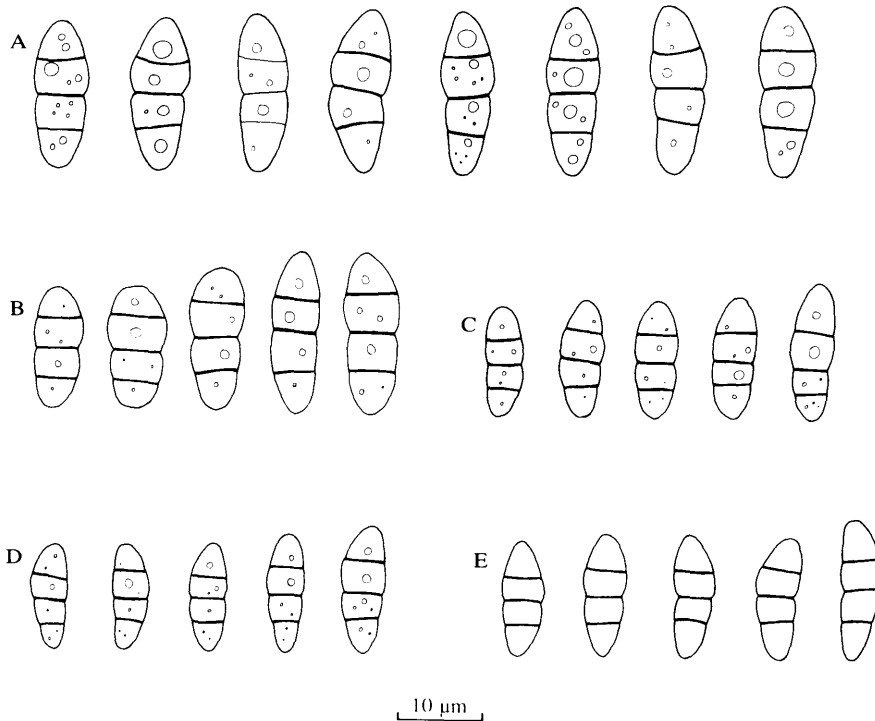


Fig. 163. *Melanomma pulvis-pyrius*. Spores. A. GM 734a. B. GM 2701. C. GM 7649. D. GM 8345. E. Type.

must be characterized as paraphysoids in both species.

Except for some samples from the Swedish MB region (see below), the ascomata and spore sizes of *Melanomma pulvis-pyrius* seem to be uniform within Scandinavia, at least on *Salix*, but slightly larger ascomata sizes and smaller spore sizes are generally reported in collections found outside Scandinavia (cf. Chesters 1938, Hilber & Hilber 1978a, Barr 1990a). This may be due to geographical variation, or perhaps to a slightly different appearance on other hosts. However, although some variation does occur, *M. pulvis-pyrius* is a distinct species, and the circumscription is not problematic.

**Hosts.** Found on all the examined *Salix* species; *S. caprea* ssp. *caprea* (7 coll.), and ssp. *sericea* (9 coll.), *S. glauca* ssp. *glauca* (30 coll.), *S. lapponum* (53 coll.), *S. myrsinifolia* ssp. *borealis* (25 coll.), and ssp. *myrsinifolia* (26 coll.), *S. pentandra* (7 coll.). In Troms (Mathiassen 1989) it was mainly found on *S. myrsinifolia* agg., but the pattern in the present investigation is different. This distributional pattern is very interesting, but difficult to explain, particularly as *Melanomma pulvis-pyrius* appeared to be considerably more frequent on *S. glauca* ssp. *glauca* and *S. lapponum*, than on *S. pentandra*. This tendency is different from that of several other species (see above), and I have no reasonable explanation. *Melanomma pulvis-pyrius* has a wide range of hosts (cf. Mathiassen 1989: 78).

**Ecology.** Found on wood and bark, but has preference for decorticated wood. Frequently found on both twigs and stems, and the results from the present investigation are very similar to those from Troms. It must, however, be considered as a primary saprophyte, although it has a wide ecological amplitude (cf. Mathiassen 1989: 14). As in Troms, it was fairly often found on humid substrate near ground level, and it seems to have different ecological preferences on other hosts, and/or in other places, e.g. on *Betula pubescens* in Iceland (cf. Jensson 1978: 90, Mathiassen 1989: 78).

**Distribution.** Very common, and distributed throughout the transect. Found in all the vegetation regions, but it is considerably more frequent in the Norwegian section of the transect, particularly in MB, than in the Swedish section. This distributional pattern indicates a weak oceanic preference, on *Salix*, and this agrees well with its distribution in Troms (cf. Mathiassen 1989: 19, Tab. 4, Fig. 70).

In some samples from the Swedish MB region, the ascomata, asci and spores were smaller than in the rest of the examined material from Scandinavia. I have no reasonable explanation for why these aberrant samples were found in this area only, particularly as normal samples were also found in the same area, and even in the same localities.

Within Scandinavia, *Melanomma pulvis-pyrius* is common in the northern parts, but seems to become more frequent southwards. Only a few samples have previously been registered from the northern parts of Sweden, but it is very common in South Sweden and Finland. In Sweden, it has previously been mentioned by several authors, e.g. Fries (1817), Wahlenberg (1826), Vleugel (1908), Holm (1957), and Nannfeldt (1969).

*Melanomma pulvis-pyrius* is probably one of the most frequent "pyrenomycetes" in Europe.

**Material examined** (in addition to the cited type and exsiccatae). **Norway:** O: Oslo: Oslo s. dat. & nom. coll. 2 coll. (O). - Tøyen 1842 s. nom. coll., associated with *Chaetosphaeria pomiformis* (O). - "Kristiania" 7 Apr 1912 *Sorbus aucuparia* J. Egeland (C). - Oslo s. dat. *S. aucuparia* J. Egeland, det. J. Lind (O). Vf: Larvik: Larvik 1840 *Fagus sylvatica* s. nom. coll., det. E. Rostrup (O). - Larvik 3 Sep 1879, associated with *Melanomma pulvis-pyrius*. A. Blytt (O). Nøtterøy: Hella 13 Nov 1982 S. Aase (O). Sem: Gullkrona 4 Jul 1982 S. Aase (O). - Gullkrona 14 Nov 1982 S. Aase (O). Te: "Telemarken" s. dat. & nom. coll., det. E. Rostrup (O). Ho: Bergen: Breistein May 1984 S. Olsen (BG). SF: Kinn: E of Skorpeidet 26 Jun 1968 *Betula* sp., associated with *Diatrype stigma*, K. Foss, det. A. Foss (O). No: Dønna: Dønna N of Hildselvvatnet UP 89,34 24 Jun 1986 *Salix caprea* ssp. *caprea* GM 2701, 2703, 2707. Alstahaug: Offersøya N of Vågen UP 84,07 25 Jun 1986 *S. myrsinifolia* ssp.

*myrsinifolia* GM 2758. Sømna: Sømna N of Berg UN 69-70,53 26 Jun 1986 *S. myrsinifolia* ssp. *borealis* GM 2890, 2898. - Sømna N of Vik near Knyk UN 69,47-48 4 Jul 1987 *S. caprea* ssp. *sericea* GM 4741. - Sømna S of Vennesund UN 61-62,35 5 Jul 1987 *S. caprea* ssp. *sericea* GM 4760. Brønnøy: W of Nebbåsen UN 85,51 28 Jun 1986 *S. myrsinifolia* ssp. *myrsinifolia* GM 3022, 3025, 3026, 3027, 3028, 3029, 3030, 3032. - Sømna Akselberg UN 83,55 29 Jun 1986 *S. myrsinifolia* ssp. *borealis* GM 3089, 3098. Grane: Majavatn E of Stortjønna VN 22,22 1 Jul 1986 *S. caprea* ssp. *caprea* GM 3271. - Majavatn Myrstad VN 24,32 2 Jul 1986 *S. lapponum* GM 3320, 3321, 3322, 3323, 3325, 3326. - Svenningdalen Fløtnes VN 25,66 3 Jul 1986 *S. caprea* ssp. *sericea* GM 3411a. - Grane S of Grane church VN 26,74 3 Jul 1986 *S. myrsinifolia* ssp. *myrsinifolia* GM 3462, 3476, 3479a, 3481c, 3496. - Store Fiplingdalen N of Nerosen VN 38,55 4 Jul 1986 *S. lapponum* GM 3535, 3536, 3538a. - Trofors at Båfjellmoen VN 25,68 27 Jul 1989 *S. myrsinifolia* ssp. *myrsinifolia* GM 7782. - Grane S of Grane church VN 26,74 28 Jul 1989 *S. pentandra* GM 7812. Hemnes: Korgfjellet SE of Ørntinden VP 41,27 20 Aug 1986 *S. glauca* ssp. *glauca* GM 4505, *S. lapponum* GM 4494. - Bjerka 14 Oct 1972 *Alnus incana* Å. Strid 13204b, det. G. Mathiassen (S). - Bryggfjelldalen Sjurfinnheimen VP 53,20-21 13 Jul 1987 *Salix glauca* ssp. *glauca* GM 5279a, *S. lapponum* GM 5241a, 5258, 5260b. - Korgfjellet S of Ørntinden VP 40-41,27 14 Jul 1987 *S. glauca* ssp. *glauca* GM 5298, 5298b, *S. lapponum* GM 5286, 5286b, 5287. - Finneidfjord N of Neset VP 45,43 31 Jul 1989 *S. caprea* ssp. *sericea* GM 7877. - Bjerka S of Sjøenget VP 47,37 31 Jul 1989 *S. glauca* ssp. *glauca* GM 7904, 7905, 7909, 7912, *S. lapponum* GM 7914, 7916, 7917. - Bjerka E of Vallabotnet VP 47,36 31 Jul 1989 *S. lapponum* GM 7918, 7920, 7921, 7925. - Sørfjorden Grønvikneset VP 40,40 1 Aug 1990 *S. glauca* ssp. *glauca* GM 8523. Hattfjelldal: Røssvatnet Krutåga VN 61,85 7 Jul 1987 *S. lapponum* GM 4894, 4897, 4899, 4901, 4903, *S. myrsinifolia* ssp. *myrsinifolia* GM 4918, 4921, 4922, 4923. - S of Røssvatnet Bjørkåsen VN 57,81 8 Jul 1987 *S. myrsinifolia* ssp. *borealis* GM 5006. - Røssvatnet near Grubben VN 60,82 9 Jul 1987 *S. lapponum* GM 5068, *S. myrsinifolia* ssp. *borealis* GM 5072, 5073, 5079a, 5082, 5085. Vefsn: Mosjøen W of Forsmoen VP 19,08 10 Jul 1987 *S. caprea* ssp. *sericea* GM 5103, 5115, 5116, 5117a. - Mjåvatnet near Sandvik VP 27,14 10 Jul 1987 *S. glauca* ssp. *glauca* GM 5148, 5150b, 5156, 5158, 5160, *S. lapponum* GM 5161, 5162. - Drevja Forsmoen VP 19,17 11 Jul 1987 *S. glauca* ssp. *glauca* GM 5182. - Drevja E of Nilsskogen VP 21,19 11 Jul 1987 *S. glauca* ssp. *glauca* GM 5185, 5187, 5188, 5194, 5196, 5201a. - Mosjøen S of Kulstad VP 18,06 28 Jul 1989 *S. myrsinifolia* ssp. *myrsinifolia* GM 7832, 7834. - Luktvatnet N of Myrenga VP 32,25 29 Jul 1989 *S. glauca* ssp. *glauca* GM 7855, 7858, 7861. - Luktvatnet Dyrvika VP 33,26 29 Jul 1989 *S. lapponum* GM 7864, 7866, 7867, 7871. Rana: Store Alteren VP 54,55 6 Aug 1987 *S. caprea* ssp. *sericea* GM 5789. - Nedre Jamtlia VP 67,57 7 Aug 1987 *S. myrsinifolia* ssp. *borealis* GM 5803c, 5807, 5814, 5815, 5816, 5822, 5824, 5833. - Dunderlandsdalen Oppdalheia VP 83,62 22 Jul 1989 *S. glauca* ssp. *glauca* GM 7609, *S. lapponum* GM 7613, 7614, 7617. - Skugghei at Holmen VP 68-69,57 23 Jul 1989 *S. myrsinifolia* ssp. *borealis* GM 7649, 7652, 7653. - Plurdalen Tappeskard VP 85,55 25 Jul 1989 *S. myrsinifolia* ssp. *borealis* GM 7725. - Langvatnet Røfsholm VP 67,63 1 Aug 1989 *S. lapponum* GM 7927, 7932, 7932C. - Illgruben VP 70,54 19 Jul 1990 *S. lapponum* GM 8168, 8169, 8170, 8171a, 8172, 8175, 8176. - Gruben N of Englia VP 65,55 20 Jul 1990 *S. pentandra* GM 8187, 8190. - Utsikten VP 72,53 23 Jul 1990 *S. lapponum* GM 8265, 8274b. Sweden: Nrk: Kumla: Kumla 28 Jun 1884 *Alnus* sp. L. Romell (H). Mpd: Sundsvall: Sundsvall Badhusparken 16 Dec 1922 *Populus* sp. E. Eriksson, det. F. Petrak (S). Ånge: Borgsjö 1 km SE of the church 30 Aug 1985 *Betula* sp. N. Lundqvist 15729 (S). Ång: Kramfors: Nyland 1859 3 coll. C.P. Laestadius "*Sphaeria pulvis-pyrus*" (UPS, S). Örnsköldsvik: Köpmanholmen 27 Sep 1972 *Alnus incana* Å. Strid 12416, det. G. Mathiassen (S). - Örnsköldsvik N of Sundåsen CR 17,83 1 Aug 1987 *Salix myrsinifolia* ssp. *borealis* GM 5530, 5532a, 5533. - Örnsköldsvik Västerås CR 20,82 2 Aug 1987 *S. pentandra* GM 5595. - Vågefjärden Vikbotten CR 12,89 2 Aug 1987 *S. myrsinifolia* ssp. *myrsinifolia* GM 5606a. - Arnäs E of Älvsjösjön CR 25-26,90 4 Aug 1987 *S. myrsinifolia* ssp. *myrsinifolia* GM 5714. - Vågefjärden E of Norrvåge CR 12-13,88 8 Jul 1988 *S. myrsinifolia* ssp. *myrsinifolia* GM 5921, *S. pentandra* GM 5901, 5906a. - Haffstafjärden N of Billsta CR 25,75 8 Jul 1988 *S. caprea* ssp. *caprea* GM 5967c, 9 Jul 1988 GM 6100, 8 Jul 1988 *S. myrsinifolia* ssp. *myrsinifolia* GM 5986b. - Haffstafjärden SE of Gala CR 27,74 10 Jul 1988 *S. pentandra* GM 6126. Sollefteå: Junsele Pustviken W of the road WL 66,95-96 4 Aug 1989 *S. lapponum* GM 8050. Jmt: Åre: Storlien 2 Aug 1950 *Betula* sp. J.A. Nannfeldt 10988 (UPS). Vb: Skellefteå: Skellefteå May 1899 *Populus* sp. J. Vleugel (S). Umeå: Stadsliden 28 Oct 1904 C.P. Laestadius, det O. Eriksson (UME 29203). - Umeå 1904 *Alnus* sp. J. Vleugel (S). - Umeå May 1910 *Alnus* sp. J. Vleugel, det. F. Petrak (S). - Hissjö pr. Umeå Aug 1908 *Alnus* sp. J. Vleugel, det. J. Lind (C). - Brännland 22 Sep 1980 *Sorbus aucuparia* O. Eriksson "*Melanomma*" (UME 29202). - Brännland 15 Oct 1983 *Betula verrucosa* O. Eriksson (UME 29117). Nb: Luleå: Råneå 3 Sep 1972 *Alnus incana* Å. Strid 10410b, det. G. Mathiassen (S). ÅsL: Vilhelmina: Vilhelmina Lövåsen WM 62,83 8 Jul 1986 *Salix myrsinifolia* ssp. *myrsinifolia* GM 3765. - W of Båksjön L. Annevare WM 81,98 29 Jul 1987 *S. glauca* ssp. *glauca* GM 5358. - Vilhelmina WM 66,80 30 Jul 1987 *S. caprea* ssp. *caprea* GM

5384. - SE of Siksjön along Siksjöbäcken WM 68,88 30 Jul 1987 *S. glauca* ssp. *glauca* GM 5393, 5409. - Bäskele E of Vojmån WM 68,89 30 Jul 1987 *S. glauca* ssp. *glauca* GM 5460, 5463, *S. lapponum* GM 5456. - Vilhelmina: Storsele W of Vojmån WM 86,85 29 Jul 1990 *S. lapponum* GM 8345.

***Melanopsamma pomiformis*** (Pers. : Fr.) Sacc.

Michelia 1: 347 (1878) - *Sphaeria pomiformis* Pers. : Fr., Syst. mycol. 2: 455 (1823); Pers., Syn. meth. fung.: 65 (1801) - *Chaetosphaeria pomiformis* (Pers. : Fr.) Müller, Beitr. KryptogFlora Schweiz 11(2): 588 (1962) - Type: Herb. Persoon (Herb. Lugd. Bat.) no. 910, 264-737 (L, lecto! fide Booth 1957) - Other synonyms; see Müller & von Arx (1962) - Anamorph: *Stachybotrys socia* (Sacc.) Sacc. fide Kirk & Spooner (1984).

Refs. descr.: Booth 1957: 17, Munk 1957: 54, Mathiassen 1989: 38. Refr. illustr.: Booth 1957: Fig. 6, Mathiassen 1989: Fig. 19.

Figs 83-85, 164, 166, 175.

**Description.** *Perithecia* 210-300 µm diam, typically collapsing, superficial, usually densely gregarious, ± shiny black, papillulate, ostiolum periphysate. Conidiophores often sparsely dispersed on the ascomata. *Asci* 60-100 x 9.2-16 µm, mean 80.5 x 12.6 µm (n = 46), variable in shape, but mostly cylindrical-clavate, short-stiped, non-amyloid. *Paraphyses* 2.5-3.5 µm wide at base, gradually tapering towards apex, branched, septate, disintegrate early. *Apical paraphyses* present. *Ascospores* (11-)11.5-16.8(-17.3) x (4-)4.5-6.5(-7.3) µm, mean 13.8 x 5.6 µm, Q = 2.5 (n = 320), oblong-ellipsoid, two-celled, hyaline, irregularly biseriolate in ascus. *Conidia* 6-9 x 4,5-6 µm, subglobose to oval, one-celled, verrucose, grey-greenish.

**Taxonomic notes.** *Melanopsamma pomiformis* is a distinct species, easily recognized by the gregarious, collabent, more or less shiny black ascomata, usually accompanied by *Stachybotrys socia*. It has previously been housed in several different genera, and a summary of the dispositions based on the perithecia is given by Booth (1957). Müller & von Arx (1962) transferred *M. pomiformis* to *Chaetosphaeria* Tul. & C. Tul., but the more familiar name *M. pomiformis* was used for many years, e.g. by Dennis (1978) and by Cannon et al. (1985).

Barr (1990c: 117) pointed out that the short apical paraphyses, asci and spores in *Melanopsamma pomiformis* were much like those of the Hypocreaceae, and she (Barr 1990c) claimed that *Melanopsamma* should be accepted as a separate genus in the Niessliaceae. *Chaetosphaeria* has different hamathecium and anamorph, and was included by her in the Lasiosphaeriaceae (Sordariales). *Melanopsamma pomiformis* actually has short apical paraphyses, but this character was not mentioned by me earlier (Mathiassen 1989). Due to the collabent ascomata, I erroneously considered these filaments as being part of the periphyses.

Referring *Melanopsamma* to the Niessliaceae may be correct (Barr 1990c), but its position still seems to be uncertain. I have therefore provisionally included *Melanopsamma* in the Trichosphaeriaceae, in which *Niesslia* is also included (cf. Eriksson & Hawksworth 1990d). Barr (1990c) assigned Trichosphaeriaceae to the Xylariales.

**Hosts.** In Troms (Mathiassen 1989) it was exclusively found on *Salix myrsinifolia* agg., and except for one single sample on *S. glauca* ssp. *glauca*, *Melanopsamma pomiformis* was also in the present investigation only found on *S. myrsinifolia* agg.; *S. myrsinifolia* ssp. *borealis* (10 coll.), and ssp. *myrsinifolia* (2 coll.). These two areas were thoroughly investigated, and the preference for *S. myrsinifolia* agg. seems to be a true distributional pattern for the species on *Salix*. I have no explanation to this, but the biochemical contents (e.g. glycosides) in *S. myrsinifolia* agg. may be important. *Melanopsamma pomiformis* has a wide host range (cf. Mathiassen 1989: 40, Material examined, Appendix I).

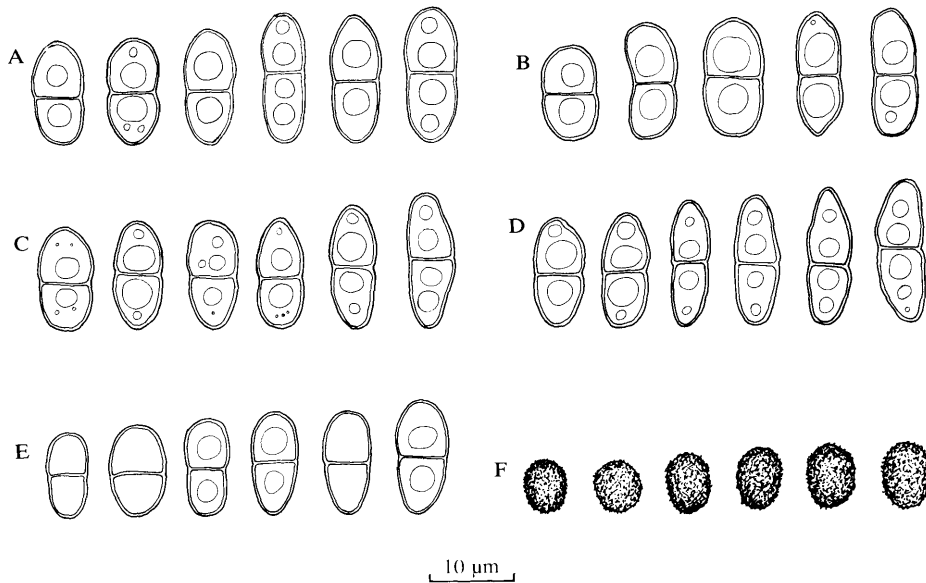


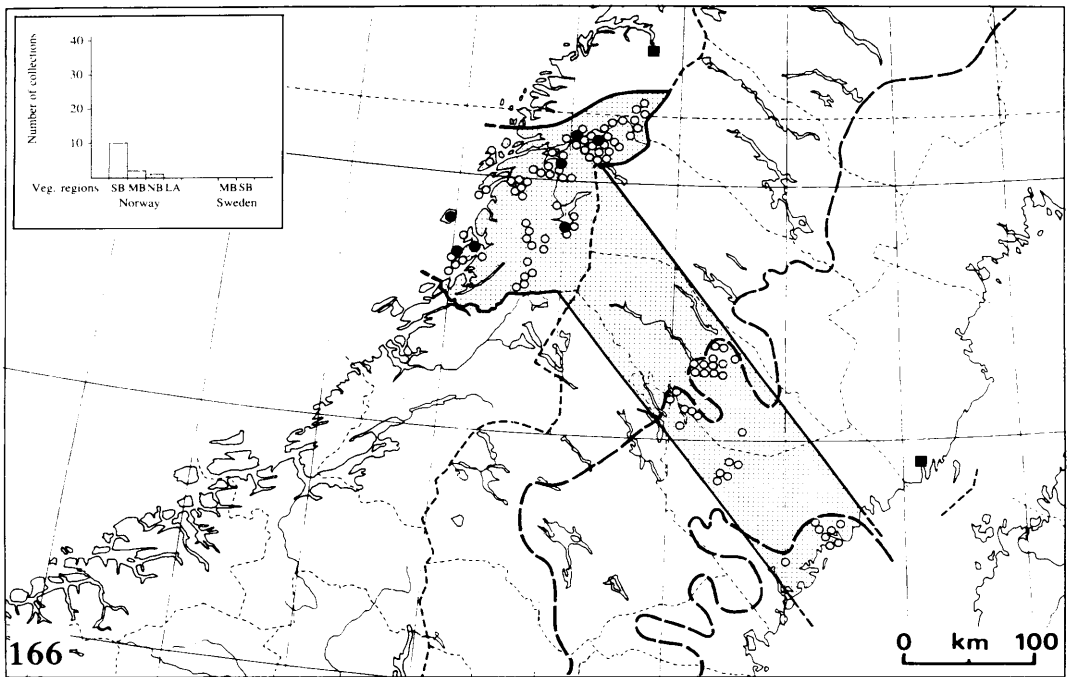
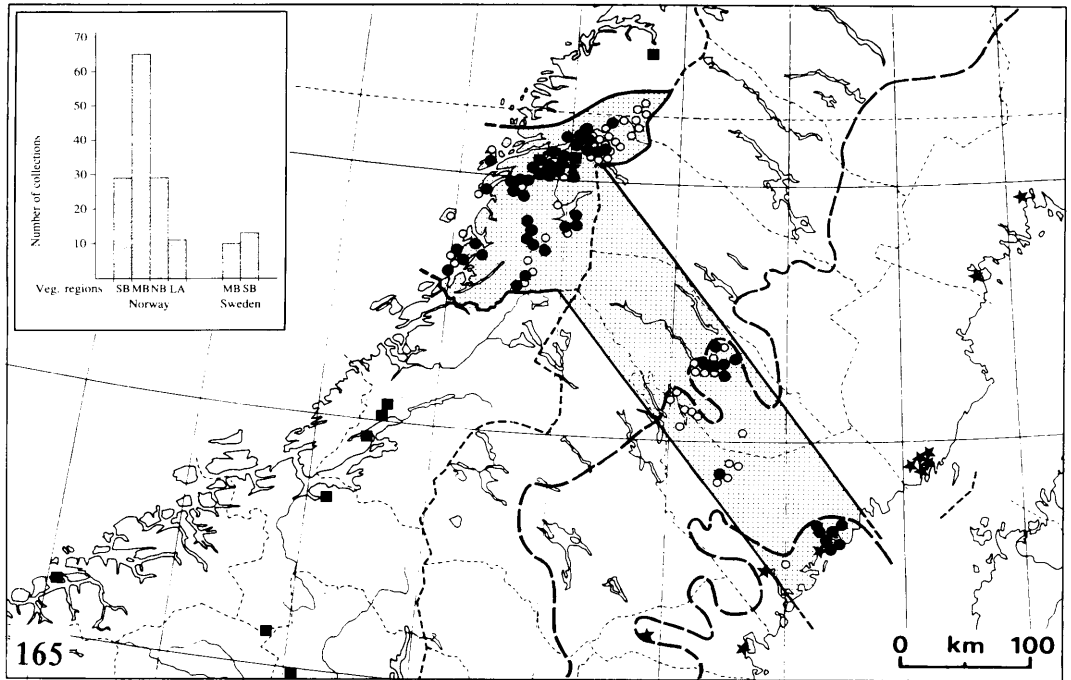
Fig. 164. *Melanopsamma pomiformis*. A-E. Spores. F. Conidia. A. GM 713b. B. GM 2885. C. GM 2876. D. GM 5827. E. Type. F. Conidia from the type collection of *Melanopsamma pomiformis*.

**Ecology.** Predominantly lignicolous, and found almost exclusively on twigs. In Troms (Mathiassen 1989) I considered it as a primary saprophyte, but within the transect, some samples were also found on rather decayed substrate. This agrees well with Müller & von Arx (1962).

**Distribution.** Only found in the Norwegian section of the transect. Common in SB, rare in MB and NB, and not found in LA. On *Salix* it seems to be slightly oceanic, and becomes more frequent to the north. None of the examined collections from other herbaria turned out to be from *Salix*, and *Salix* seems to be an important host in northern Scandinavia only. In Sweden, Nannfeldt (1969: 197) reported *Melanopsamma pomiformis* as common on naked wood of several deciduous trees, but only one sample is found within the map area. However, more than 20 samples are known from South Sweden, but it is less frequent in South Finland.

**Material examined** (in addition to the cited type). **Norway:** O: Oslo: Tøyen 1840 *Betula* sp. s. nom. coll. (C). - Tøyen 1842 s. nom. coll., associated with *Melanomma pulvis-pyrius* (O). No: Sømna: Sømna N of Berg UN 69-70,53 26 Jun 1986 *Salix myrsinifolia* ssp. *borealis* GM 2876, 2878b, 2885, 2894c, 2899a. Brønnøy: Sømna Akselberg UN 83,55 29 Jun 1986 *S. myrsinifolia* ssp. *borealis* GM 3094. Vega: Vega W of Rørøy PT 37,84-85 30 Jun 1986 *S. myrsinifolia* ssp. *myrsinifolia* GM 3156. Hattfjellidal: S of Røssvatnet Bjørkåsen VN 57,81 8 Jul 1987 *S. myrsinifolia* ssp. *borealis* GM 5004. Hemnes: Bjerka S of Sjøenget VP 47,37 31 Jul 1989 *S. glauca* ssp. *glauca* GM 7900a. Rana: Nedre Jamtlia VP 67,57 7 Aug 1987 *S. myrsinifolia* ssp. *borealis* GM 5804, 5827, 5832. - Plurdalen SE of Langfjellet VP 76,58 26 Jul 1989 *S. myrsinifolia* ssp. *myrsinifolia* GM 7757.





Figs 165-166. Distribution maps. Fig. 165. *Melanomma pulvis-pyrius*. Fig. 166. *Melanopsamma pomiformis*. Legend on p. 24.

***Rebentischia* cf. *massalongii* (Mont.) Sacc.**

Atti Soc. Ven.-Trent. sci. nat. 4: 88 (1875, as preprint 1875: 12) - *Sphaeria massalongii* Mont., Syll. Gen. spec. Crypt.: 237 (1856) - Type: Not seen - *Rebentischia pomiformis* Karst., Mycol. fenn. 2: 97 (1873) - Type: Finland, pr. Åbo, 7 Apr 1861, *Acer platanoides*, Karsten (FH! H! = Karst., F. fenn. 881) - Anamorph: *Asteromella* sp. fide Barr (1980: 142).

Refr. descr.: Müller 1950: 309, Barr 1980: 143, Mathiassen 1989: 82. Refr. illustr.: Barr 1980: Figs 1, 2, 1987: Fig. 17j, Mathiassen 1989: Fig. 81.

Exsic.: Karst., F. fenn. 881 (FH, H, UPS).

Figs 86-88, 167, 169, 176.

**Description.** *Pseudothecia* 200-350(-400)  $\mu\text{m}$  diam., globose to subglobose, often collabent, erumpent superficial, generally scattered, papilla not prominent. *Asci* 97-137 x 11.5-22.6  $\mu\text{m}$ , mean 113 x 19.2  $\mu\text{m}$  (n = 45), variable, but generally clavate (-cylindrical), short-stiped. *Pseudoparaphyses* 1.5-2.5  $\mu\text{m}$  diam., septate, branched, anastomosing, abundant. *Ascospores* (18-)20.2-28.8(-32.6) x (6.8-)7.2-9.6(-10.8)  $\mu\text{m}$ , mean 23.9 x 8.4  $\mu\text{m}$ ,  $\bar{Q} = 2.9$  (n = 480), narrowly obovoid and slightly curved main body, 4(-5-6)-septate, slightly constricted, guttulate, hyaline basal cell and setiform base 7-15  $\mu\text{m}$  long, cell 4-5  $\mu\text{m}$  wide, tapering to a width of 1-1.5  $\mu\text{m}$ , apical cell hyaline or faintly pigmented, mid cells olive-brown to light brown, biseriate.

**Taxonomic notes.** Earlier (Mathiassen 1989), I discussed the circumscription of *Rebentischia massalongii*, and the delimitation towards *R. pomiformis* and my material on *Salix*. Some differences were pointed out, but I found the examined material to form a more or less continuous sequence from *R. pomiformis*, via my material, to *R. massalongii*. Unfortunately I have not yet succeeded in tracing the type material of *R. massalongii*, and the determination of my material, and *R. pomiformis* as *R. massalongii* is uncertain and provisional.

The present investigation revealed that the material on *Salix* was more variable than previously suggested (Mathiassen 1989), but I have decided to treat all the samples on *Salix* as one taxon. The type collections of *Rebentischia pomiformis* (FH, H) were also variable, and the spores from different ascomata could be divided into two groups; one with normal, and one with long "cauda". The main body of the spores in the latter type is generally shorter than those in the normal one, but both spore types fit Karsten's (1873: 97) description as the basal cell is included in his measurements.

The circumscription of the material on *Salix* is further complicated by the fact that *Rebentischia unicaudata* (Berk. & Br.) Sacc. (type, K!) is more similar to my material than previously suggested (cf. Mathiassen 1989: 84). They have overlapping spore sizes, shape and colour, but a slightly different average spore width.

A thorough examination of this group of species is obviously needed. The spore variability is illustrated in Fig. 167.

**Hosts.** Found on all the examined *Salix* species, and shows no preference for one particular host; *S. caprea* ssp. *caprea* (15 coll.), and ssp. *sericea* (29 coll.), *S. glauca* ssp. *glauca* (21 coll.), *S. lapponum* (19 coll.), *S. myrsinifolia* ssp. *borealis* (16 coll.), and ssp. *myrsinifolia* (26 coll.), *S. pentandra* (9 coll.). In Troms (Mathiassen 1989) it was most frequent on *S. myrsinifolia* agg., and the other few samples were found on the medium shrubs only.

*Rebentischia massalongii* (sensu Barr 1980) is reported on a wide range of hosts. In addition to those mentioned by me earlier (Mathiassen 1989: 83), I have also seen it on *Betu-*

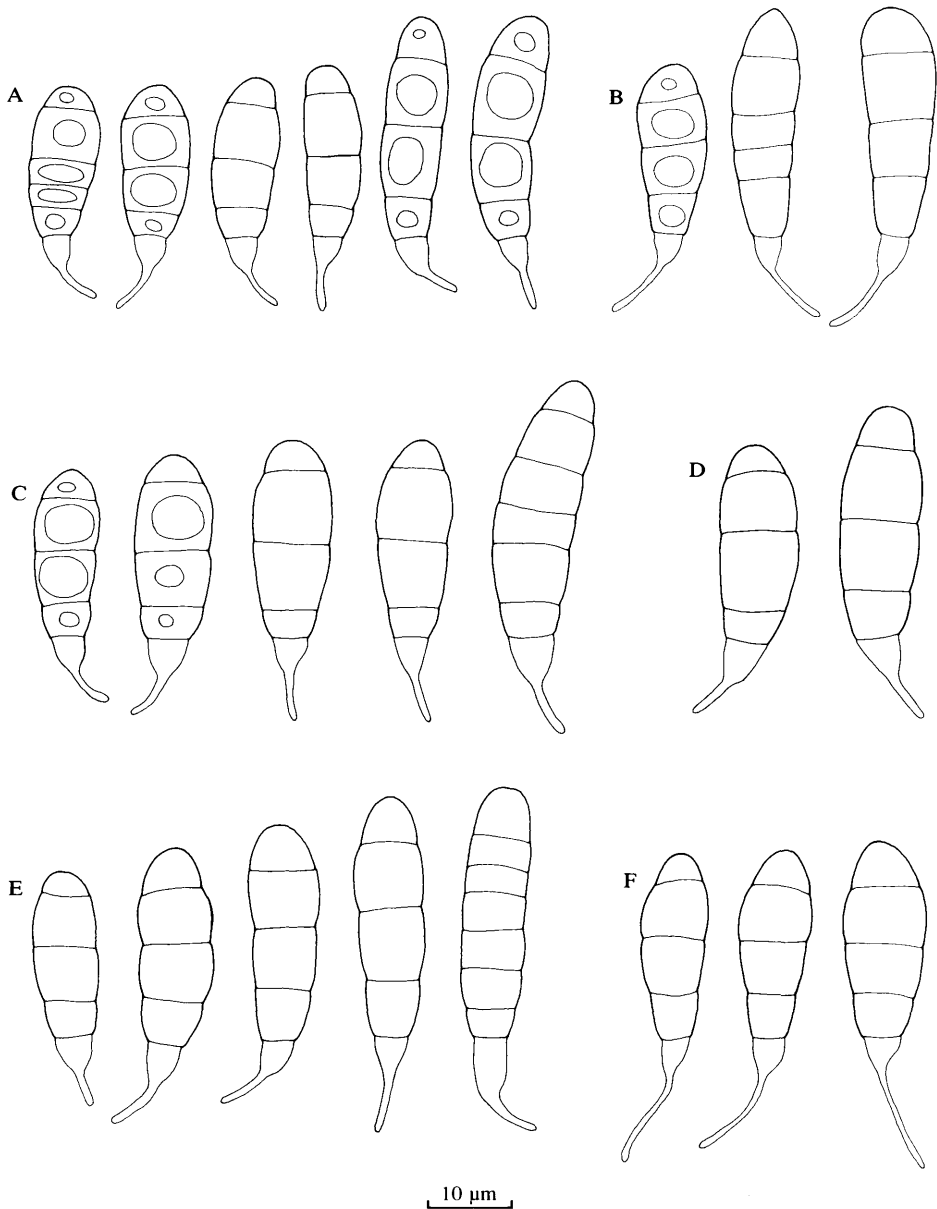


Fig. 167. *Rebentischia massalongii*. Spores. A. GM 6201a. B. GM 5612a. C. GM 7579. D. GM 2010. E-F. Type of *Rebentischia pomiformis*. Spores from two different ascomata.

*la.* The ascomata in this particular collection (UPS) were all immature, but the young spores seemed to be slightly different from those on *Salix* in the same developmental stage.

**Ecology.** A corticolous species, most frequently found on dead twigs, associated with

other fungi. Found on both living and decayed substrates, indicating a wide ecological amplitude. However, its association with other fungi seems to be more important than the condition of the substrate. It is therefore probably correct to regard *Rebentischia massalongii* as a hypersaprophyte. Invading previously colonized substrates is a typical feature for many species within the Tubeaufiaceae.

**Distribution.** Very common, and distributed throughout the transect, but it is most frequent in the Norwegian section. In Troms (Mathiassen 1989), it was distributed in all the vegetation regions, but it was not found in LA in the present investigation.

Prior to these two investigations, only a few samples were known from the Nordic countries, but I expect it to be common all over Fennoscandia. Outside Europe, it is so far only known from North America (cf. Barr 1980: 143).

**Material examined** (in addition to the cited type and exsiccata). **Norway:** Bu: Drammen: Gulskogen 1876 *Betula* sp. J.M. Norman, det. O. Eriksson "*Rebentischia* cf. *massalongii*" (UPS). Ve: Larvik: Pr. Larvik s. dat. *Alnus glutinosa* J.M. Norman, det. O. Eriksson "immature" (UPS). No: Dønna: Dønna N of Hildselvvatnet UP 89,34 24 Jun 1986 *Salix caprea* ssp. *caprea* GM 2697, 2701b, 2706. Sømna: Sømna N of Berg UN 69-70,53 26 Jun 1986 *S. myrsinifolia* ssp. *borealis* GM 2877b, 2878a, 2884, 2894b, *S. pentandra* GM 2857a, 2867, 2910. - Sømna N of Vik near Knyk UN 69,47-48 4 Jul 1987 *S. caprea* ssp. *sericea* GM 4739a, 4744, 4746a, 4747. - Sømna S of Vennesund UN 61-62,35 5 Jul 1987 *S. caprea* ssp. *caprea* GM 4801a, *S. caprea* ssp. *sericea* GM 4759, 4807a, 4809a, 4812. - Sømna S of Våg UN 66,40 6 Jul 1987 *S. pentandra* GM 4835. Brønnøy: W of Nebbåsen UN 85,51 28 Jun 1986 *S. myrsinifolia* ssp. *myrsinifolia* GM 3023b, 3025a, 3027a, 3028a, 3030a. - Sømna Akselberg UN 83,55 29 Jun 1986 *S. caprea* ssp. *caprea* GM 3080a, *S. myrsinifolia* ssp. *borealis* GM 3091, 3098b. - Brønnøysund Mossem UN 73,67 30 Jun 1986 *S. myrsinifolia* ssp. *myrsinifolia* GM 3209b, 3211b, 3213b. Vega: Vega W of Rørøy PT 37,84-85 30 Jun 1986 *S. myrsinifolia* ssp. *myrsinifolia* GM 3154a, 3157a, *S. pentandra* GM 3128. Vefsn: Mosjøen W of Forsmoen VP 19,08 10 Jul 1987 *S. caprea* ssp. *sericea* GM 5116b. - Fustvatnet S of Straum VP 27,12 10 Jul 1987 *S. myrsinifolia* ssp. *myrsinifolia* GM 5131b. - Drevja E of Nilsskogen VP 21,19 11 Jul 1987 *S. glauca* ssp. *glauca* GM 5189a, 5199a. - Luktvatnet N of Myrenga VP 32,25 29 Jul 1989 *S. glauca* ssp. *glauca* GM 7860, 7863a. - Luktvatnet Dyrvika VP 33,26 29 Jul 1989 *S. lapponum* GM 7867a, 7868a. Alstahaug: Tjøtta S of Kråkvikvatnet UP 81,04 25 Jun 1986 *S. pentandra* GM 2797a. Grane: Majavatn E of Stortjønnå VN 22,22 1 Jul 1986 *S. caprea* ssp. *caprea* GM 3272, *S. lapponum* GM 3265b, 3266a. - Majavatn S of Langås VN 22,24 1 Jul 1986 *S. glauca* ssp. *glauca* GM 3285a. - Majavatn Myrstad VN 24,32 2 Jul 1986 *S. lapponum* GM 3325b. - Svenningdalen Svenningvik VN 24,46 2 Jul 1986 *S. caprea* ssp. *sericea* GM 3348b, 3349a, 3350a, 3354a, 3357b. - Svenningdalen Fløtnes VN 25,66 3 Jul 1986 *S. caprea* ssp. *sericea* GM 3417a. - Grane S of Grane church VN 26,74 3 Jul 1986 *S. caprea* ssp. *sericea* GM 3504c, *S. myrsinifolia* ssp. *myrsinifolia* GM 3459a, 3464b, 3481, 3486a, 3489, 3493a, 3494d, 3500. Hattfjelldal: S of Røssvatnet Bjørkåsen VN 57,81 8 Jul 1987 *S. caprea* ssp. *sericea* GM 4998c, *S. glauca* ssp. *glauca* GM 5033, *S. myrsinifolia* ssp. *borealis* GM 4999b, 5001, 5055. - Røssvatnet near Grubben VN 60,82 9 Jul 1987 *S. lapponum* GM 5067. Hemnes: Finneidfjord N of Neset VP 45,43 31 Jul 1989 *S. caprea* ssp. *sericea* GM 7880a, 7884a, 7891a. - Bjerka S of Sjøenget VP 47,37 31 Jul 1989 *S. glauca* ssp. *glauca* GM 7900b, *S. lapponum* GM 7915b. - Bjerka E of Vallabotnet VP 47,36 31 Jul 1989 *S. lapponum* GM 7918b. - Sørfjorden Grønvikneset VP 40,40 1 Aug 1990 *S. glauca* ssp. *glauca* GM 8524, 8526a, *S. lapponum* GM 8513b. Rana: Nedre Jantlia VP 67,57 7 Aug 1987 *S. caprea* ssp. *sericea* GM 5842a, *S. myrsinifolia* ssp. *borealis* GM 5803b, 5807c, 5821b, 5831a. - Randalen Stokkalia WP 11-12,76 21 Jul 1989 *S. glauca* ssp. *glauca* GM 7511b. - Randalen 2 km S of Bolna WP 10,73 21 Jul 1989 *S. caprea* ssp. *sericea* GM 7542. - Virvassdalen near Verdøl WP 08,62 21 Jul 1989 *S. myrsinifolia* ssp. *myrsinifolia* GM 7570c. - Dunderlandsdalen near Storvollen VP 96-97,76 22 Jul 1989 *S. caprea* ssp. *sericea* GM 7579, 7581b. - Dunderlandsdalen Grotjømenget VP 93,72 22 Jul 1989 *S. myrsinifolia* ssp. *myrsinifolia* GM 7597a, 7599, 7604. - Grønfjelldalen near Lappsætra VP 95,51 24 Jul 1989 *S. glauca* ssp. *glauca* GM 7664b. - Grønfjelldalen E of Rundmoen VP 92,54 24 Jul 1989 *S. caprea* ssp. *sericea* GM 7670a, 7676b. - Plurdalen Kaldvatnet W of Revet VP 89,47 25 Jul 1989 *S. glauca* ssp. *glauca* GM 7698, 7699a, 7701, 7702b, 7709b. - Langvatnet Røfsholm VP 67,63 1 Aug 1989 *S. lapponum* GM 7932b. - Skonseng near Seljehaugen VP 71,59-60 1 Aug 1989 *S. caprea* ssp. *sericea* GM 7953b. - Villen near Lynghaug VP 71,55 24 Jul 1990 *S. lapponum* GM 8286a. **Sweden:** Ång: Ömsköldsvik: Ömsköldsvik N of Sundåsen CR 17,83 2 Aug 1987 *S. caprea* ssp. *caprea* GM 5572, *S. myrsinifolia* ssp. *borealis* GM 5531. - Vågefjärden Vikbotten CR 12,89 2 Aug 1987 *S. myrsinifolia* ssp. *myrsinifolia* GM 5612a. - Arnäs E of Älvsjösjön CR 25-26,90 4 Aug 1987 *S. caprea* ssp. *caprea* GM 5722,

*S. pentandra* GM 5737. - Vågefjärden E of Norrvåge CR 12-13,88 8 Jul 1988 *S. pentandra* GM 5902. - Haffstafjärden N of Billsta CR 25,75 8 Jul 1988 *S. caprea* ssp. *caprea* GM 5961, 5963a, 5967, 9 Jul 1988 GM 6037, 6045a, 6101c, 8 Jul 1988 *S. pentandra* GM 5934b. ÅsL: Dorotea: Ormsjön near Lövstrand WM 40,48 11 Jul 1988 *S. myrsinifolia* ssp. *borealis* GM 6201a, 6205a. - Dorotea along Bergvattenån WM 26,67 12 Jul 1988 *S. caprea* ssp. *sericea* GM 6286. Vilhelmina: Djupdal WM 59,65 5 Jul 1986 *S. caprea* ssp. *caprea* GM 3553a, *S. caprea* ssp. *sericea* GM 3601b. - E of Djupdal Svältmyran WM 60,71 6 Jul 1986 *S. lapponum* GM 3721b. - W of Bäsksjön L. Annevare WM 81,98 29 Jul 1987 *S. glauca* ssp. *glauca* GM 5361b. - SE of Siksjön along Siksjöbäcken WM 68,88 30 Jul 1987 *S. glauca* ssp. *glauca* GM 5413a. - Bäsksele E of Vojmån WM 68,89 30 Jul 1987 *S. glauca* ssp. *glauca* GM 5461a. - W of Lövliden near Lillån WM 70,73 13 Jul 1988 *S. myrsinifolia* ssp. *myrsinifolia* GM 6307b, 6330a. - Storsele W of Vojmån WM 86,85 29 Jul 1990 *S. lapponum* GM 8317a, 8318a, 8323, 8325, 8343b, 8347a, 8348a. - Storsele E of Vojmån WM 86,85 29 Jul 1990 *S. glauca* ssp. *glauca* GM 8352a, 8354a. LL: Jokkmokk: Lilla Luleälv Sitojaure 8 Jul 1964 *Salix* sp. G. Gilenstam 979a, det. O. Eriksson (UPS).

### *Rhynchostoma minutum* Karst.

Mycol. fenn. 2: 58 (1873) - Lectotype prop.: Finland, Tav. austr., Tammela, Mustiala, August, on old wood of *Juniperus communis*, Karsten (H! = Karst., F. fenn. 950, vide infra) - *Rhynchostoma rubrocinctum* Karst., Hedwigia 29: 178 (1890) - Type: Not seen - Anamorph: *Artropycnis praetermissa* Constantinescu & Tibell, Nova Hedwigia (in press).

Refr. descr.: Müller & von Arx 1962: 609, Mathiassen 1989: 84. Refr. illustr.: Yue & Eriksson 1986: Fig. 2, Mathiassen 1989: Fig. 82.

Exsic.: Karst., F. fenn. 950 (H, UPS).

Figs 89-91, 168, 170, 177.

**Description.** *Perithecia* 150-300 µm diam., globose, immersed-erumpent, scattered, with a prominent, cylindrical neck, 600-900 µm long, often somewhat curved, apically bulbous, and bright red, almost resembling a cigarette glow, ostiolum lined with periphyses. The ascoma is covered by a 10-30 µm thick hyaline, amorphous crust. Wood surface often slightly reddish. *Asci* 19-33 p. sp. x 5-8.6 µm, mean 25.7 x 7.3 µm (n = 28), clavate (or saccate), short-stiped, non-amyloid, numerous, easily dissolving. *Paraphyses* 80-100 x 1-2 µm, septate, filiform. *Ascospores* (7-)7.6-11.5 x (3.2-)3.4-4.9(-5) µm, mean 9.4 x 4.1 µm, Q = 2.3 (n = 110), variable in shape, generally broadly ellipsoid, often with pointed ends, two-celled, light brown to brown, with spirally arranged ridges, biseriate or crowded.

**Nomenclatural note.** Karsten (1873: 58) mentions F. fenn. exsic. 950 in his original description of *Rhynchostoma minutum*. This is the type material, but it is not permissible, in my opinion, to designate any particular one of these specimens as the holotype. Therefore, the material kept in H (see above) is proposed here as lectotype, and the other duplicates as isolectotypes.

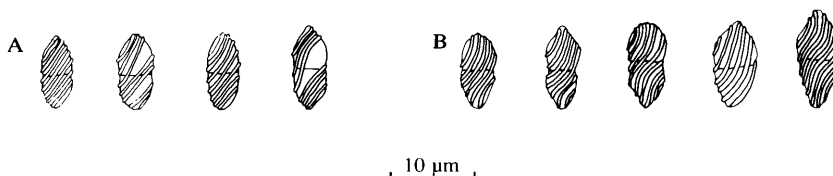
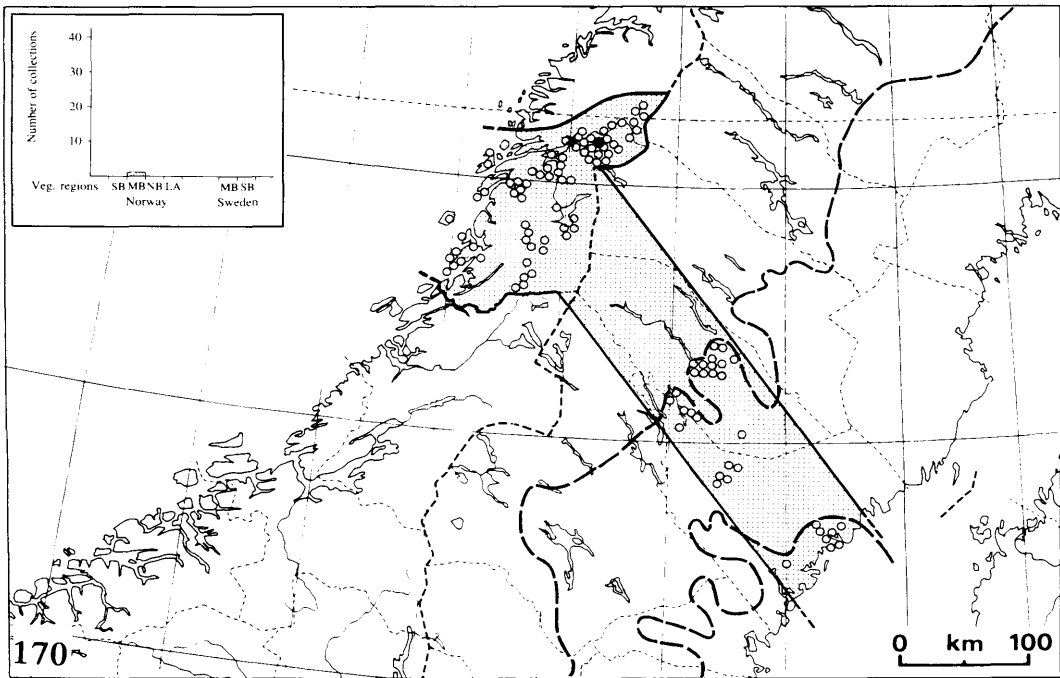
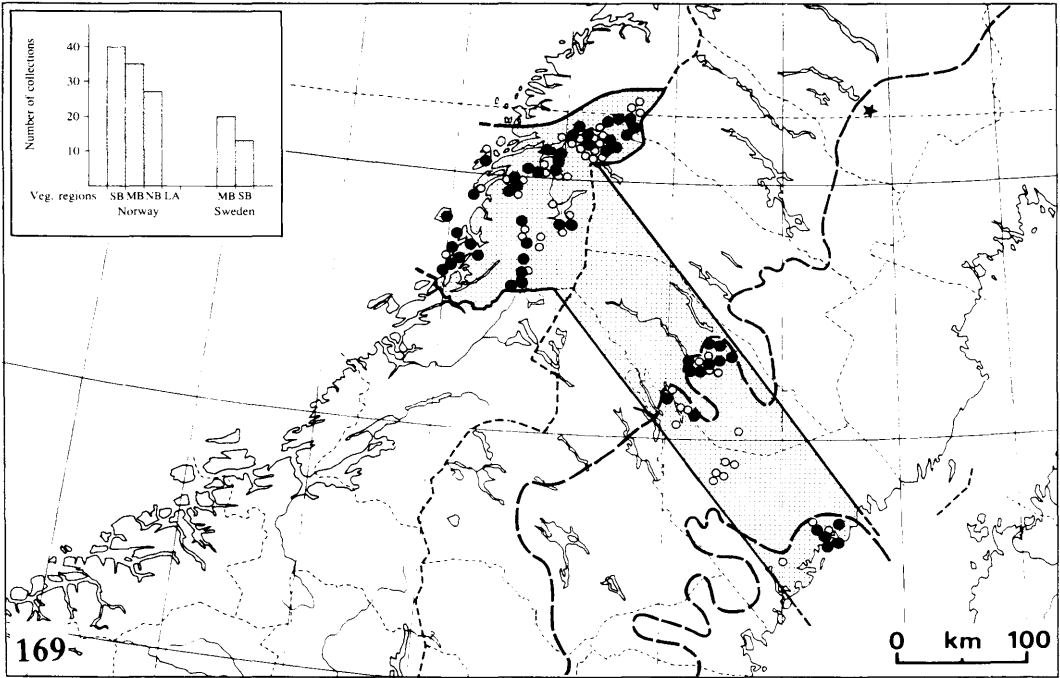


Fig. 168. *Rhynchostoma minutum*. Spores. A. GM 836. B. Type.



Figs 169-170. Distribution maps. Fig. 169. *Rebentischia massalongii*. Fig. 170. *Rhynchosstoma minutum*. Legend on p. 24.

**Taxonomic notes.** M. Barr (in litt. 1989) kindly called my attention to *Camarops flava* Samuels & J.D. Rogers, a species with a reduced stroma and with spore ridges similar to those of *Rhynchostoma minutum*. Both *R. minutum* and *C. flava* are indeed very peculiar species, and the latter differ from the previously described *Camarops* species in its reduced stroma and ornamented, non-flattened spores. Samuels & Rogers (1987: 54) pointed out that it resembles *Apiocamarops alba* Samuels & J.D. Rogers in its scanty stromatal development.

Barr (1990c: 132) found several similarities between *Camarops* and *Rhynchostoma*, and she therefore added *Rhynchostoma* to the Boliniaceae. I doubt that the thin, amorphous crust in *Rhynchostoma* is a reduced stroma of the *Camarops*-type, but I must admit that there are similarities, according to the descriptions by Samuels & Rogers (1987), between the reduced stroma in both *Apiocamarops alba* and *Camarops flava*, and the amorphous outer layer in *R. minutum*. However, the Boliniaceae does not seem to be the right family for *Rhynchostoma*, nor for *C. flava*. I therefore follow Eriksson & Hawksworth (1990d), who still provisionally include *Rhynchostoma* in the Trichosphaeriaceae.

Ascospores with the same surface structure and ontogeny are known in the Caliciaceae (cf. Yue & Eriksson 1986), but *Rhynchostoma* and the Caliciaceae are taxonomically far from each other. Yue & Eriksson (1986: 97) mentioned this example, especially to show how dangerous it is to base a classification on one criterion only.

Barr (1990c: 132) mentioned that Mathiassen (1989) obtained an *Acremonium*-like anamorph from *Rhynchostoma minutum*, but it must be emphasized that I did not carry out cultural experiments on *R. minutum*. The conidiophores were only observed on the collected samples of this species.

However, cultural experiments on *Rhynchostoma* have recently been carried out by Constantinescu & Tibell (1992). A coelomycetous anamorph was formed from single-spore isolations of *R. minutum*, and the fungus, *Arthropycnis praetermissa*, was described as gen. & sp. nov. The anamorphic genus, more or less related to *Arthropycnis*, have no teleomorph connections, and they therefore made no comments about possible relationships of *Rhynchostoma* to other ascomycete genera. More investigation on *Rhynchostoma* is necessary, and molecular and DNA studies will probably also provide us with new data of importance for the classification of this genus.

**Hosts.** Only one sample was found on the limited number of trees treated in this paper, but two samples were found within the transect area, both on *Salix myrsinifolia* ssp. *myrsinifolia*. The only sample from Troms (Mathiassen 1989) was also found on *S. myrsinifolia* ssp. *myrsinifolia*.

*Rhynchostoma minutum* does not show preference for any particular host genus, and it is so far known from *Betula*, *Juniperus*, *Populus* and *Salix* (cf. Mathiassen 1989: 85).

**Ecology.** Only found and reported on wood on twigs and stems, but I have seen too few samples to be confident in considering it as a lignicolous species. The ascomata were found on old, and rather decayed wood in all the examined samples, (see also Karsten 1873: 58, Müller & von Arx 1962: 609, Yue & Eriksson 1986: 95), and *Rhynchostoma minutum* is probably a secondary saprophyte. This substrate type was not systematically investigated in the present investigation, and it is probably more common in Scandinavia than the investigation indicates.

**Distribution.** *Rhynchostoma minutum* is widely distributed, but few samples have previously been made. About 15 samples are known from Norway, Sweden and Finland. *Rhynchostoma minutum* is previously mentioned from Sweden by Yue & Eriksson (1986).

**Material examined** (in addition to the cited type and exsiccata). Norway: No: Rana: Store Alteren VP 54,55 6 Aug 1987 *S. myrsinifolia* ssp. *myrsinifolia* GM 5780a (TROM). - Plurdalen SE of Langfjellet VP 76,58

26 Jul 1989 *Salix myrsinifolia* ssp. *myrsinifolia* GM 7759. Sweden: Vrm: Bjurtjärn W of Botjärns mossen 31 Oct 1977 *Populus tremula* L.-E. Muhr, det. L. Holm "*Rhynchostoma rubrocinctum*" (OULU).

***Saccardoella kanderana* G. Mathiassen sp. nov.**

Refr. descr.: Mathiassen 1989: 85. Refr. illustr.: Mathiassen 1989: Fig. 83.

*Stromata* clypeoidea, debilia. *Perithecia* 540-900  $\mu\text{m}$  diam., globularia, plerumque sparsa, omnino immersa, solum papillis plus minusve conicis, nigris prominentibus. *Ostiolum* circulare, periphysibus cinctum. *Peridium* (15-)20-35  $\mu\text{m}$  crassum, circum *ostiolum* crassius, e cellulis magnis, fuscis formatum parietibus tenuibus indutis, saepe paulum elongatis, textura plus minusve angulari, ad papillam versus sensim parietes crassiores praebentibus, textura in clypeo plus minusve epidermoide. *Asci* 260-348 x 10.4-14  $\mu\text{m}$  magni, media magnitudine 312.7 x 11.8  $\mu\text{m}$ , cylindrici, breviter stipitati, unitunicati, parietibus satis crassis, octospori. *Paraphyses* ad bases 2.5-4  $\mu\text{m}$  diam., sursum sensim ad minus quam 1.0  $\mu\text{m}$  attenuatae, numerosae, longae, septatae, super ascos hic illic ramificatae. *Ascospores* (35-)38.5-59.5(-60.5) x (7.3-)7.7-10(-10.5)  $\mu\text{m}$  magna, media magnitudine 50.2 x 8.7  $\mu\text{m}$ , ellipsoides vel late fusiformes, subcurvae, 11-18-septis divisae, ad septum medium nec ad alia constrictae, hyalinae, oblique uniseriatae.

Type: Tr: Kåfjord: Kåfjorddalen 2 km SE of Sabitjåkka EB 02,97 7 Sep 1982 *Salix lanata* ssp. *lanata* on wood and bark GM 1974a (TROM - holotype). Etymology: From Kander = kanderanus. The first known find of this species is from Kandersteg in Switzerland.

Figs 92-94, 171, 172, 178.

**Description.** *Stromata* clypeoid, but poorly developed. *Perithecia* 540-900  $\mu\text{m}$  diam., globose, usually scattered and completely immersed, only with the  $\pm$  conical, black papillae visible. *Ostiolum* circular, periphysate. *Peridium* (15-)20-35  $\mu\text{m}$  thick, thicker around the *ostiolum*, consisting of large, rather thin-walled, often slightly elongated, brown cells ( $\pm$  *textura angularis*), which gradually become more thick-walled towards the papilla and turn into  $\pm$  *textura epidermoidea* in the clypeus. *Asci* 260-348 x 10.4-14  $\mu\text{m}$ , mean 312.7 x 11.8  $\mu\text{m}$  (n = 41), cylindrical, short-stiped, unitunicate, rather thick-walled, 8-spored. *Paraphyses* 2.5-4  $\mu\text{m}$  wide at base, but gradually tapering towards apex to a width of less than 1.0  $\mu\text{m}$ , numerous, long, septate, and somewhat branched above the *asci*. *Ascospores* (35-)38.5-59.5(-60.5) x (7.3-)7.7-10(-10.5)  $\mu\text{m}$ , mean 50.2 x 8.7  $\mu\text{m}$ ,  $\bar{Q} = 5.8$  (n = 160), ellipsoid to broadly fusiform, slightly curved, 11-18-septate, constricted at the middle septum, not at the other septa, hyaline and obliquely uniseriate.

**Nomenclatural and taxonomic notes.** *Saccardoella kanderana* was previously treated by me (Mathiassen 1989: 85) as *S. transsylvanica* (Rehm) Berl. The type material of *S. transsylvanica* (S), and the other examined central European collections were variable, and could actually be divided into two groups (cf. Mathiassen 1989: 89). Bose & Müller's (1967) report on this species from Himalaya clearly indicated that *S. transsylvanica* was very variable, and I therefore accepted the observed variations as natural for the species. However, a closer examination of the previously examined collections, and the type collections of *S. berberidis* Eliasson (UPS!) and *S. canadensis* Ell. & Everh. (NY!), revealed that the material on *Salix* actually represented a separate species. *Saccardoella kanderana* is separated from *S. transsylvanica* on the following characters; the shape of the papilla, the length of the *asci*, and the ontogeny, shape, septation and sizes of the spores. *Saccardoella kanderana* has spores with real septa, and the shape of the spore cells, or guttulæ in H<sub>2</sub>O are also different from those in *S. transsylvanica*.

Earlier (Mathiassen 1989: 89), I pointed out that the *asci* were morphologically bitunicate, but I was not sure whether they functioned like real bitunicate *asci*. The *ascus* wall



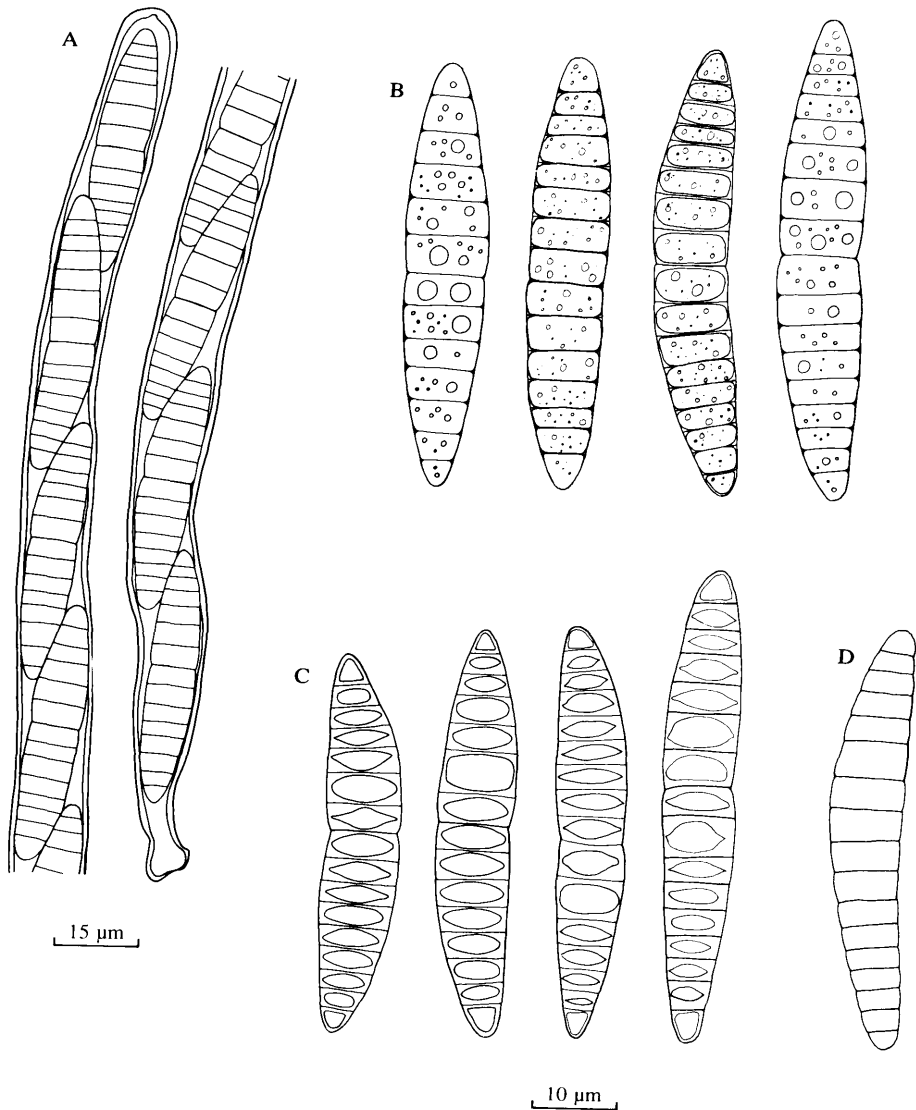


Fig. 171. *Saccardoella kanderana*. Type. A. Ascus with eight spores. B-D. Spores. B. Mounted in water. C. The two first spores are stained with cotton blue in lactophenol. The two last spores are mounted in KOH (2%). D. Old spore, light brown.

is undoubtedly double in *Saccardoella kanderana*, the ectotunica ruptures and the endotunica is extruded. This type of dehiscence is similar to the fissitunicate dehiscence illustrated by Eriksson (1981: Fig. 4a), but after a closer examination, I am inclined to agree with Barr (1990c), and Eriksson & Hawksworth (1990d) that the asci seem to be unitunicate. However, the position of *Saccardoella* is not clear. Barr (1990c: 138) tentatively added *Saccardoella* in

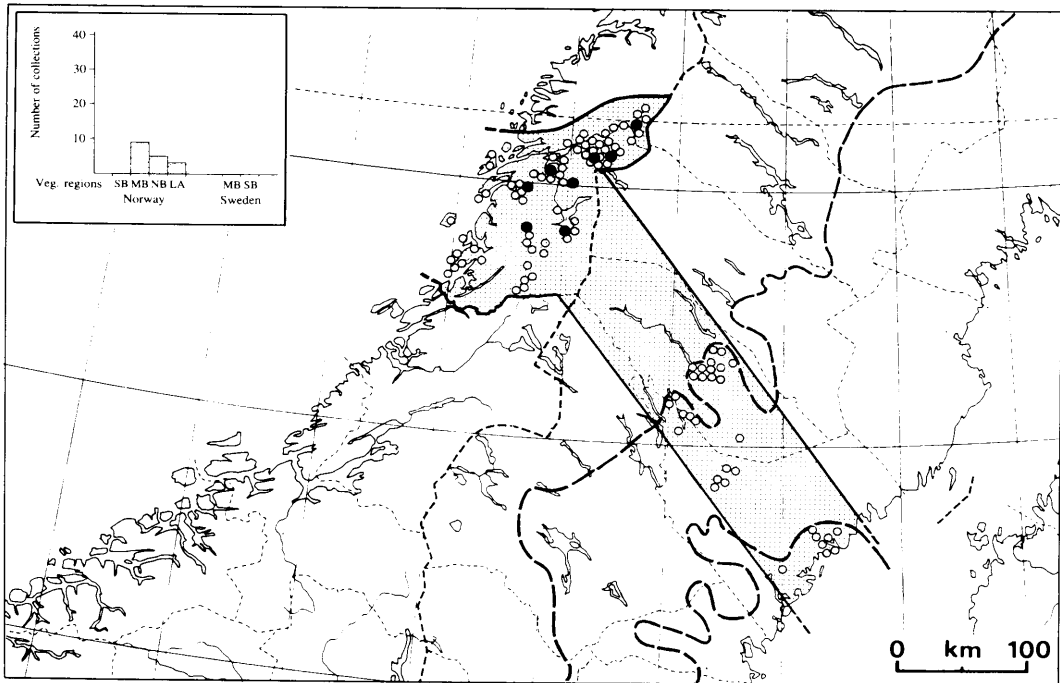


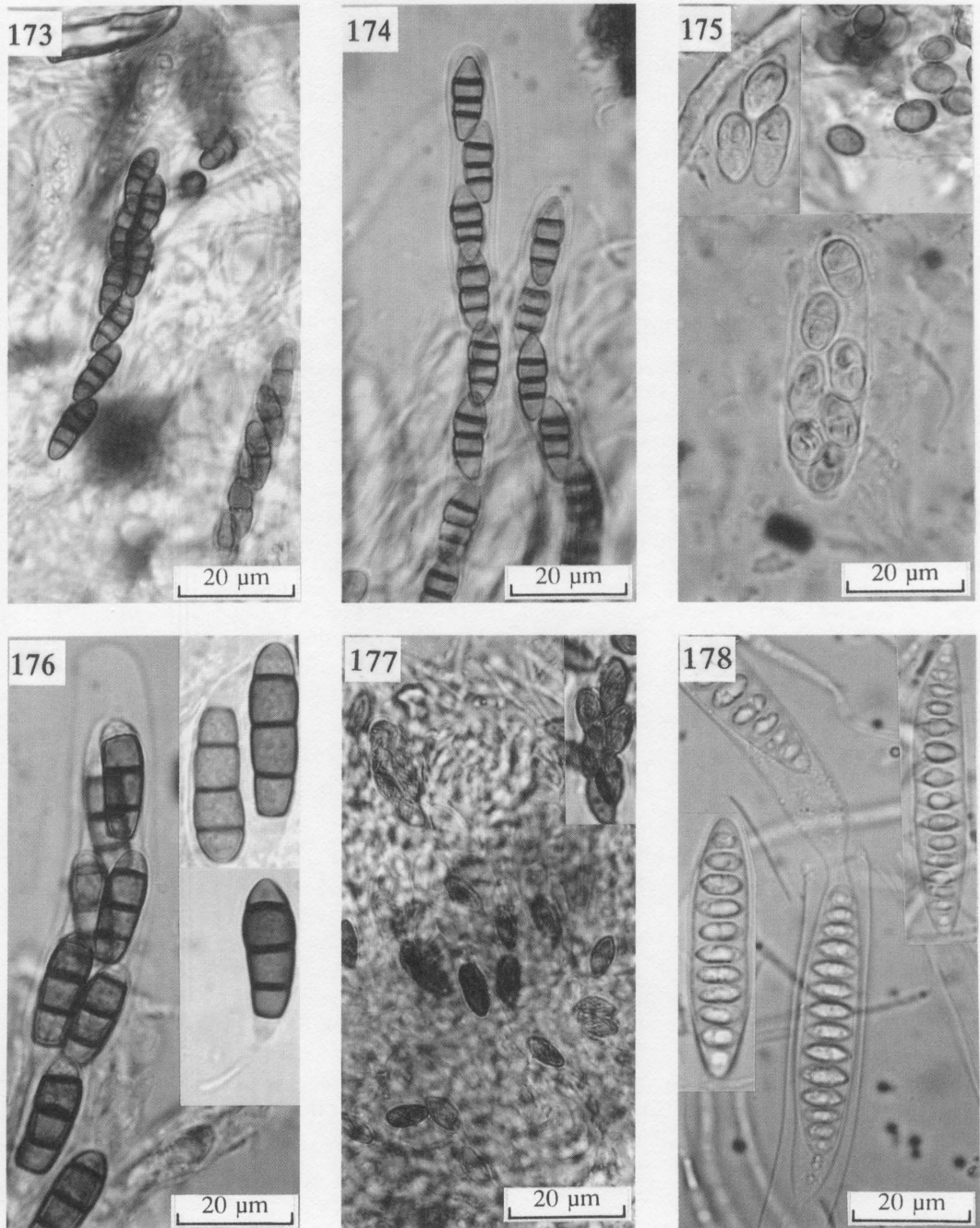
Fig. 172. Distribution map. *Saccardoella kanderana*. Legend on p. 24.

Clypeosphaeriaceae, while Eriksson & Hawksworth (1990d: 120) still include it among the Unitunicate Ascomycetes inc. sed.

Barr (in litt. 1991) is at present working on a draft manuscript on *Saccardoella*. Several species are added to the genus, also species with down to 3-septate spores. Two new species from mangroves in Australia will also probably soon be described by K. Hyde (in litt. 1991). However, *S. canadensis*, *S. berberidis* and *S. transsylvanica* (cf. Petrak 1962) probably represent only one single taxon, and this group of species ought to be thoroughly reexamined. The specimen found in Himalaya (Bose & Müller 1967) seems to be distinct from *S. transsylvanica*. *Saccardoella ingridae* Riedl (Riedl 1967) is closely related to *S. montellica* Spg., but they are both distinct from the above mentioned species.

**Hosts.** Found on *Salix caprea* ssp. *sericea* (3 coll.), *S. glauca* ssp. *glauca* (6 coll.), *S. lapponum* (2 coll.), *S. myrsinifolia* ssp. *borealis* (1 coll.), and ssp. *myrsinifolia* (2 coll.), *S. pentandra* (3 coll.). In Troms (Mathiassen 1989), it was most frequent on the *S. glauca* group, and mainly found on the medium shrubs. This pattern could to some extent be correlated with its distribution pattern, but it was too infrequent to justify a further discussion on host preferences. In the present investigation it was most frequent on *S. glauca* ssp. *glauca*, but no particular pattern is evident as it also was found on the large *Salix* trees. *Saccardoella kanderana* is so far only found on *Salix*.

**Ecology.** Found on wood and bark on both twigs and stems, but has some preference for decorticated wood. It seems to fit well among the primary saprophytes, as it also did in Troms (cf. Mathiassen 1989: 14), but it has a broader ecological amplitude than previously



Figs 173-178. Photographs of type collections. Fig. 173. *Melanomma fuscidulum* (K). Fig. 174. *Melanomma pulvis-pyrius* (UPS). Fig. 175. *Melanopsamma pomiformis* (L). Fig. 176. *Rebentischia pomiformis* (FH). Fig. 177. *Rhynchostoma minutum* (H). Fig. 178. *Saccardoella kanderana* (TROM).

suggested. It was also found on decayed substrates, and ca. 35% of the samples were found near ground level.

**Distribution.** Only found in MB, NB and LA in the Norwegian section of the transect. This agrees well with its distributional pattern in Troms (Mathiassen 1989: 20), but in Troms it was most frequent in the LA region.

This distributional pattern is very similar to that for *Hypoxyylon macrosporum*, both within and outside Scandinavia. The only known sample of *Saccardoella kanderana* outside Scandinavia is found in the Swiss Alps, and *S. kanderana* has the same disjunct distributional pattern in Europe as *Glyphium grisonense* and *H. macrosporum*. Within Scandinavia, *S. kanderana* is only known from central and northern Norway. It is not very common in any of these areas, but it probably occurs all along the Kjølén Mountains.

**Material examined** (in addition to the cited type). **Norway:** No: Vefsn: Mjåvatnet near Sandvik VP 27,14 10 Jul 1987 *Salix glauca* ssp. *glauca* GM 5151, *S. pentandra* GM 5166c. Grane: Grane S of Grane church VN 26,74 3 Jul 1986 *S. caprea* ssp. *sericea* GM 3504b, 3506b, 3510c, *S. myrsinifolia* ssp. *myrsinifolia* GM 3477a, 3494c, *S. pentandra* GM 3447a, 3468b. Hattfjellidal: S of Røssvatnet Bjørkåsen VN 57,81 8 Jul 1987 *S. myrsinifolia* ssp. *borealis* GM 5008. Hemnes: Bryggfjelldalen Sjurfinnheimen VP 53,20-21 13 Jul 1987 *S. glauca* ssp. *glauca* GM 5279, *S. lapponum* GM 5241b. - Korgfjellet S of Ørntinden VP 40-41,27 14 Jul 1987 *S. glauca* ssp. *glauca* GM 5309e. Rana: Randalen Stokkalia WP 11-12,76 21 Jul 1989 *S. glauca* ssp. *glauca* GM 7515, 7526. - Plurdalen Kaldvatnet W of Revet VP 89,47 25 Jul 1989 *S. glauca* ssp. *glauca* GM 7705a. - Utsikten VP 72,53 23 Jul 1990 *S. lapponum* GM 8274. Tr.: Lavangen: Høgtind Bukkemyra XS 15,19-20 22 Aug 1983 *Salix lanata* ssp. *lanata* on coll. GM 253a. Tromsø: N of Storslett CC 86,24 23 Jul 1981 *S. myrsinifolia* ssp. *borealis* GM 1029. Kålfjord: Kålfjorddalen SE of Sabitjåkka EB 01,98 20 Aug 1983 5 coll. *S. glauca* ssp. *glauca* GM 2494a, *S. glauca* ssp. *stipulifera* GM 2479b, 2483, 2484c, *S. hastata* ssp. *hastata* GM 2486. Nordreisa: Reisadalen Josvatn-Josdalen EC 10,17 6 Sep 1982 *S. myrsinifolia* ssp. *borealis* GM 1907b. - Reisadalen Josdalen EC 09,15-16 6 Sep 1982 *S. arbuscula* on coll. GM 1953a. **Switzerland:** Kandersteg Jul 1888 leg. Wegelin, det. N. Rehm "*Saccardoella transsylvanica*" (S).

## SYSTEMATIC SURVEY OF THE INVESTIGATED TAXA

The systematic classification follows Eriksson & Hawksworth (1990d). The genera and the species are listed in alphabetical order within each family.

CALOSPHERIALES Barr, Mycologia 75: 11 (1983).

CALOSPHERIACEAE Munk, Dansk bot. Ark. 17: 1: 278 (1957).

*Enchnoa* Fr., Summ. veg. Scand. 2: 393 (1849).

*Enchnoa infernalis* (G. Kunze : Fr.) Fuckel, Symb. mycol.: 302 (1871).

DIAPORTHALES Nannf., Nova Acta regiae Soc. scient. upsal. IV 8: 2: 53 (1932).

VALSACEAE Tul. & C. Tul., Sel. fung. carp. 1: 180 (1861).

*Cryptodiaporthe* Petr., Annl. mycol. 19: 118 (1921).

*Cryptodiaporthe salicella* (Fr.) Petr., Annl. mycol. 19: 180 (1921).

DIATRYPALES Chadev. ex D. Hawksw. & O. Eriksson, Systema ascom. 5: 178 (1986).

DIATRYPACEAE Nits., Pyren. germ.: 62 (1867).

*Cryptosphaeria* Grev., Scot. crypt. Fl.: 13 (1823).

*Cryptosphaeria subcutanea* (Wahl. : Fr.) Rappaz, Mycotaxon 10: 581 (1984).

*Diatrype* Fr., Summ. veg. Scand. 2: 384 (1849).

*Diatrype bullata* (Hoffm. : Fr.) Fr., Summ. veg. Scand. 2: 385 (1849).

DOTHIDEALES Lindau, Nat. Pfl.-fam. 1: 1: 373 (1897).

ARTHOPYRENIACEAE W. Watson, New Phytol. 28: 107 (1929).

*Arthopyrenia* Massal., Ricerch. auton. Lich.: 165 (1852).

*Arthopyrenia lapponina* Anzi, Comm. Soc. critt. ital. 2: 25 (1864).

HERPOTRICHIELLACEAE Munk, Dansk bot. Ark. 15: 2: 131 (1953).

*Capronia* Sacc., Syll. fung. 2: 288 (1883).

*Capronia collapsa* (Mathiassen) Barr, Mycotaxon 41: 427 (1991).

*Capronia nigerrima* (Bloxam. ex Curr.) Barr, Mycotaxon 41: 431 (1991).

HYSTERIACEAE Chev., Fl. gen. env. Paris 1: 432 (1826).

*Hysterographium* Corda emend. De Not., G. bot. ital. 2: 21 (1847).

*Hysterographium elongatum* (Wahl.) Corda, Icon. fung. 5: 77 (1842).

LEPTOSPHAERIACEAE Barr, Mycotaxon 29: 503 (1987).

*Leptosphaeria* Ces. & De Not., Comm. Soc. critt. ital. 1: 234 (1863).

*Leptosphaeria tollens* G. Mathiassen sp. nov.

LOPHIACEAE Zogg ex v. Arx & Müller, CBS mycol. Stud., Baarn 9: 60 (1975).

*Glyphium* Nits. ex Lehm., Nova Acta Acad. Caes. Leop.-Carol. germ. nat. curios. 50: 139 (1886).

*Glyphium grisonense* G. Mathiassen sp. nov.

LOPHIOSTOMATACEAE Nits., Verh. naturh. Ver. preuss. Rheinl. 26. Corr.-Bl. 2: 74 (1869).

*Keissleriella* v. Höhn., Sber. Akad. Wiss. Wien, Math.-nat. Kl., Abt. 1, 128: 582 (1919).

*Keissleriella holmiorum* G. Mathiassen sp. nov.

*Lophiostoma* Ces. & De Not., Comm. Soc. critt. ital. 1: 219 (1863).

*Lophiostoma compressum* (Pers. : Fr.) Ces. & De Not., Comm. Soc. critt. ital. 1: 219 (1863).

*Lophiostoma curtum* (Fr.) Ces. & De Not., Comm. Soc. critt. ital. 1: 219 (1863).

*Lophiostoma macrostomoides* (De Not.) Ces. & De Not., Comm. Soc. critt. ital. 1: 219 (1863).

*Lophiostoma quadrinucleatum* Karst., Mycol. fenn. 2: 85 (1873).

*Lophiotrema* Sacc. emend. L. & K. Holm, Symb. bot. upsala. 28(2): 25 (1988).

*Lophiotrema boreale* Mathiassen, Sommerfeltia 9: 71 (1989).

*Lophiotrema nucula* (Fr. : Fr.) Sacc., Michelia 1: 338 (1878).

MELANOMMATACEAE Winter, Rabenh. Krypt.-Fl. 1: 2: 220 (1885).

*Melanomma* Nits. ex Fuckel, Symb. mycol.: 159 (1870).

*Melanomma fuscidulum* Sacc., Michelia 1: 450 (1878).

*Melanomma pulvis-pyrius* (Pers. : Fr.) Fuckel, Symb. mycol.: 160 (1870).

PLEOSPORACEAE Nits., Verh. naturh. Ver. preuss. Rheinl. 26. Corr.-Bl. 2: 74 (1869).  
*Kirschsteiniothelia* D. Hawksw., Bot. J. Linn. Soc. 91: 182 (1985).

*Kirschsteiniothelia aethiops* (Berk. & Curtis) D. Hawksw., Bot. J. Linn. Soc. 91: 185 (1985).

TUBEUFIACEAE Barr, Mycologia 71: 948 (1979).

*Rebentischia* Karst., Mycol. fenn. 2: 14 (1873).

*Rebentischia massalongii* (Mont.) Sacc., Atti Soc. Ven.-Trent. sci. nat. 4: 88 (1875).

SORDARIALES Chadeff. ex D. Hawksw. & O. Eriksson, Systema ascom. 5: 182 (1986).

NITSCHKIACEAE (Fitzp.) Nannf., Nova Acta regiae Soc. sci. upsal. IV 8: 2: 56 (1932).

*Bertia* De Not., G. bot. ital. 1: 334 (1844).

*Bertia moriformis* (Tode : Fr.) De Not. var *moriformis*, G. bot. ital. 1: 335 (1844).

TRICHOSPHAERIALES Barr, Mycologia 75: 11 (1983).

TRICHOSPHAERIACEAE Winter, Rabenh. Krypt.-Fl. 1: 2: 191 (1885).

?*Melanopsamma* Niessl emend. Sacc., Michelia 1: 347 (1878).

*Melanopsamma pomiformis* (Pers. : Fr.) Sacc., Michelia 1: 347 (1878).

?*Rhynchostoma* Karst., Mycol. fenn. 2: 7 (1873).

*Rhynchostoma minutum* Karst., Mycol. fenn. 2: 58 (1873).

XYLARIALES Nannf., Nova Acta regiae Soc. sci. upsal IV 8: 2: 66 (1932).

AMPHISPHAERIACEAE Winter, Rabenh. Krypt.-Fl. 1: 2: 191 (1885).

*Amphisphaerella* (Sacc.) Kirschst. emend. Munk, Dansk bot. Ark. 15: 2: 88 (1953).

*Amphisphaerella erikssonii* G. Mathiassen sp. nov.

XYLARIAACEAE Tul. & C. Tul., Sel. fung. carp. 2: 3 (1863).

*Anthostomella* Sacc., Nuovo G. bot. ital. 8: 12 (1863).

*Anthostomella melanotes* (Berk. & Br.) Martin, S. afr. J. Bot. 42(1): 71 (1976).

*Hypoxylon* Bull. : Fr., Syst. orb. veg.: 105 (1825).

*Hypoxylon macrosporum* Karst., Not. Sällsk. F. Fl. fenn. Förh. 8: 211 (1882).

*Hypoxylon mammatum* (Wahl.) Karst., Not. Sällsk. F. Fl. fenn. Förh. 8: 212 (1882).

UNITUNICATE ASCOMYCETES inc. sed.

*Saccardoella* Speg., Michelia 1: 461 (1878).

*Saccardoella kanderana* G. Mathiassen sp. nov.

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## APPENDIX

## APPENDIX I. SUPPLEMENT TO SOMMERFELTIA 9: 1989. MATERIAL EXAMINED

The nomenclature of *Salix* and the fungi are in strict accordance with that used in Sommerfeltia 9 (Mathiassen 1989).

*Amphisphaerella* cf. *xylostei*

**Norway:** O: Oslo: Tøyen s. dat. *Lonicera xylosteum* N.G. Moe " *Anthostoma xylostei*" (O). - Østre Skøyen May 1844 *Lonicera xylosteum* 3 coll. s. nom. coll. " *Anthostoma xylostei*" (O). - Tøyen Oct 1840 *Lonicera xylosteum* N.G. Moe (cf. Rostrup (1904: 18)) " *Anthostoma xylostei*" (O). Op: Ringebu: Ringebu Apr 1835 *Lonicera xylosteum* S.C. Sommerfelt " *Anthostoma xylostei*" (O). Tr: Lavangen: Høgtind Bukkemyra XS 15,19-20 22 Aug 1983 6 coll. *Salix glauca* ssp. *glauca* GM 2523a, *S. lanata* ssp. *lanata* GM 2524, 2526, 2533, 2547, *S. phyllicifolia* GM 2531. Målselv: Dividalen Dødesvann DB 45,41 21 Aug 1983 2 coll. *S. glauca* ssp. *glauca* GM 2496, *S. lanata* ssp. *lanata* GM 2499c. Kåfjord: Kåfjorddalen SE of Sabitjåkka EB 02,97 7 Sep 1982 2 coll. *S. lanata* ssp. *lanata* GM 1960b, 1963b. - Kåfjorddalen SE of Sabitjåkka EB 01,98 20 Aug 1983 *S. lanata* ssp. *lanata* GM 2475a. Without locality: s. dat. *Lonicera xylosteum* det. Rostrup " *Anthostoma xylostei*" (O). **Sweden:** Västergötland: Vänersborg Lilleskog 28 Jun 1892 *Lonicera xylosteum* A.G. Eliasson " *Anthostoma xylostei*" (O). Västerbotten: Umeå Brännland 16 May 1976 *Lonicera tatarica* O. Eriksson (UME 28074). **Denmark:** Sjælland: Aasevang 20 May 1891 O. Rostrup (C). - Søllerup indelukke 9 Apr 1950 *Lonicera xylosteum* Ø. Winge (C). - Marselisborg 9 Jan 1909 *Lonicera xylosteum* Ø. Winge (C).

*Anthostomella melanotes*

**Norway:** Tr: Kvæfjord: Gullesfjordbotn WS 29,02 5 Jul 1981 3 coll. *Salix caprea* ssp. *caprea* GM 132, *S. caprea* ssp. *coetanea* GM 135, 148. - Kvæfjordeidet S of Stormyra WS 52,29 6 Jul 1981 *S. nigricans* ssp. *nigricans* GM 220a. Lavangen: Høgtind Bukkemyra XS 15,19-20 22 Aug 1983 *S. lanata* ssp. *lanata* GM 2530. Bardu: Sørtdalen Sørmo DB 01,18 15 Jul 1981 *S. caprea* ssp. *coetanea* GM 617b. - Storala near Bruhaugen CB 93,44 15 Jul 1981 5 coll. *S. glauca* ssp. *glauca* GM 628, *S. lapponum* GM 623a, *S. nigricans* ssp. *nigricans* GM 630, *S. phyllicifolia* GM 649a, 653c. Målselv: Dividalen near Svalheim DB 42,40 16 Jul 1981 *S. nigricans* ssp. *nigricans* GM 666a. - Dividalen Dødesvann DB 45,41 21 Aug 1983 3 coll. *S. glauca* ssp. *glauca* GM 2504a, 2505, 2514a. Berg: Straumsbotn E of Elvevoll WS 95,97 13 Jul 1981 *S. nigricans* ssp. *nigricans* GM 504. Tromsø: Russevankskardet DC 36-37,26 5 Jul 1982 *S. caprea* ssp. *coetanea* GM 1471. Lyngen: Kvalvik DC 69,11 14 Sep 1982 2 coll. *S. nigricans* ssp. *borealis* GM 2086a, *S. nigricans* ssp. *nigricans* GM 2107. Storfjord: Signaldalen near Rognli DB 64,67 15 Sep 1982 4 coll. *S. nigricans* ssp. *borealis* GM 2149a, 2165, 2169, *S. nigricans* ssp. *nigricans* GM 2173a. Kåfjord: Manndalen Dalen DC 81,08 18 Jul 1981 3 coll. *S. nigricans* ssp. *borealis* GM 761a, 764c, *S. nigricans* ssp. *nigricans* GM 773b. Nordreisa: Reisadalen Josvatn-Josdalen EC 10,17 6 Sep 1982 *S. nigricans* ssp. *borealis* GM 1907a. Kvænangen: Badderer EC 39,50 5 Sep 1982 *S. nigricans* ssp. *nigricans* GM 1828. Kvænangsbotten W of Lassajav'ri EC 42,30 20 Aug 1983 2 coll. *S. glauca* ssp. *stipulifera* GM 2472a, *S. nigricans* ssp. *nigricans* x *phyllicifolia* GM 2453. **Sweden:** Närke: Romell, L.: Fungi exs. p. scand. No. 66: *Anthostoma melanotes*, Kumla Jul-Aug 1885 "in ligno emortuo *Salicis Capreae*" L. Romell 2 coll. (C). Norrbotten: Luleå Jul 1915 *Sorbus aucuparia* J. Lind " *Anthostoma melanotes*" (C). **East-Germany:** Leipzig, 2 coll. May 1874 G. Winter " *Anthostoma schmidtii*" (C). - Dresden, Königstein, Elbe Apr 1881 *Salix purpurea* W. Krieger " *Anthostoma schmidtii*" (C). **Austria:** Petrak, F.: Fl. Bohem. Mor. exs. No. 1553: *Anthostoma melanotes*, Mähren, Mähr.-Weisskirchen, Hrabuvka 20 Mar 1923 *Cytisus scoparius* F. Petrak (C). **Italy:** Venetia, Treviso Sep 1874 Saccardo " *Anthostoma schmidtii*" (C). Saccardo, D.: Mycotheca italica No. 77: *Anthostoma melanotes*, Vittorio Oct 1897 "in ramis decorticatis emortuis *Castanea*" D. Saccardo (B). **U.S.A.:** Sydow: Fungi exotici exs. No. 947: *Anthostoma melanotes*, South Dakota, Northville May 1929 "in ramis *Symphoricarpi occidentalis*" J.F. Brenckle 2 coll. (C & B). - Cryptogamae exs. No. 4627: *Anthostoma melanotes*, editae a Museo Hist. Natur. Vindobonensi. South Dakota, Mellette 9 Aug 1950 "auf entlindeten *Fraxinus-Ästen*" F. Petrak 2 coll. (BG & C).

*Arthopyrenia lapponina*

**Norway:** Tr: Kvæfjord: Gullesfjordbotn WS 29,02 5 Jul 1981 2 coll. *Salix lapponum* GM 154a, S.

*nigricans* ssp. *nigricans* GM 155a. Skånland: Tovik along Breiteigelva WS 75,19 7 Jul 1981 *S. lapponum* GM 244. Ibestad: Rolla between Agneset and Hamran WS 77,26 8 Jul 1981. *S. nigricans* ssp. *nigricans* GM 309a. Lavangen: Høgtind Bukkemyrå XS 15,19-20 22 Aug 1983 *S. lapponum* GM 2525. Bardu: Storalå near Bruhaugen CB 93,44 15 Jul 1981 *S. lapponum* GM 625. Målselv: Dividalen near Svalheim DB 42,40 16 Jul 1981 *S. nigricans* ssp. *borealis* GM 675. - Dividalen Dødesvann DB 45,41 16 Sep 1982 & 21 Aug 1983 6 coll. *S. nigricans* ssp. *nigricans* GM 2234, *S. glauca* ssp. *glauca* GM 2505c, 2509, 2517a, *S. hastata* GM 2503a, *S. lanata* ssp. *lanata* GM 2500. Sørreisa: N of Rabbås CB 28,66 14 Jul 1981 *S. lapponum* GM 590. Tranøy: N of Vangsvik XS 09,77 12 Jul 1981 4 coll. *S. lapponum* GM 413, 414, 415, 420. Berg: Straumsbotn E of Elvevoll WS 95,97 13 Jul 1981 5 coll. *S. lapponum* GM 487, 489, 506, *S. nigricans* ssp. *nigricans* GM 507, 512a. Lenvik: W of Laukhella XS 12,83 12 Jul 1981 2 coll. *S. lapponum* GM 443, *S. nigricans* ssp. *nigricans* GM 458b. Balsfjord: Laksvatn DB 36,97 18 Jul 1981 3 coll. *S. myrsinities* GM 703, *S. pentandra* GM 717, 719a. - NW of Laksvatn DB 35,37 18 Jul 1981 *S. nigricans* ssp. *borealis* GM 734. Tromsø: Tønsvikkalden DC 29,37 23 Jun 1981 *S. nigricans* ssp. *nigricans* GM 68. Tromsdalen Storsteinen DC 22,26-27 13 Sep 1982 3 coll. *S. nigricans* ssp. *borealis* GM 2028b, *S. nigricans* ssp. *borealis* x *glauca* ssp. *glauca* GM 2074, *S. nigricans* ssp. *nigricans* GM 2062a. Lyngen: Sørølenangen near Botn DC 61,40 21 Jul 1981 2 coll. *S. nigricans* ssp. *borealis* GM 947a, *S. nigricans* ssp. *nigricans* GM 961a. Kåfjord: Kåfjorddalen 2 km SE of Sabitjåkka EB 02,97 7 Sep 1982 9 coll. *S. glauca* ssp. *glauca* GM 1977b, 1979, 1981a, 1982a, 1987, 1989, *S. lanata* ssp. *lanata* GM 1958b, 1969b, 1972a. - Kåfjorddalen SE of Sabitjåkka EB 01,98 20 Aug 1983 *S. glauca* ssp. *stipulifera* GM 2479a. Skjervøy: Arnøy Årviksand DC 81,86 20 Jul 1981 3 coll. *S. myrsinities* GM 903, *S. nigricans* ssp. *borealis* GM 881a, *S. nigricans* ssp. *nigricans* GM 898. Nordreisa: Kvænangsfjellet EC 20,54 6 Sep 1982 *S. nigricans* ssp. *borealis* x *glauca* ssp. *glauca* GM 1898. - Reisadalen Josvatn-Josdalen EC 10,17 6 Sep 1982 2 coll. *S. lapponum* GM 1923a, 1924b. - Reisadalen Josdalen EC 09,15-16 6 Sep 1982 4 coll. *S. arbuscula* GM 1952, 1953, 1954b, *S. glauca* ssp. *glauca* GM 1949a. Kvænangen: Kvænangsbotten W of Lassajav'ri EC 42,30 20 Aug 1983 3 coll. *S. lanata* ssp. *lanata* GM 2471, *S. lapponum* GM 2462, 2468a. Reference: Tr: Tromsø: Tønsvik s. dat. *Alnus incana* D.O. Øvstedal (Øvstedal 1980: 193).

### ***Berlesiella nigerrima***

Norway: Tr: Nordreisa: Reisadalen Josvatn-Josdalen EC 10,17 6 Sep 1982 2 coll. *Salix nigricans* ssp. *borealis* (associated with *Cryptosphaeria subcutanea*) GM 1909a, 1912a. Without locality: s. dat. "in ramis *Pruni Pad.*, locio *Eutypella padi* Karst." Saccardo (PAD).

### ***Bertia moriformis* var. *moriformis***

Norway: Øf: Borge: Torp 5 Des 1979 R. Kristiansen (O). Ak: Bærum: Bjerke Jun 1826 *Corylus* & *Quercus* S.C. Sommerfelt "*Sphaeria moriformis*" (O). - Øverlandselva 6 Jun 1879 A. Blytt (O). - Vøyen 4 Sep 1913 J. Kos (O). - Isidalen NM 79,46 14 May 1969 *Matteuccia struthiopteris* H. Bøhler 38/69 (O). Nannestad: Tømte Gård 1 Sep 1972 A.-E. Torkelsen (O). Hurdal: Brustadkollen 14 May 1972 *Pinus* Ø. Tveitstul (O). - Brustadkollen Hurdalssjøen 31 Aug 1972 A.-E. Torkelsen 461/72 (O). O: Oslo: Surrounding area s. dat. *Salix* s. nom. coll. det. Rostrup (O). - Nordmarka 21 Sep 1879 A. Blytt (O). - Østre Aker Nøklevann 5 Jun 1927 *Corylus avellana* I. Jørstad (O). - Sarabråten Østmarka 9 Sep 1961 "på løvtre(?)" R.A. Maas Geesteranus & F.-E. Eckblad (O). - Bogstad 8 Oct 1963 G. Gulden (O). He: Ringsaker: Mesnali 4 Jul 1963 F.-E. Eckblad (O). Op: Gjøvik: Biri Stumlia 25 May 1975 *Picea* A.-E. Torkelsen 105/75 (O). Dovre: (possibly Oppdal/Sør-Trøndelag): Dovre s. dat. & nom. coll. det. Rostrup (O). Ringeby: Ringeby s. dat. *Salix* S.C. Sommerfelt "*Sphaeria moriformis*" (O). - Ringeby Jul 1836 S.C. Sommerfelt "*Sphaeria moriformis*" (O). Gausdal: Ormtjernkampen 2 Aug 1973 *Betula* L. Ryvarden no. 12061 (O). Bu: Hole: Vik 1 Jun 1967 *Picea* G. Gulden 46/67 (O). - Vik 19 Apr 1971 *Salix caprea* K. Høiland & H. Bøhler (O). Nes: Nesbyen Hallingdal Museum 3 Oct 1965 F.-E. Eckblad (O). Vf: Larvik: Larvik s. dat. & nom. coll. det. Rostrup (O). Sem: Gullkronen 12 Oct 1978 *Fagus* A.-E. Torkelsen 305/78 (O). Te: Notodden: Bolkesjø 19 Aug 1879 A. Blytt (O). AA: Lillesand: Justøy 21 May 1972 *Hymenochaete tabacina* G. Gulden 161/72 (O). Ro: Sandnes: Høle N of Krusafjellet 6 Apr 1968 *Betula* P.M. Jørgensen 2 coll. (BG). Ho: Bergen: Hamre 10 Jul 1981 *Salix aurita* B.F. Moen (BG). Kvinnherad: Ølve 20 Jul 1976 *Fraxinus* E. Jensson (BG). Kvam: Kvamskogen 20 Apr 1975 *Ulmus* O. Balle (BG). Osterøy: Haus Vatle 5 May 1978 *Fraxinus excelsior* R. Langnes (NPPI). Lindås: Vågseidet 23 Mar 1973 *Pinus* A. Granmo (BG). - Seim Vollom 29 Sep 1973 F.-E. Eckblad 2 coll. (BG), 17 Sep 1974 2 coll. (BG), 12 Oct 1975 *Fagus* E. Jensson (BG). SF: Flora: Flora 26 Aug 1972 F.-E. Eckblad (BG). - Sunnarvik 27 Aug 1972 F.-E. Eckblad (BG). Gulen: Brekke Brekkestranda 28 Apr 1974 F.-E. Eckblad (BG). Vågsøy: Vågsøy Måløy 2 Oct 1975 A. Granmo 121/75 (BG). MR: Ålesund: Aksla 24 Sep 1975 *Salix*(?) F.-E. Eckblad (BG). Rauma: Åndalsnes 13 Aug 1973 *Sorbus aucuparia* A. Granmo (BG). Surnadal: Sjøya near Pollen kbl. 1420 IV MQ 87 7 May 1971 *Salix*(?) J.N. Kristiansen et al. (TRH). ST: Midtre Gausdal: Støren 16 Jul 1973 *Alnus incana* A. Granmo (BG). NT: Stjørdal:

S of Forra near Leirfallvollen PR 35 30 Jun 1972 "morken løvved" S. Sivertsen (TRH). - Elvran Blåhammaren PR 03 31 May 1973 *Rubus idaeus* Å. Erlandsen (TRH). No: Hattfjelldal: Børgefjell near the outlet of Simskarelvva VN 53 5 Aug 1971 *Salix* S. Sivertsen (TRH). Rana: Storalteren VP 55 26 Aug 1971 *Alnus* S. Sivertsen (TRH). - Hammarnes VP 56 14 Sep 1976 S. Sivertsen (TRH). Bodø: Vågøy 5 May 1968 *Alnus* H. Andersen (O). Evenes: Brenna 18 May 1974 A. Granmo (TROM). Narvik: Skjomen Forsheim 17 Oct 1979 *Salix* A. Granmo 451/79 (TROM). Ballangen: Råndal 28 Aug 1981 *Salix* A. Granmo 333/81 (TROM). Tr: Kvæfjord: Kvæfjordeidet S of Stormyra WS 52,29 6 Jul 1981 2 coll. *Salix pentandra* GM 165, 166. Ibestad: Rolla N of Hamnvik WS 86,32 8 Jul 1981 *S. nigricans* ssp. *borealis* GM 326. Gratangen: Gratangsbotn along Meelva XR 09-10,19 8 Jul 1981 *S. nigricans* ssp. *nigricans* GM 277. Bardu: Sørtdalen Sørmo DB 01,18 15 Jul 1981 *S. nigricans* ssp. *borealis* GM 605. Målselv: Dividalen near Åsen DB 37,54 13 Jul 1981 *S. nigricans* ssp. *nigricans* GM 685. - Dividalen Dødesvann DB 45,41 16 Sep 1982 *S. nigricans* ssp. *borealis* GM 2243. Balsfjord: NW of Laksvatn DB 35,97 18 Jul 1981 2 coll. *S. nigricans* ssp. *borealis* GM 733, *S. nigricans* ssp. *nigricans* GM 737. Tromsø: Russevangskardet DC 36-37,26 5 Jul 1982 *S. caprea* ssp. *coetanea* GM 1472. - Tromsdalen Storsteinen DC 22,26-27 13 Sep 1982 2 coll. *S. nigricans* ssp. *borealis* GM 2036, 2050b. Lyngen: Sørleangen near Botn DC 61,40 21 Jul 1981 *S. nigricans* ssp. *borealis* GM 951a. - Drabeng DC 72,27 3 Oct 1981 *S. nigricans* ssp. *borealis* GM 1151b. Storfjord: Signaldalen near Rognli DB 64,67 15 Sep 1982 2 coll. *S. nigricans* ssp. *nigricans* GM 2174, 2176. Skibotndalen SE of Øvrevatn DB 73,93 15 Sep 1982 2 coll. *S. nigricans* ssp. *nigricans* x *phylicifolia* GM 2220a, *S. phylicifolia* GM 2226a. Kåfjord: Manndalen Dalen DC 81,08 18 Jul 1981 *S. pentandra* GM 766a. Nordreisa: Sørkjosen 3 Aug 1973 *Salix* sp. AG 215/73 (TROM). - Reisadalen near Punta EC 17,10 19 Jul 1981 *S. nigricans* ssp. *borealis* GM 795. - Reisadalen Josedalen EC 09,15-16 6 Sep 1982 *S. nigricans* ssp. *borealis* GM 1933. Kvænangen: Burfjorddalen W of Kåsen EC 41,57 19 Jul 1981 2 coll. *S. nigricans* ssp. *borealis* GM 817a, 818. - Kvænangsfjellet NW of Sandnesvatnet EC 25,52 6 Sep 1982 *S. caprea* ssp. *coetanea* GM 1890. - Kvænangsbotten W of Lassjav'ri EC 42,30 20 Aug 1983 *S. nigricans* ssp. *borealis* GM 2460. Fi: Tana: W of Suolovarre 10 Aug 1968 *Betula* L. Ryvarden (O). **Finland:** Kusamo: Liikasenvaara. S slope of hill Korvasvaara 23 Aug 1978 *Picea* A.-E. Torkelsen 167/78 (O).

### *Chaetosphaeria pomiformis*

**Norway:** Ak: Nannestad: Hornsjøen 20 Sep 1976 *Betula* E. Jensen (BG). O: Oslo: Tøyen 1840 *Betula* N.G. Moe 2 coll. det. Rostrup (cf. Rostrup (1904: 21)) (O). - Bogstadås 1840 *Populus tremula* N.G. Moe det. Rostrup (cf. Rostrup (1904: 21)) (O). - Skådal 1840 N.G. Moe det. Rostrup (O). Ro: Gjesdal: Dirdal 13 Jul 1974 *Quercus* p.p. on *Eutypella* A. Granmo 72/74 (TROM, dubl. BG). No: Saltdal: Saltdalen Mar 1824 *Betula* S.C. Sommerfelt (O). Tr: Hårstad: Sørvik-Sørvikfjellet WS 60,20-61,19 7 Jul 1981 *Salix nigricans* ssp. *borealis* GM 222a. Skånland: Tovik along Breiteigelva WS 75,19 7 Jul 1981 *S. nigricans* ssp. *borealis* GM 264a. Ibestad: Rolla Rognvik WS 82,27 8 Jul 1981 2 coll. *S. nigricans* ssp. *nigricans* GM 315, 316. - Rolla N of Hamnvik WS 86,32 8 Jul 1981 *S. nigricans* ssp. *nigricans* GM 324. Bardu: Sørtdalen Sørmo DB 01,18 15 Jul 1981 2 coll. *S. nigricans* ssp. *borealis* GM 611, 618. Salangen: Skårvikdalen XS 13,45 11 Jul 1981 2 coll. *S. nigricans* ssp. *borealis* GM 369, *S. nigricans* ssp. *nigricans* GM 370. Målselv: Dividalen near Svalheim DB 42,40 16 Jul 1981 *S. nigricans* ssp. *nigricans* GM 668a. Dyrøy: Brøstadbotten XS 07,65 11 Jul 1981 *S. nigricans* ssp. *borealis* GM 399. Balsfjord: Laksvatn DB 36,97 18 Jul 1981 2 coll. *S. nigricans* ssp. *borealis* GM 706, *S. nigricans* ssp. *nigricans* GM 713b. Tromsø: Tromsøya N of Langnes DC 20,33 5 Oct 1981 *S. nigricans* ssp. *borealis* GM 1146a. - Tromsdalen Storsteinen DC 22,26-27 13 Sep 1982 3 coll. *S. nigricans* ssp. *borealis* GM 2021, 2029, *S. nigricans* ssp. *nigricans* GM 2037. Kåfjord: Manndalen Dalen DC 81,08 18 Jul 1981 3 coll. *S. nigricans* ssp. *borealis* GM 750a, 763, *S. nigricans* ssp. *nigricans* GM 755. - Manndalen Elvelund DC 82,06 18 Jul 1981 2 coll. *S. nigricans* ssp. *borealis* GM 780a, 784a. Nordreisa: Reisadalen near Punta EC 17,10 19 Jul 1981 *S. nigricans* ssp. *borealis* GM 791. **Sweden:** Uppland: Stockholm May 1888 *Ulmus* L. Romell "*Melanopsamma pomiformis*" (S). - Ekbacken 23 Apr 1889 *Sorbus aucuparia* L. Romell "*Melanopsamma pomiformis*" (S). - Värmdö Mörtån 12 Aug 1891 H. Kugelberg "*Sphaeria pomiformis*" (S). - Aspvik Jun 1892 H. Kugelberg "*Melanopsamma pomiformis*" (S). - Solna Frösunda 23 Feb 1920 *Sorbus aucuparia* T. Vestergren "*Melanopsamma pomiformis*" det. F. Petrak (S). Västerbotten: Umeå Jul 1900 J. Vleugel "*Melanopsamma pomiformis*" (S). **Denmark:** Sjælland: Herfølge Nordgårdens hegn 10 Apr 1944 *Populus canadensis* Ø. Winge "*Melanopsamma pomiformis*" (C). **East-Germany:** Sydow: Mycotheca Marchica No. 4745: *Melanopsamma pomiformis*, Eggersdorf Strausberg Jul 1897 *Pyrus malus* P. Sydow (S).

### *Cryptodiaporthe salicella*

**Norway:** Ak: Ås: Aschjemskogen 2 coll. 12 Nov 1978 & 19 Nov 1978 *Salix caprea* R. Langnes (stat. conid.) (NPPI). Ro: Stavanger: Hillevåg 29 Apr 1974 *S. alba* A. Sletten (stat. conid.) (NPPI). Tr: Kvæfjord: Gullsfjordbotn WS 29,02 5 Jul 1981 2 coll. *S. glauca* ssp. *glauca* GM 133a, *S. lapponum* GM 134. Dyrøy:

Brøstadbotn XS 07,65 11 Jul 1981 2 coll. *S. lapponum* GM 402, 403. Without locality: s. dat. *Salix* S.C. Sommerfelt "*Diaporthe salicella*" det. Rostrup (cf. Rostrup (1904: 22)) (O). **Denmark:** Sjælland: Lyngby near Furesø 13 May 1901 *Salix pentandra* J. Lind "*Gnomonia salicella*" (C). - A churchyard in Kolding 10 Mar 1938 *Salix alba* P. Larsen "*Cryptodiaporthe salicina*" (C). - Trudsbro at Kolding Å 9 Feb 1964 *Salix* sp. A. Munk "*Cryptodiaporthe salicina*" (C). - Brorfelde Skov 30 Apr 1963 *Salix* A. Munk "*Cryptodiaporthe salicina*" (C). - Møens Klint 15 May 1963 *Salix caprea* A. Munk "*Cryptodiaporthe salicina*" (C).

### *Cryptosphaeria subcutanea*

**Norway:** ST: Oppdal: Oppdal 15 Jul 1973 *Salix hastata* A. Granmo 78/83 "*Cryptosphaeria vicinula*" (TROM). Tr: Harstad: Sørvik-Sørvikfjellet WS 60,20-61,19 7 Jul 1981 *S. nigricans* ssp. *nigricans* GM 232. Skånland: Tovik along Breiteigelva WS 75,19 7 Jul 1981 3 coll. *S. nigricans* ssp. *borealis* GM 263, 266, *S. nigricans* ssp. *nigricans* GM 269. Ibestad: Rolla Fugleberg WS 80,39 8 Jul 1981 *S. lanata* ssp. *lanata* GM 331a. Gratangen: Gratangsbøttn along Meelva XR 09-10,19 8 Jul 1981 2 coll. *S. nigricans* ssp. *nigricans* GM 287, 292. Bardu: Sørtdalen Sørmo DB 01,18 15 Jul 1981 2 coll. *S. nigricans* ssp. *borealis* GM 595, 604. Salangen: Seljeskogen XS 14,46 11 Jul 1981 2 coll. *S. nigricans* ssp. *borealis* GM 348, 351. - Skårvikdalen XS 13,45 11 Jul 1981 4 coll. *S. nigricans* ssp. *borealis* GM 366, *S. nigricans* ssp. *nigricans* GM 368, 371, 373. Målselv: S of Nordstrand DB 00,84 13 Jul 1981 *S. nigricans* ssp. *nigricans* GM 521. - Dividalen near Åsen DB 37,54 13 Jul 1981 2 coll. *S. nigricans* ssp. *borealis* GM 688, 690. - Dividalen near Svalheim DB 42,40 16 Jul 1981 2 coll. *S. nigricans* ssp. *borealis* GM 674, *S. nigricans* ssp. *nigricans* GM 668. - Dividalen Dødesvann DB 45,41 16 Sep 1982 3 coll. *S. nigricans* ssp. *borealis* GM 2241, 2245, 2255. Sørreisa: N of Rabbås CB 28,66 14 Jul 1981 6 coll. *S. nigricans* ssp. *borealis* GM 571, 574, *S. nigricans* ssp. *nigricans* GM 566, 568, 569, 581. Dyrøy: Brøstadbotn XS 07,65 11 Jul 1981 3 coll. *S. nigricans* ssp. *borealis* GM 384, 391, 393. Lenvik: W of Laukhella XS 12,83 12 Jul 1981 *S. nigricans* ssp. *borealis* GM 432. Balsfjord: Laksvatn DB 36,97 18 Jul 1981 4 coll. *S. nigricans* ssp. *borealis* GM 705, 707, *S. nigricans* ssp. *nigricans* GM 710, 713c. Tromsø: Tromsdalen Storsteinen DC 22,26-27 13 Sep 1982 5 coll. *S. nigricans* ssp. *borealis* GM 2026, 2052, 2053, 2054, 2055. Lyngen: Sørleangen near Botn DC 61,40 21 Jul 1981 2 coll. *S. nigricans* ssp. *nigricans* GM 955, 970. - Kvalvik DC 69,11 14 Sep 1982 3 coll. *S. nigricans* ssp. *borealis* GM 2075, 2085, 2097. Storfjord: Signaldalen near Rognli DB 64,67 15 Sep 1982 *S. nigricans* ssp. *borealis* GM 2168. - Skibotndalen SE of Øvrevatn DB 73,93 15 Sep 1982 4 coll. *S. hastata* GM 2190, *S. nigricans* ssp. *nigricans* GM 2201, *S. nigricans* ssp. *nigricans* x *phylicifolia* GM 2220, *S. phylicifolia* GM 2187. Kåfjord: Manndalen Dalen DC 81,08 18 Jul 1981 5 coll. *S. nigricans* ssp. *borealis* GM 750c, 753, 754, 767, 770. - Kåfjordbotn near Holmen DC 95,08 18 Jul 1981 *S. nigricans* ssp. *borealis* GM 787. Nordreisa: Reisadalen near Punta EC 17,10 19 Jul 1981 3 coll. *S. lapponum* GM 809, *S. nigricans* ssp. *borealis* GM 793a, 803a. - Straumfjordbotn Tretten EC 04,43 20 Jul 1981 5 coll. *S. nigricans* ssp. *borealis* GM 841, 854, 860a, 863, 864. - Reisadalen Bergmo EC 11,25 21 Jul 1981 2 coll. *S. nigricans* ssp. *borealis* GM 927, 935. - Reisadalen Josvatn-Josdalen EC 10,17 6 Sep 1982 3 coll. *S. nigricans* ssp. *borealis* GM 1909, 1912, 1917a. - Reisadalen Josdalen EC 09,15-16 6 Sep 1982 2 coll. *S. nigricans* ssp. *borealis* GM 1932, 1937. Kvænangen: Burfjorddalen W of Kåsen EC 41,57 19 Jul 1981 *S. nigricans* ssp. *borealis* GM 821. - Kvænangsbøttn W of Lassjav'ri EC 42,30 20 Aug 1983 *S. nigricans* ssp. *borealis* x *phylicifolia* GM 2451. **Finland:** Travastia australis. Tammela, Mustiala 1 coll. s. dat. & 2 coll. 5 Sep 1867 *Salix* P.A. Karsten No. 2371, 2372, 2377 "*Sphaeria vicinula*" (H). **Soviet Union:** Karsten, P.A.: Fungi Fenn. exs. No. 272: *Sphaeria vicinula* Nyl. Kola h.o.d. *Salix* s. dat. P.A. Karsten (H). - Lapponia tulomensis. Kola 18 Jul 1861 "ad cort. alni" N.D. Fellman, det. W. Nylander "*Sphaeria vicinula*" (H, lectotypus (?)). - Prope Kola versus Tuloma 25 Jul 1861 *Salix* P.A. Karsten No. 2369 "*Sphaeria vicinula*" (H). - Kola 25 Jul 1861 *Salix* P.A. Karsten "*Sphaeria vicinula*" (H, lectotypus fide Rappaz 1984).

### *Diatrype bullata*

**Norway:** Øf: Halden: Remmen 19 Sep 1975 *Salix* A.-E. Torkelsen 389/75 (O). Skjeberg: Stordal 5 Des 1979 *Salix* R. Kristiansen (O). Askim: Rom Jun 1933 A. Hagen 2 coll. (O). Råde: Finstad gård 27 Jun 1975 *Salix* L. Ryvarden 13395 (O). Ak: Ås: Årungen 16 Jun 1976 *Salix* R. Langnes (NPPI). Oppegård: Kolbotnvatnet 28 Mar 1964 *Salix* F.-E. Eckblad (O). Asker: Syverstadvannet 23 Apr 1972 *S. caprea* A.-E. Torkelsen 12/72 (O). Nannestad: Herstad 24 Sep 1968 *Salix* F.-E. Eckblad (O). O: Oslo: Ullern 13 Apr 1907 *Populus tremula* O. Hagem (O). - Mærradalen Apr 1912 *Salix* J. Egeland (O). - Slemdal 27 Apr 1952 *Alnus*(?) F.-E. Eckblad (O). - Sørkedalen 26 Oct 1969 *Salix* T. Schumacher (O). He: Ringsaker: S of Byssetervika PN 05,45 17 Nov 1974 "på løvved" E. Høgholen (O). Op: Gjøvik: Biri Hegge 25 May 1975 *Salix* A.-E. Torkelsen 115/75 (O). Lesja: Lesjaskogvatn 29 Jul 1972 *Salix* A.-E. Torkelsen 273/72 (O). Vang: Helinstrand 1863(?) *Betula* A. Blytt(?) (O). Bu: Ringerike: N of Ringerike Verk 29 Apr 1967 O. Skifte et al. (TROM). - Sundvollen 29 Apr 1967 O. Skifte et al. (TROM). - Vik 25 Apr 1969 *Salix* G. Gulden 5/69 (O). - Vik Sandviken 10 May 1969 *Salix* G. Gulden

33/69 (O). Modum: Tangen N of Fure at Tyrifjorden 17 May 1964 F.-E. Eckblad (O). Vf: Nøtterøy: Veierland Tangen 25 Jun 1975 *Salix* A.-E. Torkelsen 311/75 (O). Te: Bø: Grivi at Beverøya 8 May 1975 *Alnus* O. Vevele (BG). Sauherad: Grannes 24 Jul 1982 *Salix* B.F. Moen (BG). Tokke: Dalen 28 Jun 1973 *Salix* L. Ryvarden 11873 (O). AA: Grimstad: Fjære Søm 22 Sep 1977 *Salix* A.-E. Torkelsen 564/77 (O). Ro: Stavanger: Ullandhaug 16 Oct 1977 *Salix* A.-E. Torkelsen 948/77 (O). Hjelmeland: Førre Jøsenfjord 30 Jun 1967 L. Ryvarden (O). - Hjelmeland 28 Jun 1968 L. Ryvarden (O). Ho: Bergen: Hamre 29 Jun 1981 *Salix caprea* B.F. Moen (BG). Tysnes: Uggdalseidet Beltestad 15 Jul 1978 R. Hvoslef (BG). Odda: Tokheim 19 May 1972 *Salix* A.-E. Torkelsen 44/72 (O). Ullenvang: Brattespe 21 May 1972 *Salix* A.-E. Torkelsen 86/72 (O). Ulvik: Ulvik 5 Aug 1950 *Salix*(?) J. Stordal 4631 (BG). Sund: Sund 20 Sep 1981 *S. caprea* B.F. Moen (BG). Osterøy: Øvsthus 12 Jan 1964 O. Vevele (BG). - Hausvik 28 Apr 1981 *S. caprea* B.F. Moen (BG). SF: Gulen: Near Oppdalsøyra 28 Apr 1974 *Salix* F.-E. Eckblad (BG). Gaular: Bygstad Osen Aug 1972 O. Vevele (BG). Jølster: Befring LP 74,33 3 coll. 23 Jun 1974 *Salix* O. Befring 373 (BG), 3 Nov 1974 *S. caprea* O. Befring 394 (BG), 8 Aug 1978 *Salix* O. Befring (BG). - Haugen W of Skei LP 65,28 17 Oct 1974 *Salix* O. Befring 393 (BG). Førde: Erdal 30 Jun 1971 H. Østhagen (O). Gloppen: Hyen 10 Jul 1973 *Salix*(?) A. Granmo 12/73 (BG). Stryn: Varberg 1 Aug 1972 *Salix* A.-E. Torkelsen 341/72 (O). MR: Ålesund: Nervøy 2 Jan 1974 I. Røsberg (BG). Stranda: Geiranger 12 Jul 1973 A. Granmo (BG). Sunndal: Sunndalsøra 14 Jul 1973 *Salix*(?) A. Granmo (BG). - Sunndalsøra near Driva 15 Jul 1973 *Populus tremula* A. Granmo (BG). ST: Trondheim: Gjerdet NR 52NE 24 Sep 1974 *Salix caprea* S. Sivertsen (TRH). - Ladehammeren NR 713.366 23 Feb 1975 *Populus tremula* A. Garthe 2 coll. (TRH). Rissa: Rissa 18 Jul 1973 *Salix*(?) A. Granmo (BG). Oppdal: Oppdal 15 Jul 1973 *Salix*(?) A. Granmo (BG). Midtre Gauldal: Støren 16 Jul 1973 *Salix* A. Granmo (BG). Melhus: Melhus NR 62SW 2 Jun 1975 *S. triandra* S. Sivertsen & T. Schumacher (TRH). NT: Steinkjer: Steinkjer 19 Jul 1973 *Salix* A. Granmo (BG). Grong: Grong UM 72,51 15 Sep 1969 *S. caprea* S. Sivertsen (TRH). No: Rana: Storalteren 10 Sep 1976 *Salix* A.-E. Torkelsen 735/76 (O). Saldal: Saldalen s. dat. *S. caprea* S.C. Sommerfelt 2 coll. "*Sphaeria disciformis*" (O). - Saldalen Jan 1824 *Alnus* S.C. Sommerfelt "*Sphaeria disciformis*" (O). - Junkerdalen 10 Aug 1971 *Salix* A.-E. Torkelsen (O). - Røklund 23 Jul 1973 *Salix* A. Granmo (BG). Fauske: Kvænflåget WQ 15 8 May 1976 *Populus* H. Andersen (TROM). Bodø: W of Børvatn 26 May 1968 H. Andersen 260 (O). - Vågø VQ 76 25 Apr 1975 *Salix caprea* S. Sivertsen (TRH). Tysfjord: Hellemobotn WR 654,224 17 Aug 1978 *Salix* A. Elvebakk 78: 608 (TROM). Narvik: Skjomen Elvegård 17 Oct 1979 *Salix* A. Granmo 430/79 (TROM). - Skjomen Klubbvik 29 Aug 1981 *Salix* A. Granmo 330/81 (TROM). Tr: Gratangen: Gratangsbøtn along Meelva XR 09-10,19 8 Jul 1981 2 coll. *S. nigricans* ssp. *nigricans* GM 279, 281. Lyngen: Kvalvik DC 69,11 14 Sep 1982 4 coll. *S. nigricans* ssp. *borealis* GM 2083, 2094, 2099, *S. nigricans* ssp. *nigricans* GM 2111. Without locality: s. dat. *Salix* s. nom. coll. 2 coll. det. Rostrup (O). **Sweden:** Södermanland: Nacka s:n, Nacknäs Jul 1888 *Salix caprea* L. Romell (UPS). Uppland: Vänge s:n, SW of Liffland 1 Nov 1946 *Salix* G. Sandberg (UPS). - Holm par., the shore of the L. Mälaren (Gorran) c. 150 m ESE of the cottage Skogshagen 15 Mar 1980 *Salix fragilis* K. & L. Holm No. 1952b (UPS). - Dalby par., c. 150 m NNE of Jerusalem 12 May 1980 *Salix caprea* K. & L. Holm No. 2121b (UPS).

### *Enchnoa infernalis*

**Norway:** O: Oslo: Montebello s. dat. *Quercus* s. nom. coll. det. Rostrup (cf. Rostrup (1904: 16)) (O). Tr: Kvænangen: Badderer EC 39,50 5 Sep 1982 *S. nigricans* ssp. *nigricans* x *myrsinites* GM 1869a. **East-Germany:** Leipzig s. dat. & nom. coll. (K). - Leipzig May 1874 s. nom. coll. (C). Without locality: Petrak, F.: Fungi Alb. et Bros. exs. No. 124: *Enchnoa infernalis* (Kze.) Sacc. 4 Oct 1918 *Quercus* F. Petrak (K).

### *Glyphium* cf. *schizosporum*

**Norway:** Tr: Harstad: Sørvik-Sørvikfjellet WS 60,20-61,19 7 Jul 1981 *Salix nigricans* ssp. *nigricans* GM 230. Lavangen: Høgtind Bukkemyra XS 15,19-20 22 Aug 1983 3 coll. *S. lanata* ssp. *lanata* GM 2534a, 2536, 2537a. Salangen: Skårvikdalen XS 13,45 11 Jul 1981 *S. nigricans* ssp. *borealis* GM 365. Målselv: Dividalen Dødesvann DB 45,41 21 Aug 1983 *S. lanata* ssp. *lanata* GM 2500b. Tranøy: Vangsvik XS 09,76 12 Jul 1981 *S. caprea* ssp. *coetanea* GM 429b. Lenvik: W of Laukhella XS 12,83 12 Jul 1981 4 coll. *S. nigricans* ssp. *borealis* GM 453c, 455a, *S. pentandra* GM 442a, 445. Balsfjord: The outlet of Laksvatn DB 36,97 18 Jul 1981 *S. lanata* ssp. *lanata* x ssp. *glandulifera* GM 729. Tromsø: Tromsøya S of Langnes DC 19,30 24 Aug 1982 2 coll. *S. lanata* ssp. *glandulifera* GM 1814, *S. lanata* ssp. *lanata* x ssp. *glandulifera* GM 1816. - Tromsdalen Storsteinen DC 22,26-27 13 Sep 1982 7 coll. *S. caprea* ssp. *coetanea* GM 2061, *S. nigricans* ssp. *borealis* GM 2014, 2019, 2047, 2056, *S. nigricans* ssp. *nigricans* GM 2007, 2040. Karlsøy: Karlsøy DC 58-59,66 22 Jul 1981 *S. nigricans* ssp. *borealis* GM 894c. Skjervøy: Arnøy Årviksand DC 81,86 20 Jul 1981 *S. glauca* ssp. *glauca* x *nigricans* ssp. *nigricans* GM 913a.

***Herpotrichiella collapsa***

Norway: Tr: Harstad: Sørvik Sørvikfjellet WS 60,20-61,19 7 Jul 1981 2 coll. *Salix nigricans* ssp. *borealis* GM 211b, *S. nigricans* ssp. *nigricans* GM 230a. Ibestad: Rolla between Agneset and Hamran WS 77,26 8 Jul 1981 *S. nigricans* ssp. *borealis* GM 311c. - Rolla near Rognvik WS 82,27 8 Jul 1981 *S. nigricans* ssp. *nigricans* GM 315b. - Rolla Sørrollnes WS 74,26 8 Jul 1981 *S. nigricans* ssp. *borealis* GM 372a. Lavangen: Høgtind Bukkemyra XS 15,19-20 22 Aug 1983 3 coll. *S. lanata* ssp. *lanata* GM 2530a, 2533c, 2536b. Målselv: Dividalen near Svalheim DB 42,40 16 Jul 1981 2 coll. *S. nigricans* ssp. *nigricans* GM 662c, 664a. - Dividalen near Åsen DB 37,54 16 Jul 1981 *S. nigricans* ssp. *borealis* GM 694a. Dividalen Dødesvann DB 45,41 16 Sep 1982 & 21 Aug 1983 8 coll. *S. glauca* ssp. *glauca* GM 2496b, 2506b, *S. lanata* ssp. *lanata* GM 2499, 2500a, 2502a, *S. nigricans* ssp. *borealis* GM 2240, 2251b, *S. nigricans* ssp. *borealis* x *glauca* ssp. *glauca* GM 2257a. Sørreisa: N of Rabbås CB 28,66 14 Jul 1981 2 coll. *S. nigricans* ssp. *nigricans* GM 565a, *S. pentandra* GM 556. Balsfjord: The outlet of Laksvatn DB 36,97 18 Jul 1981 *S. nigricans* ssp. *borealis* GM 561d. Tromsø: Tromsøya Folkeparken DC 18-19,26 30 Sep 1981 *S. nigricans* ssp. *borealis* GM 1100. - Tromsøya S of Langnes DC 19,30 24 Aug 1982 *S. nigricans* ssp. *borealis* GM 1809a. - Tromsdalen Storsteinen DC 22,26-27 13 Sep 1982 2 coll. *S. nigricans* ssp. *borealis* GM 2015, 2049a. Storfjord: Signaldalen near Rognli DB 64,67 15 Sep 1982 *S. nigricans* ssp. *borealis* GM 2143a. Kåfjord: Manddalen Dalen DC 81,08 18 Jul 1981 *S. pentandra* GM 766. - Kåfjorddalen 2 km SE of Sabitjåkka EB 02,97 7 Sep 1982 13 coll. *S. glauca* ssp. *glauca* GM 1980a, 1981c, 1988, *S. hastata* GM 1994a, *S. lanata* ssp. *lanata* GM 1956d, 1958, 1963c, 1969a (holotypus), 1971b, 1972, 1973a, 1974b, *S. lapponum* GM 1991a. - Kåfjorddalen SE of Sabitjåkka EB 01,98 20 Aug 1983 *S. lanata* ssp. *lanata* GM 2492b. Skjervøy: Arnøy Årviksand DC 81,86 20 Jul 1981 *S. nigricans* ssp. *borealis* GM 894. Kvænangen: Badderen EC 39,50 5 Sep 1982 *S. nigricans* ssp. *nigricans* GM 1863d. - Kvænangsbøtn W of Lassjav'ri EC 42,30 20 Aug 1983 *S. nigricans* ssp. *nigricans* x *phylicifolia* GM 2457.

***Hypoxyton macrosporum***

Norway: No: Evenes: Forra Huggevik WR 860,955 7 Jun 1981 *Salix* GM, *S. Dunfeld*, A. Granmo AG 69/81 (TROM). Tr: Ibestad: Between Agneset and Hamran WS 77,26 8 Jul 1981 2 coll. *Salix nigricans* ssp. *borealis* GM 310b, 311. Lavangen: Høgtind Bukkemyra XS 15,19-20 22 Aug 1983 7 coll. *S. glauca* ssp. *glauca* GM 2523, 2546, *S. lanata* ssp. *lanata* GM 2524a, 2534, 2536a, 2544, *S. nigricans* ssp. *nigricans* GM 2528. Salangen: Skårvik XS 13,44 11 Jul 1981 *S. nigricans* ssp. *nigricans* x *phylicifolia* GM 338. - Skårvikdalen XS 13,45 11 Jul 1981 *S. nigricans* ssp. *borealis* GM 372. Målselv: Dividalen: Dødesvann DB 45,41 16 Sep 1982 & 21 Aug 1983 8 coll. *S. glauca* ssp. *glauca* GM 2517, *S. lanata* ssp. *lanata* GM 2502, 2503, *S. nigricans* ssp. *borealis* GM 2231, 2233, 2242, 2250, *S. nigricans* ssp. *borealis* x *glauca* ssp. *glauca* GM 2257. Tranøy: N of Vangsvik XS 09,77 12 Jul 1981 *S. lapponum* GM 424. - Vangsvik XS 09,76 12 Jul 1981 *S. nigricans* ssp. *nigricans* GM 429. Berg: E of Elvevoll WS 95,97 13 Jul 1981 4 coll. *S. nigricans* ssp. *borealis* GM 515, 516, *S. nigricans* ssp. *nigricans* GM 490, 513. Lenvik: W of Laukhella XS 12,83 12 Jul 1981 5 coll. *S. nigricans* ssp. *borealis* GM 449, 452, 453, 455, *S. nigricans* ssp. *nigricans* GM 458. Balsfjord: NW of Laksvatn DB 35,97 18 Jul 1981 *S. nigricans* ssp. *borealis* GM 735. Tromsø: Tromsdalen DC 23,26 20 Sep 1981 *S. nigricans* ssp. *nigricans* GM 1161. - Russevankskardet DC 36-37,26 5 Jul 1982 3 coll. *S. glauca* ssp. *glauca* GM 1469, *S. lanata* ssp. *glandulifera* GM 1470, *S. nigricans* ssp. *borealis* GM 1468. - Tromsdalen Storsteinen DC 22,26-27 13 Sep 1982 7 coll. *S. caprea* ssp. *coaetanea* GM 2061a, *S. nigricans* ssp. *borealis* GM 2012, 2016, 2027a, 2049, 2057, *S. nigricans* ssp. *nigricans* GM 2002. Karlsøy: Karlsøy DC 58-59,66 22 Jul 1981 7 coll. *S. nigricans* ssp. *borealis* GM 984, 988, 989, 1010, 1011, *S. nigricans* ssp. *nigricans* GM 999, 1001. Lyngen: Sørleangen near Bøtn DC 61,40 21 Jul 1981 4 coll. *S. nigricans* ssp. *borealis* GM 950, *S. nigricans* ssp. *nigricans* GM 957, 959, 961. Kåfjord: Manddalen Dalen DC 81,08 18 Jul 1981 3 coll. *S. nigricans* ssp. *borealis* GM 749, 756, 761. - Kåfjorddalen 2 km E of Sabitjåkka EB 02,97 7 Sep 1982 2 coll. *S. glauca* ssp. *glauca* GM 1981, *S. lanata* ssp. *lanata* GM 1973. - Kåfjorddalen 500 m SE of Sabitjåkka EB 01,98 20 Aug 1983 5 coll. *S. glauca* ssp. *glauca* GM 2494, *S. glauca* ssp. *stipulifera* GM 2480, 2484a, *S. lanata* ssp. *lanata* GM 2489, *S. lanata* ssp. *lanata* x *hastata* GM 2476. Skjervøy: Arnøy Årviksand DC 81,86 20 Jul 1981 10 coll. *S. nigricans* ssp. *borealis* GM 879, 880, 881, 882, 891, 892, 893, 894, 897, & on coll. 877a. Nordreisa: Sørkjosen 3 Aug 1973 *Salix* A. Granmo 221/73 (TROM; dubl. of 8 macro (BG)). - Reisadalen Josvatn-Josdalen EC 10,17 6 Sep 1982 4 coll. *S. lapponum* GM 1923, 1924, 1927. *S. nigricans* ssp. *borealis* GM 1907. - Reisadalen Josdalen EC 09,15-16 6 Sep 1982 3 coll. *S. arbuscula* GM 1953, 1954, *S. glauca* ssp. *glauca* GM 1947. Kvænangen: Kvænangsbøtn W of Lassjav'ri EC 42,30 20 Aug 1983 *S. nigricans* ssp. *nigricans* x *phylicifolia* GM 2454. Fi: Porsanger: Russenes 5 Aug 1973 *Salix* A. Granmo 250/73 (TROM; dubl. of 6 macro (BG)). Lebesby: Ifjord 7 Aug 1973 *Salix* A. Granmo 259/73 (TROM; dubl. of 4 macro (BG)). References: Tr: Balsfjord 5 km W of Vollan 1 Aug 1973 *Salix* I. Granmo & AG 200/73 (Granmo 1977: 63). Tromsø: Tromsøya s. dat. *Salix* J.M. Normann (Granmo 1977: 64).

***Hypoxylon mammatum***

**Norway:** Tr: Skånland: Tovik along Breiteigelva WS 75,19 7 Jul 1981 3 coll. *Salix nigricans* ssp. *nigricans* GM 260, 265, 268. Bjarkøy: Sandsøy Altevik WS 67,49 6 Jul 1981 *S. nigricans* ssp. *nigricans* GM 203. Ibestad: Rolla Fugleberg WS 80,39 8 Jul 1981 5 coll. *S. nigricans* ssp. *borealis* GM 330, *S. nigricans* ssp. *nigricans* GM 333, 334, 335, 336. Bardu: Sjørdalen Sørmo DB 01,18 15 Jul 1981 *S. nigricans* ssp. *borealis* GM 449. Målselv: Dividalen near Svalheim DB 42,40 16 Jul 1981 3 coll. *S. nigricans* ssp. *nigricans* GM 662, 665, 669. Dividalen near Åsen DB 37,54 16 Jul 1981 3 coll. *S. nigricans* ssp. *borealis* GM 692, 693, 700. - Dividalen Dødesvann DB 45,41 16 Sep 1982 *S. nigricans* ssp. *borealis* GM 2251. Dyrøy: Brøstadbotn XS 07,65 11 Jul 1981 5 coll. *S. nigricans* ssp. *borealis* GM 386, 392, 396a, *S. nigricans* ssp. *nigricans* GM 377, 394. Balsfjord: E of Hamnes DB 40,80 19 Apr 1980 *Salix* A. Elvebakk, *S. Sandvik* AE 80: 166 (TROM). - The outlet of Laksvatn DB 36,97 18 Jul 1981 3 coll. *S. nigricans* ssp. *borealis* GM 704, *S. nigricans* ssp. *nigricans* GM 709, 712. - NW of Laksvatn DB 35,97 18 Jul 1981 2 coll. *S. nigricans* ssp. *borealis* GM 730, 732. Tromsø: Tromsøya Folkeparken DC 19,26 12 Aug 1981 *S. nigricans* ssp. *borealis* GM 1057. - Hundbergan DC 23,17 19 Sep 1981 *S. nigricans* ssp. *borealis* GM 1158. - Tromsøya Folkeparken DC 18-19,26 30 Sep 1981 2 coll. *S. nigricans* ssp. *borealis* GM 1098, 1101. Lyngen: Kvalvik DC 69,11 14 Sep 1982 10 coll. *S. nigricans* ssp. *borealis* GM 2084, 2089, 2095, 2102, 2103, *S. nigricans* ssp. *nigricans* GM 2105, 2114, 2124, 2127. Storfjord: Signaldalen near Rognli DB 64,67 15 Sep 1982 6 coll. *S. nigricans* ssp. *borealis* GM 2142, 2154, 2161, 2162, 2163a, 2166. - Skibotndalen SE of Øvrevatn DB 73,93 15 Sep 1982 5 coll. *S. hastata* GM 2189, 2192, *S. nigricans* ssp. *nigricans* x *phylicifolia* GM 2216, *S. phylicifolia* GM 2227, 2228a. Kåfjord: Manndalen Dalen DC 81,08 18 Jul 1981 7 coll. *S. nigricans* ssp. *borealis* GM 746, 750b, 751, 752, 768, 774, *S. nigricans* ssp. *nigricans* GM 758. - Manndalen Elvelund DC 82,06 18 Jul 1981 *S. nigricans* ssp. *borealis* GM 781. Nordreisa: Reisadalen near Punta EC 17,10 19 Jul 1981 6 coll. *S. nigricans* ssp. *borealis* GM 789, 793, 798, 802, 804, 811. - Straumfjordbotn Tretten EC 04,43 20 Jul 1981 *S. nigricans* ssp. *borealis* GM 866. - Reisadalen Bergmo EC 11,25 21 Jul 1981 5 coll. *S. nigricans* ssp. *borealis* GM 924, 930, 936, 938, *S. nigricans* ssp. *nigricans* GM 933. - Reisadalen Josdalen EC 09,15-16 6 Sep 1982 *S. nigricans* ssp. *borealis* GM 1931. Kvænangen: Burfjorddal W of Kåsen EC 41,57 19 Jul 1981 3 coll. *S. nigricans* ssp. *borealis* GM 820a, 825, 831. - Badden EC 39,50 5 Sep 1982 *S. nigricans* ssp. *borealis* GM 1844, 1849, 1851, 1855, *S. nigricans* ssp. *nigricans* GM 1824, 1825, 1826, 1831, 1834, 1835, 1836, 1837, 1862, 1863c, 1865. Fi: Tana: Tana Bru along Seidajäkka 8 Aug 1973 *Salix* A. Granmo 270/73 (TROM; dubl. of 6 mamm (BG)). Reference: Tr: Lyngen: Lyngseidet 2 Aug 1973 *Salix* I. Granmo & AG 208/73 (Granmo 1977: 111).

***Hysterographium elongatum***

**Norway:** Bærum: Bjerke Nov 1825 S.C. Sommerfelt (O), O: Oslo: s. dat. Blytt "*Hysterographium fraxini*" (O). - Malmøya s. dat. Blytt (O). - Frogner s. dat. *Lonicera* Blytt (O). - Bogstadåsen 1840 *Populus tremula* s. nom. coll. det. Rostrup (O). - Skådalen 1840 *Populus tremula* N.G. Moe (O). MR: Kristiansund: Kolvikbukta MR 420,009 12 Jun 1978 *Populus tremula* A. Elvebakk "*Hysterographium fraxini*" (TRH). Rauma: Åndalsnes 13 Jul 1973 *Populus tremula* A. Granmo (BG). Tingvoll: Bokksaspa MQ 48NV 7 Apr 1978 *Corylus*(?) A. Elvebakk "*Hysterographium fraxini*" (TRH). Smøla: Kuli MR 54,19 12 Oct 1983 *Sorbus aucuparia* S. Sivertsen 83-199 "*Hysterographium fraxini*" (TRH). ST: Oppdal: Drivstuen 13 Jun 1864 Th.M. Fries "*Hysterium elongatum*" (UPS). No: Saltdal: Saltdalen 3 coll. S.C. Sommerfelt Aug 1819 *Salix caprea*, Apr 1823 "på løvved", Feb 1824 *Populus tremula* (O). Bodø: Soløyvatn 22 May 1971 *Salix* H. Andersen (TROM). Tr: Kvæfjord: Gullefjordbotn WS 29,02 5 Jul 1981 *Salix caprea* ssp. *caprea* GM 146. Harstad: Sørvik Sørvikfjellet WS 60,20-61,19 7 Jul 1981 4 coll. *S. caprea* ssp. *coetanea* GM 235, 236, *S. nigricans* ssp. *borealis* GM 211, *S. pentandra* GM 221. Skånland: Tovik along Breiteigelva WS 75,19 7 Jul 1981 *S. nigricans* ssp. *borealis* GM 254. Ibestad: Rolla Hamnvik WS 87,30 8 Jul 1981 *S. pentandra* GM 319. Gratangen: Gratangsbotten along Meelva XR 09-10,19 8 Jul 1981 *S. nigricans* ssp. *nigricans* GM 272. Bardu: Setermoen 9 Feb 1970 *Populus tremula* D.O. Øvstedal (BG). - Sjørdalen Sørmo DB 01,18 15 Jul 1981 *Salix nigricans* ssp. *borealis* GM 600a. Dyrøy: Brøstadbotn XS 07,65 11 Jul 1981 2 coll. *S. nigricans* ssp. *nigricans* GM 375a, *S. pentandra* GM 390. Torsken: Gryllefjordbotn WS 83-84,96 12 Jul 1981 *S. caprea* ssp. *coetanea* GM 466. Balsfjord: The outlet of Laksvatn DB 36,97 18 Jul 1981 *S. pentandra* GM 720. Tromsø: Russevankskardet DC 36-37,26 5 Jul 1982 *S. caprea* ssp. *coetanea* GM 1473. - Tromsdalen Storsteinen DC 22,26-27 13 Sep 1982 3 coll. *S. nigricans* ssp. *borealis* GM 2022, 2046, 2050. Lyngen: Sørleangen near Botn DC 61,40 21 Jul 1981 *S. nigricans* ssp. *borealis* GM 945. Storfjord: Skibotndalen Lulle 21 Jun 1911 B. Lyng "*Hysterographium fraxini*" (O). - Skibotndalen SE of Øvrevatn DB 73,93 15 Sep 1982 3 coll. *S. nigricans* ssp. *nigricans* x *phylicifolia* GM 2218, *S. phylicifolia* GM 2212, 2215. Kåfjord: Manndalen Elvelund DC 82,06 18 Jul 1981 *S. nigricans* ssp. *borealis* GM 748. - Manndalen Dalen DC 81,08 18 Jul 1981 2 coll. *S. nigricans* ssp. *borealis* GM 759a, 764. **Sweden:** Småland: Fungi exs. suecici, p. upsal. No. 2264: *Hysterographium elongatum* (Wahl. ex Fr.) Cda. Kärda parish 2 coll. 17 Jul 1944 "on a



decorticated, fallen trunk of beech" S. Lundell (C & UPS). Uppland: Vaksala s:n, Vitulfsberg 1852 E.P. Fries (UPS). - Uppsala Norby 4 coll. 1857 E.P. Fries "*Hysterium elongatum*" (C). - Bondkyrka s:n, "strax öster om Vårdsåtra naturpark" 13 May 1915 H. Osvald (UPS). - Fungi exs. suecici, p. upsal. No. 291: *Hysterographium elongatum* (Wahl. ex Fr.) Cda. Near Uppsala 20 May 1935 *Salix* sp. S. Lundell (C). - Petrak, F.: Mycotheca generalis No. 150: *Hysterographium elongatum* (Wahl.) Cda. Bei Uppsala Nov 1935 *Salix* S. Lundell (UPS). - Svinsskinsskogen 15 Jun 1947 *Populus tremula*(?) J.A. Nannfeldt (UPS). - Lidingsö Stäcklinge 1 Apr 1919 L. Romell (UPS). - Fl. Suecica No. 3885: *Hysterographium elongatum* (Wahl.) Cda. Almunge s:n, Harparbol lund 6 May 1923 J.A. Nannfeldt (UPS). - Fl. Suecica No. 14305: *Hysterographium elongatum*, Vendel parish, between Hof and Skarbo 27 May 1956 "lignum putridum" J.A. Nannfeldt (UPS). Gästrikland: Fungi exs. suecica, p. upsal. No. 2265: *Hysterographium elongatum* (Wahl. ex Fr.) Cda. Gävle Tolffors 6 Aug 1947 "on fallen decorticated branches of frondose trees" J.A. Nannfeldt No. 9502 (C). Västerbott: Umeå Nov 1907 *Alnus* J. Vleugel (C). Torne Lappmark: Abisko 19 Jun 1948 "in ramis populinis(?)" J.A. Nannfeldt (UPS). **Finland:** Lapponia Kemensis 16 Aug 1802 *Salix caprea* G. Wahlenberg (UPS). - Mustiala 22 Aug 1873 *Populus* P.A. Karsten "*Hysterium elongatum*" (UPS). - Karsten, P.A.: Fungi Fenn. exs. No. 169: *Hysterium elongatum* Wahl. Merimasku a. May 1883 *Salix* P.A. Karsten (K). Without locality: 2 coll. s. dat. & nom. coll. "*Hysterium elongatum*" (C).

#### *Keissleriella* cf. *cladophila*

**Norway:** Tr: Bardu: Storalen near Bruhaugen CB 93,44 15 Jul 1981 *Salix phylicifolia* GM 653. Salangen: Skårvikdalen XS 13.45 11 Jul 1981 *S. nigricans* ssp. *borealis* GM 367. Tromsø: Tromsdalen Storsteinen DC 22,26-27 17 Sep 1982 3 coll. *S. lanata* ssp. *lanata* x ssp. *glandulifera* GM 2068, *S. nigricans* ssp. *nigricans* GM 2003, 2038a. Storfjord: Signaldalen near Rognli DB 64,67 15 Jun 1982 10 coll. *S. lapponum* GM 2134a, *S. nigricans* ssp. *borealis* GM 2152, 2155, 2156, 2157, 2169b, 2170, *S. nigricans* ssp. *nigricans* GM 2177, 2179, 2180a. Nordreisa: Reisadalen near Punta EC 17,10 19 Jul 1981 2 coll. *S. nigricans* ssp. *borealis* GM 796, 803b. - Straumfjordbotn Tretten EC 04,43 20 Jul 1981 2 coll. *S. nigricans* ssp. *borealis* GM 855a, 861. - Reisadalen Bergmo EC 11,25 21 Jul 1981 *S. nigricans* ssp. *borealis* GM 931. - Reisadalen near Snemyr EC 04,37 6 Sep 1982 *S. nigricans* ssp. *borealis* GM 1903. Reisadalen Josedalen EC 09,15-16 6 Sep 1982 2 coll. *S. nigricans* ssp. *borealis* GM 1938, 1940. Kvænangen: Badderen EC 39,50 5 Sep 1982 3 coll. *S. nigricans* ssp. *borealis* GM 1845, 1847, *S. nigricans* ssp. *nigricans* GM 1861. **East-Germany:** Krieger: Fungi sax. exs. No. 2113: *Didymella cladophila* (Niessl) Sacc. Wehlen 19 May 1910 "auf durren Aestchen von *Genista tinctoria*" W. Krieger (S). **Austria:** Petrak, F.: Mycotheca generalis No. 427: *Didymella cladophila* (Niessl) Sacc. Mähre Mähr.-Weisskirchen Hrabuvka Nov 1924 *Genista tinctoria* F. Petrak (S). - Petrak, F.: Fl. Bohem. Mor. exs. No. 1587: *Didymella cladophila* (Niessl) Sacc. Mähren Mähr.-Weisskirchen Hrabuvka 1932 *Genista tinctoria* F. Petrak (S).

#### *Kirschsteiniethelia aethiops*

**Norway:** O: Oslo: Abbediengen s. dat. *Quercus*(?) s. nom. coll. det. Rostrup "*Amphisphaeria applanata*" (cf. Rostrup (1904: 23)) (O). No: Narvik: Skjomen Elvegård 17 Oct 1979 A. Granmo "*Astrosphaeriella applanata*" (TROM). Tr: Gratangen: Gratangsbotten along Meelva XR 09-10,19 8 Jul 1981 2 coll. *S. nigricans* ssp. *nigricans* GM 275, 280a. Bardu: Sjørdalen Sjøromo DB 01,18 15 Jul 1981 *S. nigricans* ssp. *borealis* GM 606a. Målselv: S of Nordstrand DB 00,84 13 Jul 1981 *S. nigricans* ssp. *borealis* GM 541a. **Sweden:** Uppland: Kulla par., Nybylund 24 Feb 1980 "hazel- and oakgrove" K. & L. Holm No. 1920 "*Kirschsteiniella applanata*" (UPS). Västmanland: Västerås-Barkarö s:n, Ridön 1845 M.A. Lindblad "*Sphaeria pomiformis*" (S). **Denmark:** Bornholm: Døndalen distr. 47 12 Oct 1964 "on very rotten wood" A. Munk leg. & det. "*Kirschsteiniella applanata*" (C). **Great Britain:** Glovers wood Surrey 22 Apr 1935 E.W. Mason "*Kirschsteiniella applanata*" (K). - Ruislip Mar 1945 "on dead Hornbeam wood" R.W.G. Dennis "*Kirschsteiniella applanata*" (K). **West-Germany:** Rehm: Ascomycetes No. 2063: *Amphisphaeria applanata* (Fr.) Ces. & de Not. Ramsau bayr. Alpen Jul 1913 *Carpinus* Rehm (W).

#### *Leptosphaeria hendersoniae*

**Norway:** He: Stor-Elvdal: Koppang ca. 5 Aug 1977 *Salix aurita* R. Langnes "*Melanomma pulvis-pyrius*" (NPPI). NT: Verran: Verrastranda 24 Jul 1977 *Salix caprea* R. Langnes "*Melanomma pulvis-pyrius*" (NPPI). - Verrastranda Storengt 30 Jul 1977 *S. alba* R. Langnes "*Melanomma pulvis-pyrius*" (NPPI). Tr: Kvæfjord: Gullsfjordbotn WS 29,02 5 Jul 1981 *Salix nigricans* ssp. *nigricans* GM 155. Harstad: Sørvik-Sørvikfjellet WS 60,20-61,19 7 Jul 1981 3 coll. *S. nigricans* ssp. *borealis* GM 209, *S. pentandra* GM 223, 224. Bjarkøy: Sandsøy Nordstrand-Veten WS 67,50 6 Jul 1981 2 coll. *S. nigricans* ssp. *nigricans* GM 204b, 205. Gratangen: Gratangsbotten along Meelva XR 09-10,19 8 Jul 1981 3 coll. *S. nigricans* ssp. *nigricans* GM 279a, 286, 290. Målselv: Dividalen near Åsen DB 37,54 16 Jul 1981 *S. caprea* ssp. *coetanea* GM 696. Sørreisa: N of Rabbås CB 28,66 14 Jul 1981 2 coll. *S. hastata* GM 555, *S. nigricans* ssp. *nigricans* GM 559. Tranøy: N of Vangsvik

XS 09.77 12 Jul 1981 2 coll. *S. lapponum* GM 421, *S. nigricans* ssp. *borealis* GM 418. - Vangsvik XS 09,76 12 Jul 1981 *S. nigricans* ssp. *nigricans* GM 429b. Torsken: Gryllefjordbotn WS 83-84,96 12 Jul 1981 *S. nigricans* ssp. *nigricans* GM 479. Tromsø: Tromsøya Folkeparken DC 19,26 12 Aug 1981 *S. nigricans* ssp. *borealis* GM 1065. - Tromsdalen Storsteinen DC 22,26-27 13 Sep 1982 7 coll. *S. lanata* ssp. *lanata* x ssp. *glandulifera* GM 2066, *S. nigricans* ssp. *borealis* GM 2013, 2017, 2020, 2045, *S. nigricans* ssp. *nigricans* GM 2042, 2043. Storfjord: Signaldalen near Rognli DB 64,67 15 Sep 1982 2 coll. *S. nigricans* ssp. *borealis* GM 2141b, *S. pentandra* GM 2181b. Nordreisa: Straumfjordbotn Tretten EC 04,43 20 Jul 1981 2 coll. *S. nigricans* ssp. *borealis* GM 855, 856. - Kvænangsfjellet EC 20,54 6 Sep 1982 *S. nigricans* ssp. *borealis* GM 1897a. Without locality: s. dat. *Salix* S.C. Sommerfelt (?) No. 458 "*Metasphaeria cinerea*" (cf. Rostrup (1904: 24)) (O). **Sweden:** Närke: Kumla 14 Aug 1885 *Salix caprea* L. Romell "*Melanomma hendersoniae*" det. L. Holm (S). Uppland: Uppsala 1 Apr 1894 *Salix* sp. L. Romell "*Melanomma hendersoniae*" det. L. Holm (S). - Carolinaparken 1 May 1894 "an berindeten *Salix*-åsten" L. Romell "*Melanomma hendersoniae*" det. L. Holm (S). **West-Germany:** Rehm: Ascomyceten No. 1138: *Melanomma cinereum*, Südbayern Oberammergau Aug 1893 "an durren Aesten von *Salix nigricans*" Schnabel "*Melanomma hendersoniae*" det. L. Holm (S). **Austria:** Sonntagberg Mar 1913 *Salix caprea* Strasser "*Melanomma hendersoniae*" det. L. Holm (S). **Italy:** Riva Valdobbia 2 coll. 4 Apr 1897 *Salix elaeagnos* Carestia "*Melanomma hendersoniae*" det. L. Holm & 16 Apr 1899 *Salix alba* Carestia "*Melanomma hendersoniae*" (S).

#### *Lophiostoma macrostomoides*

**Norway:** Tr: Sørreisa: N of Rabbås CB 28,66 14 Jul 1981 *Salix pentandra* GM 585. Kåfjord: Kåfjorddalen 2 km SE of Sabitjåka EB 02,97 7 Sep 1982 *S. reticulata* GM 1998a. **Denmark:** Sjælland: Lyngby Mose 3 coll. 8 Oct 1908 *Salix cinerea* J. Lind (C), 20 Jan 1965 "on *Salix*-wood in fissure of a twig" & "on rotten wood" A. Munk (C). - Birkerød path Vasevej towards Furesø 25 Nov 1963 *Salix aurita* A. Munk (C). - Granløse 24 Jan 1964 *Salix caprea* A. Munk (C). - Furesøstien Bistrup 11 Des 1964 *Salix* A. Munk (C).

#### *Lophiostoma quadrinucleatum*

**Norway:** Tr: Storalen near Bruhaugen CB 93,44 15 Jul 1981 *Salix pentandra* GM 640. Målselv: Dividalen Dødesvann DB 45,41 16 Sep 1982 & 21 Aug 1983 2 coll. *S. glauca* ssp. *glauca* GM 2258, 2505b. Tromsø: Tromsdalen Storsteinen DC 22,26-27 13 Sep 1982 *S. nigricans* ssp. *borealis* GM 2028. Lyngen: Sørrenangen near Botn DC 61,40 21 Jul 1981 *S. nigricans* ssp. *nigricans* GM 959a. - Kvalvik DC 69,11 14 Sep 1982 *S. nigricans* ssp. *borealis* GM 2125. Storfjord: Signaldalen near Rognli DB 64,67 15 Sep 1982 *S. nigricans* ssp. *borealis* GM 2140. Skjervøy: Arnøy Årviksand DC 81,86 20 Jul 1981 2 coll. *S. nigricans* ssp. *borealis* GM 877, *S. nigricans* ssp. *nigricans* GM 898a. Nordreisa: Reisadalen near Snemyr EC 04,37 6 Sep 1982 *S. nigricans* ssp. *borealis* GM 1901a. **Finland:** Tavastia australis. Tammela Mustiala 25 Jul 1869 *Rhamnus frangula* P.A. Karsten No. 2612 leg. & det. (H, holotypus (?)). - Nylandia (N/U). Borgå (=Porvoo) 1922 *Berberis* W. Nyberg (aberrant form, H).

#### *Lophiotrema boreale*

**Norway:** Tr: Harstad: Sørvik-Sørvikfjellet WS 60,20-61,19 7 Jul 1981 2 coll. *Salix nigricans* ssp. *nigricans* GM 207, 218 (holotypus). Bardu: Sordalen Sørmo DB 01,18 15 Jul 1981 *S. nigricans* ssp. *borealis* GM 614. Målselv: Dividalen near Åsen DB 37,54 16 Jul 1981 *S. nigricans* ssp. *nigricans* GM 685a. Nordreisa: Reisadalen Jisdalen EC 09,15-16 6 Sep 1982 *S. nigricans* ssp. *borealis* GM 1941b. Kvænangen: Burfjorddalen W of Kåsen EC 41,57 19 Jul 1981 *S. nigricans* ssp. *borealis* GM 817b. Fi: Alta: Alta s. dat. N.G. Moe "*Melanomma pulvis-pyrius*" det. Rostrup (O).

#### *Lophiotrema nucula*

**Norway:** Tr: Harstad: Sørvik-Sørvikfjellet WS 60,20-61,19 7 Jul 1981 4 coll. *Salix nigricans* ssp. *borealis* GM 211a, 212, 214, 222b. Ibestad: Rolla between Agneset and Hamran WS 77,26 8 Jul 1981 2 coll. *S. nigricans* ssp. *borealis* GM 310, 311a. - Rolla N of Hamnvik WS 86,32 8 Jul 1981 *S. nigricans* ssp. *nigricans* GM 323. Bardu: Sordalen Sørmo DB 01,18 15 Jul 1981 *S. nigricans* ssp. *borealis* GM 617. Salangen: Skårvika XS 13,44 11 Jul 1981 *S. nigricans* ssp. *nigricans* x *phylicifolia* GM 338a. Målselv: S of Nordstrand DB 00,84 13 Jul 1981 *S. nigricans* ssp. *nigricans* GM 523a. - Dividalen Dødesvann DB 45,41 16 Sep 1982 *S. nigricans* ssp. *borealis* GM 2242a. Tromsø: Russevankskardet DC 36-37,26 5 Jul 1982 *S. caprea* ssp. *coetanea* GM 1474. Storfjord: Signaldalen near Rognli DB 64,67 15 Sep 1982 2 coll. *S. nigricans* ssp. *borealis* GM 2140a, 2160a. - Skibotndalen E of Øvrevatn DB 73,93 15 Sep 1982 *S. nigricans* ssp. *nigricans* x *phylicifolia* GM 2219. Kåfjord: Manndalen Dalen DC 81,08 18 Jul 1981 3 coll. *S. nigricans* ssp. *borealis* GM 756b, 773a, *S. pentandra* GM 766b. - Manndalen Elvelund DC 82,06 18 Jul 1981 2 coll. *S. nigricans* ssp. *borealis* GM 783, 784. Nordreisa: Reisadalen Josvatn-Jisdalen EC 10,17 6 Sep 1982 2 coll. *S. nigricans* ssp. *borealis* GM 1913a, 1920. -

Reisadalen Josdalen EC 09,15-16 6 Sep 1982 2 coll. *S. nigricans* ssp. *borealis* GM 1939, 1941a. Kvænangen: Badderen EC 39,50 5 Sep 1982 *S. nigricans* ssp. *borealis* GM 1850. **Finland:** Tavastia australis. Tammela Mustiala 2 coll. 21 Jul 1865 "ad cort. crass. *Salic*" & 21 Apr 1869 "ad *Salic*" P.A. Karsten No. 2764, 2766 "*Lophiostoma nucula*" (H). **Denmark:** Sjælland: Granløse 24 Jan 1964 "on rotten, decorticated branch of *Salix caprea*" A. Munk leg. & det. (C).

### *Melanomma fusciculum*

**Norway:** Ho: Osterøy: Haus Vatlø 4 May 1978 *Fraxinus excelsior* R. Langnes "*Melanomma pulvis-pyrius*" (NPPI). Tr: Lyngen: Kvalvik DC 69,11 14 Sep 1982 4 coll. *Salix nigricans* ssp. *borealis* GM 2076a, 2079, *S. nigricans* ssp. *nigricans* GM 2112, *S. pentandra* GM 2117a. **West-Germany:** München Neufriedenheim Jul 1905 *Populus* Rehm (K). **Italy:** Vittorio (Treviso) Oct 1873 "in ramis *Sambuci nigrae*" s. nom. coll. (K). Without locality: s. dat. & nom. coll. (K). - 7 Mar 1938 "on bark of *Phylica*" Y. Mejland No. 1693 (K) (Tristan da Cunha?).

### *Melanomma pulvis-pyrius*

**Norway:** Øf: Borge: Holm Torsnes 21 Feb 1930 *Salix fragilis* B. Lunde (O). Råde: Tomb landbruksskole 4 Jul 1973 *S. caprea* L. Ryvarden No. 11914 (O). Våler: Torstentjernelle S of Sæbyvatn 21 Feb 1965 *Alnus*(?) F.-E. Eckblad (O). Ak: Ås: Åsmoen 2 coll. 1 May 1969 *Sorbus aucuparia* 29 Feb 1976 *Betula* R. Langnes (NPPI). - Aschjemskogen 19 Nov 1978 *Betula* R. Langnes (NPPI). - Nordskogen 10 Des 1978 *Fagus sylvatica* R. Langnes (NPPI). - Ås Kirkejordet Sep 1982 *Rubus idaeus* cult. R. Langnes (NPPI). Asker: Asker 2 coll. Oct 1825 *Corylus avellana* S.C. Sommerfelt "*Sphaeria pulvis-pyrius*" (O). Eidsvoll: Bjugen 21 Nov 1976 *Betula* E. Jensson (BG). O: Oslo: "Christiana" 2 coll. s. dat. & nom. coll. det. Rostrup (O). - Aker 2 coll. s. dat. & nom. coll., 2 coll. May 1849 *Salix caprea* s. nom. coll. det. Rostrup (O). - Tøyen s. dat. *Betula* N.G. Moe, 2 coll. Jan 1841 & Mar 1842 s. nom. coll. det. Rostrup (O). - Tveten 2 coll. 1840 N.G. Moe (O). - Ljabro Oct 1840 *Betula* N.G. Moe det. Rostrup (O). - Prinsdal s. dat. & nom. coll. det. Rostrup (O). - Ekeberg s. dat. & nom. coll. det. Rostrup (O). - Frogner 1840 s. nom. coll. det. Rostrup (O). - Abbediengen s. dat. & nom. coll., 7 Apr 1912 J. Egeland (O). - Bygdøy 4 Apr 1912 *Salix* J. Egeland (O). - Montebello 2 coll. s. dat. & nom. coll. (O & TRH). - Skådalen 2 coll. 1840 s. nom. coll. det. Rostrup (O). - Bogstadåsen s. dat. & nom. coll. det. Rostrup (O). - Nordmarka 21 Sep 1879 A. Blytt det. Rostrup (O). - Brekke near Maridalen 4 Sep 1969 *Betula* B. & A. Foss (associated with *Diatrype stigma*) (O). He: Stor-Elvdal: Atnbrua Aug 1882 A. Blytt det. Rostrup (O). Op: Dovre: (possibly Oppdal/Trøndelag): Dovre s. dat. N.G. Moe (TRH), 3 coll. 1841 N.G. Moe det. Rostrup (O). Ringebru: Ringebru 2 coll Nov 1838 S.C. Sommerfelt "*Sphaeria pulvis-pyrius*" (O). Østre-Toten: Rådalen s. dat. N.G. Moe det. Rostrup (O). Bu: Hole: Vik 25 Apr 1969 *Betula* G. Gulden 6/69 (ass. with *Diatrype stigma*) (O). Vf: Tjølling: Viksfjord Vikørøy 28 Apr 1968 G. Gulden 43/68 (O). Te: Porsgrunn: Eidanger Øvre Bjørntvedt 2 coll. 10 May 1968 *Corylus* 1 May 1970 *Betula* A. Langangen (ass. with *Diatrype stigma*) (O). VA: Lyngdal: Hellenes 25 Oct 1970 *Betula* A. Tangen (ass. with *Diatrype stigma*) (O). Ho: Bergen: Natlandsfjellet 6 Jul 1976 *Betula* E. Jensson (BG). - Fantoft 25 Jul 1976 *Prunus padus* E. Jensson (BG). - Natland 21 Nov 1976 *Betula* E. Jensson (BG). - Langeskogen 18 Mar 1977 E. Jensson (BG). Fitjar: Sandvikvåg 13 May 1974 *Salix* F.-E. Eckblad (BG). Tysnes: Drange 8 Sep 1977 *Betula* E. Jensson (BG). Fusa: Håvik 3 Sep 1974 O. Balle "*Melanomma*" (BG). Modalen: Granheim 12 Jan 1973 *Ribes rubrum* I. Langedal (BG). - Duesund 28 Apr 1974 *Betula* F.-E. Eckblad (BG). Osterøy: Haus Rognved 5 Apr 1977 *Salix caprea* R. Langnes (NPPI). Lindås: Vågseidet 23 Mar 1973 *Betula pubescens* A. Granmo (BG). SF: Flora: Kinn 1 km E of Skorpeidet 29 Jun 1968 *Betula* K. Foss (ass. with *Diatrype stigma*) (O). Gulen: Brekke Brekkestranda 28 Apr 1974 F.-E. Eckblad (BG). Aurland: W of Stølen 17 Jul 1968 O. Vevle "*Melanomma*" (BG). Askvoll: Askvoll 15 Oct 1976 *Betula* E. Jensson (BG). Gaular: 1 km S of Storehaug 9 Jul 1968 *Betula* K. Foss (ass. with *Diatrype stigma*) (O). Jølster: Befring 8 May 1973 *Ribes rubrum* O. Befring (BG). MR: Sula: Sulesund 30 Mar 1974 I. Røsberg (BG). ST: Trondheim: Jonsvatnet May 1973 *Betula* Søreng (BG). NT: Verran: Malm 19 Jul 1973 A. Granmo "*Melanomma*" (BG). - Vadanesset 29 Jul 1977 *Betula pubescens* R. Langnes (NPPI). - Verrastranda Storengt 2 coll. 30 Jul 1977 *Salix aurita* 16 Apr 1979 *Sorbus aucuparia* R. Langnes (NPPI). No: Vefsn: Angermoen 4 Aug 1968 *Betula* B. & A. Foss (ass. with *Diatrype stigma*) (O). Hemnes: Finneidfjord 22 Jul 1973 *Sorbus aucuparia* A. Granmo "*Melanomma*" (BG). Saltdal: Saltdalen Oct 1818 *Alnus* S.C. Sommerfelt "*Sphaeria pulvis-pyrius*" (O). Evenes: Forra Huggvik WR 860,955 *Alnus* GM. S. Dunfjeld, A. Granmo (AG 72/81) (TROM). Narvik: Tyttebærvik 18 Jul 1968 *Betula* B. & A. Foss (ass. with *Diatrype stigma*) (O). Tr: Kvæfjord: Gulletfjordbotn WS 30,02 5 Jul 1981 *Salix lapponum* GM 127. - Gulletfjordbotn WS 29,02 5 Jul 1981 5 coll. *S. glauca* ssp. *glauca* GM 142, *S. lapponum* GM 139, *S. nigricans* ssp. *borealis* GM 151, 156, *S. nigricans* ssp. *nigricans* GM 149. Harstad: Sørvik Sørvikfjellet WS 60,20-61,19 7 Jul 1981 *S. nigricans* ssp. *borealis* GM 222. Skånland: Tovik along Breiteigelva WS 75,19 7 Jul 1981 3 coll. *S. nigricans* ssp. *borealis* GM 258, *S. nigricans* ssp. *nigricans* 250, 271. Bardu: Storalen near -

Bruhaugen CB 93,44 15 Jul 1981 *S. phyllicifolia* GM 654. Salangen: Seljeskogen XS 14,46 11 Jul 1981 4 coll. *S. glauca* ssp. *glauca* GM 355, *S. nigricans* ssp. *borealis* GM 347, 352, 354. Målselv: S of Nordstrand DB 00,84 13 Jul 1981 5 coll. *S. lapponum* GM 545, *S. nigricans* ssp. *borealis* GM 520, 540, *S. nigricans* ssp. *nigricans* GM 522, 537. Sørreisa: N of Rabbås CB 28,66 14 Jul 1981 *S. lapponum* GM 588. Dyrøy: Brøstadbotn XS 07,65 11 Jul 1981 2 coll. *S. nigricans* ssp. *borealis* GM 387, 388a. Berg: E of Elvevoll WS 95,97 13 Jul 1981 5 coll. *S. nigricans* ssp. *nigricans* GM 488, 500, 510, 512, 515. Lenvik: W of Laukhella XS 12,83 12 Jul 1981 4 coll. *S. nigricans* ssp. *borealis* GM 450, 454, *S. nigricans* ssp. *nigricans* GM 430, 457. Balsfjord: Laksvatn DB 35,97 18 Jul 1981 4 coll. *S. lapponum* GM 742, *S. nigricans* ssp. *borealis* GM 734a, *S. nigricans* ssp. *nigricans* GM 738, 739. Tromsø: Tønsvikdalen DC 29,37 23 Jun 1981 *S. nigricans* ssp. *nigricans* GM 69. - Tromsøya Telegrafbukta DC 18,26 12 Aug 1981 3 coll. *S. nigricans* ssp. *borealis* GM 1038,1039,1044. - Tromsøya Folkeparken DC 19,26 12 Aug 1981 4 coll. *S. nigricans* ssp. *borealis* GM 1058, 1060, 1073, *S. nigricans* ssp. *nigricans* GM 1056. - Tromsøya Folkeparken DC 18-19,26 30 Sep 1981 *S. nigricans* ssp. *borealis* GM 1093. - Tromsøya Breivik-Stakkevollan DC 22,31-32 1 Oct 1981 3 coll. *S. nigricans* ssp. *borealis* GM 1109, 1120, *S. nigricans* ssp. *nigricans* x *glauca* ssp. *glandulifera* GM 1119. - Tromsøya SW of Hamna DC 21,33 5 Oct 1981 *S. nigricans* ssp. *nigricans* GM 1126. - Tromsøya N of Langnes DC 20,33 5 Oct 1981 *S. nigricans* ssp. *borealis* GM 1144. - Tromsøya S of Langnes DC 19,30 24 Aug 1982 5 coll. *S. caprea* ssp. *coetanea* GM 1786, *S. nigricans* ssp. *borealis* GM 1805, *S. nigricans* ssp. *nigricans* GM 1793, 1794, *S. pentandra* GM 1802. - Tromsdalen Storsteinen DC 22,26-27 13 Sep 1982 6 coll. *S. nigricans* ssp. *borealis* GM 2023, 2025, 2034, 2048, 2051, *S. nigricans* ssp. *nigricans* GM 2038b. - Kroken DC 25,32 1 May 1984 *Betula pubescens* J.T. Schwenke (TROM). - Tromsøya Vesterli DC 19,27 10 Jun 1984 *S. caprea* ssp. *coetanea* GM 2576. Karlsøy: Karlsøy DC 58-59,66 22 Jul 1981 2 coll. *S. nigricans* ssp. *nigricans* GM 974, 1004. Lyngen: Leine DC 61,12 Mar 1975 *Betula* S. Sivertsen (TRH). Skjervøy: Arnøy Årviksand DC 81,86 20 Jul 1981 *S. nigricans* ssp. *borealis* GM 884. Nordreisa: Straumfjordbotn Tretten EC 04,43 20 Jul 1981 *S. nigricans* ssp. *borealis* GM 845. Kvænangen: Burfjorddal W of Kåsen EC 41,57 19 Jul 1981 *S. nigricans* ssp. *borealis* GM 826. Reference: Tr: Tromsø: Tromsdalen 28 Aug 1885 "auf Birkenholz" J. Schröter (Schröter 1886: 210; 1888: 274). Denmark: Sjælland: Suserup Sorø Aug 1963 G. Gulden & A. Munk (O).

### *Platystomum compressum*

Norway: Ak: Bærum: Bjerke Oct 1826 *Corylus avellana* S.C. Sommerfelt (cf. Rostrup (1904: 12)) "*Lophidium compressum*" (O). O: Oslo: Abbedingen s. dat. *Malus sylvestris* s. nom. coll. "*Lophidium compressum*" det. Rostrup (cf. Rostrup (1904: 12)) (O). - Grimelunden s. dat. *Quercus robur* s. nom. coll. "*Lophidium compressum*" (cf. Rostrup (1904: 12)) (O)). Tr: Lavangen: Høgtind Bukkemyra XS 15,19-20 22 Aug 1983 6 coll. *Salix glauca* ssp. *glauca* GM 2540, *S. lanata* ssp. *lanata* GM 2533a, 2534b, *S. lapponum* GM 2527, 2550a, *S. myrsinites* GM 2545. Målselv: Dividalen Dødesvann DB 45,41 21 Aug 1983 13 coll. *S. glauca* ssp. *glauca* GM 2496a, 2504, 2506a, 2507, 2508, 2510, 2511, 2514, 2516, *S. lanata* ssp. *lanata* GM 2498, 2499a, *S. nigricans* ssp. *borealis* GM 2520, 2522a. Storfjord: Signaldalen near Rognli DB 64,67 15 Sep 1982 *S. nigricans* ssp. *borealis* GM 2138. Kåfjord: Kåfjorddalen 2 km SE of Sabitjåkka EB 02,97 7 Sep 1982 20 coll. *S. glauca* ssp. *glauca* GM 1977a, 1978, 1979, 1980, 1981b, 1984a, 1985, 1986, *S. hastata* GM 1994, 1995b, *S. lanata* ssp. *lanata* GM 1956, 1957, 1960, 1962, 1963a, 1964, 1970a, 1971a, 1972b, *S. lapponum* GM 1991. - Kåfjorddalen SE of Sabitjåkka EB 01,98 20 Aug 1983 14 coll. *S. glauca* ssp. *glauca* GM 2495, *S. glauca* ssp. *stipulifera* GM 2477, 2479, 2483a, 2484, *S. hastata* GM 2485a, *S. lanata* ssp. *lanata* GM 2474, 2475, 2487, 2489a, 2490, 2492, 2493, *S. lanata* ssp. *lanata* x *hastata* GM 2476a. Skjervøy: Arnøy Årviksand DC 81,86 20 Jul 1981 *S. nigricans* ssp. *borealis* GM 885. Kvænangen: Kvænangsbotn W of Lassajav'ri EC 42,30 20 Aug 1983 6 coll. *S. lapponum* GM 2463, 2467, 2468, *S. nigricans* ssp. *nigricans* x *phyllicifolia* GM 2449, 2450b, 2454c. Without locality: s. dat. *Tilia* N.G. Moe (O).

### *Platystomum curtum*

Norway: No: Narvik: Skjomen Forsheim 17 Oct 1979 *Betula* A. Granmo 449/79 " *Lophidium deflectens*" (TROM). Tr: Skånland: Tovik along Breiteigelva WS 75,19 7 Jul 1981 *Salix nigricans* ssp. *borealis* GM 253. Ibestad: Rolla between Agneset and Hamran WS 77,26 8 Jul 1981 *S. caprea* ssp. *coetanea* GM 305. - Rolla N of Hamnvik WS 86,32 8 Jul 1981 4 coll. *S. nigricans* ssp. *borealis* GM 326a, 327, *S. nigricans* ssp. *nigricans* GM 325, 328. Gratangen: Gratangsbotn along Meelva XR 09-10,19 8 Jul 1981 2 coll. *S. nigricans* ssp. *nigricans* GM 293, 298. Bardu: Sørødal Sørmo DB 01,18 15 Jul 1981 6 coll. *S. nigricans* ssp. *borealis* GM 596, 597, 601a, 602a, 603, 615d. Salangen: Seljeskogen XS 14,46 11 Jul 1981 *S. lapponum* GM 356. - Skårvikdalen XS 13,45 11 Jul 1981 *S. nigricans* ssp. *nigricans* GM 370a. Målselv: S of Nordstrand DB 00,84 13 Jul 1981 5 coll. *S. nigricans* ssp. *borealis* GM 520a, 536, *S. nigricans* ssp. *nigricans* GM 527, 530, 542. - Dividalen near Svalheim DB 42,40 16 Jul 1981 2 coll. *S. nigricans* ssp. *nigricans* GM 662a, 664. - Dividalen near Åsen DB

37,54 16 Jul 1981 3 coll. *S. nigricans* ssp. *borealis* GM 692a, 693a, 694. - Dividalen Dødesvann DB 45,41 16 Sep 1982 5 coll. *S. nigricans* ssp. *borealis* GM 2232, 2233b, 2250a, 2251a, 2254. Sørreisa: N of Rabbås CB 28,66 14 Jul 1981 5 coll. *S. nigricans* ssp. *borealis* GM 571a, 575, 582, *S. nigricans* ssp. *nigricans* GM 565, 570. Dyrøy: Brøstadbotn XS 07,65 11 Jul 1981 6 coll. *S. nigricans* ssp. *borealis* GM 383, 387a, 388, *S. nigricans* ssp. *nigricans* GM 376, 380, 396. Balsfjord: Outlet of Laksvatn DB 36,97 18 Jul 1981 2 coll. *S. nigricans* ssp. *nigricans* GM 714, 715. Tromsø: Tromsdalen Storsteinen DC 22,26-27 13 Sep 1982 2 coll. *S. nigricans* ssp. *borealis* GM 2050a, *S. nigricans* ssp. *nigricans* GM 2038. Lyngen: Sørleangen near Botn DC 61,40 21 Jul 1981 2 coll. *S. nigricans* ssp. *nigricans* GM 967, 968. - Kvalvik DC 69,11 14 Sep 1982 5 coll. *S. nigricans* ssp. *borealis* GM 2100, 2101, 2126. *S. nigricans* ssp. *nigricans* GM 2105a, 2116. Storfjord: Signaldalen near Rognli DB 67,64 15 Sep 1982 6 coll. *S. nigricans* ssp. *borealis* 2139, 2145, 2155a, 2161, 2163, 2164. - Skibotndalen SE of Øvrevatn DB 73,93 15 Sep 1982 5 coll. *S. hastata* GM 2191, *S. nigricans* ssp. *borealis* GM 2222, *S. nigricans* ssp. *nigricans* x *phyllicifolia* GM 2220b, *S. phyllicifolia* GM 2226, 2228. Kåfjord: Manndalen Dalen DC 81,08 18 Jul 1981 *S. nigricans* ssp. *borealis* GM 751. - Manndalen Elvelund DC 82,06 18 Jul 1981 *S. nigricans* ssp. *nigricans* GM 780. Nordreisa: Reisadalen near Punta EC 17,10 19 Jul 1981 3 coll. *S. nigricans* ssp. *borealis* GM 789, 792, 806. - Reisadalen Bergmo EC 11,25 21 Jul 1981 5 coll. *S. nigricans* ssp. *borealis* GM 921, 923, 924, 936a, 939. - Reisadalen Josvatn-Josdalen EC 10,17 6 Sep 1982 6 coll. *S. lapponum* GM 1929, *S. nigricans* ssp. *borealis* GM 1911, 1915, 1918a, 1919, 1921. - Reisadalen Josdalen EC 09,15-16 6 Sep 1982 *S. nigricans* ssp. *borealis* GM 1942. Kvænangen: Burfjorddal W of Kåsen EC 41,57 19 Jul 1981 5 coll. *S. nigricans* ssp. *borealis* GM 820b, 826, 828, 832, 833. - Badderen EC 39,50 5 Sep 1982 4 coll. *S. nigricans* ssp. *borealis* GM 1852, *S. nigricans* ssp. *nigricans* GM 1856, 1863, 1864. Fi: Alta: Alta s. dat. N.G. Moe "*Melanomma pulvis-pyrius*" det. Rostrup (O). - Bossekop s. dat. N.G. Moe "*Melanomma pulvis-pyrius*" det. Rostrup (O). **Finland:** Tavastia australis. Tammela Mustiala 21 Dec 1865 *Salix* sp. P.A. Karsten No. 2718, & 2 coll. 20 May 1866 *Alnus incana* P.A. Karsten No. 2716 & 2717 "*Mytilostoma subcompressum*" (H). **Soviet Union:** Kola peninsula. Lapponia Imandrae, Sasheika 27 Jun 1861 *Salix* sp. 3 coll. P.A. Karsten No. 2697, 2698 & 2715 "*Mytilostoma subcompressum*" (H).

### *Rebentischia massalongii*

**Norway:** Tr: Gratangen: Gratangsbotten along Meelva XR 09,10-10,19 8 Jul 1981 *Salix nigricans* ssp. *nigricans* GM 274. Bardu: Sjørdalen Sørmo DB 01,18 15 Jul 1981 *S. nigricans* ssp. *borealis* GM 615. Salangen: Skårvikdalen XS 13,45 11 Jul 1981 *S. nigricans* ssp. *borealis* on coll. GM 366. Målselv: S of Nordstrand DB 00,84 13 Jul 1981 *S. nigricans* ssp. *nigricans* GM 521a. - Dividalen near Svalheim DB 42,40 16 Jul 1981 *S. nigricans* ssp. *nigricans* GM 662b. - Dividalen Dødesvann DB 45,41 16 Sep 1982 & 21 Aug 1983 2 coll. *S. glauca* ssp. *glauca* on coll. GM 2505, *S. nigricans* ssp. *borealis* on coll. GM 2246a. Lenvik: W of Laukhella XS 12,83 12 Jul 1981 *S. nigricans* ssp. *nigricans* GM 558a. Balsfjord: The outlet of Laksvatn DB 36,97 18 Jul 1981 *S. nigricans* ssp. *nigricans* on coll. GM 710. Tromsø: Tromsøya S of Langnes DC 19,30 24 Aug 1982 2 coll. *S. nigricans* ssp. *nigricans* GM 1798a, 1810a. - Tromsdalen Storsteinen DC 22,26-27 13 Sep 1982 *S. nigricans* ssp. *nigricans* GM 2010. Karlsøy: Karlsøy DC 58-59,66 22 Jul 1981 *S. nigricans* ssp. *nigricans* GM 999c. Lyngen: Kvalvik DC 69,11 14 Sep 1982 4 coll. *S. nigricans* ssp. *borealis* GM 2096b, 2103a, *S. nigricans* ssp. *nigricans* GM 2107b, 2114a. Storfjord: Signaldalen near Rognli DB 64,67 15 Sep 1982 *S. nigricans* ssp. *borealis* GM 2141. - Skibotndalen SE of Øvrevatn DB 73,93 15 Sep 1982 *S. nigricans* ssp. *nigricans* x *phyllicifolia* on coll. GM 2220a. Kåfjord: Kåfjorddalen 2 km SE of Sabitjåkka EB 02,97 7 Sep 1982 5 coll. *S. glauca* ssp. *glauca* GM 1977, 1984, 1987a, *S. lanata* ssp. *lanata* GM 1956b & on coll. GM 1963. Kåfjorddalen SE of Sabitjåkka EB 01,98 20 Aug 1983 *S. glauca* ssp. *stipulifera* GM 2484b. Skjervøy: Arnøy Årviksand DC 81,86 20 Jul 1981 2 coll. *S. nigricans* ssp. *borealis* GM 877 & on coll. GM 881c. Nordreisa: Reisadalen near Punta EC 17,10 19 Jul 1981 *S. nigricans* ssp. *borealis* GM 804b. - Strømfjordbotn Tretten EC 04,43 20 Jul 1981 *S. nigricans* ssp. *borealis* GM 860b. Kvænangen: Badderen EC 39,50 5 Sep 1982 *S. nigricans* ssp. *borealis* GM 1849a. - Kvængsfjellet NW of Sandnesvatnet EC 25,52 6 Sep 1982 *S. lapponum* GM 1881a. **Finland:** Karsten, P.A.: Fungi Fenn. exs. No. 881: *Rebentischia pomiformis* Karst. Åbo 7 Apr 1861 "på lønnbark" P.A. Karsten leg. & det. (H). Without locality: s. dat. & nom. coll. *Acer campestris* (PAD).

### *Rhynchostoma minutum*

**Norway:** Tr.: Kvænangen: Burfjorddal W of Kåsen EC 41,57 19 Jul 1981 *Salix nigricans* ssp. *borealis* GM 836. **Sweden:** Värmland: N.Ny S of Markmyren 15 Jul 1977 "on lignum in a bog" S.W. Sundell No. 11880 "*Rhynchostoma* cfr. *rubrocinctum*" (UPS). - Langsund par., the E slope of Bastföthöjden 23 Jul 1979 "on rotten *Populus tremula* in shaded situation" L.E. Muhr "*Rhynchostoma rubrocinctum*" (UPS). **Finland:** Karsten, P.A.: Fungi Fenn. exs. No. 950: *Rhynchostoma minutum* Karst. Mustiala 2 coll "på gammal enved, Aug." P.A. Karst. leg. & det. (H & UPS).

***Saccardoella transsylvanica***

**Norway:** Tr.: Lavangen: Høgtind Bukkemyra XS 15,19-20 22 Aug 1983 *Salix lanata* ssp. *lanata* on coll. GM 253a. Tromsø: N of Storslett CC 86,24 23 Jul 1981 *S. nigricans* ssp. *borealis* GM 1029. Kåfjord: Kåfjorddalen 2 km SE of Sabitjåkka EB 02,97 7 Sep 1982 *S. lanata* ssp. *lanata* GM 1974a. - Kåfjorddalen SE of Sabitjåkka EB 01,98 20 Aug 1983 5 coll. *S. glauca* ssp. *glauca* GM 2494a, *S. glauca* ssp. *stipulifera* GM 2479b, 2483, 2484c. *S. hastata* GM 2486. Nordreisa: Reisadalen Josvatn-Josdalen EC 10,17 6 Sep 1982 *S. nigricans* ssp. *borealis* GM 1907b. - Reisadalen Josdalen EC 09,15-16 6 Sep 1982 *S. arbuscula* on coll. GM 1953a. **Switzerland:** Kandersteg Jul 1888 Wegelin "*Trematosphaeria* t." (S). **Austria:** Alpen Jun 1885 Britzelmayr "*Zignoella transsylvanica*" (S). Tyrol Alpen Sep 1902 N. Rehm. (S). **Romania:** Transsylvania "prope Petrita" 30 Aug 1873 *Syringa vulgaris* Lojka (S).

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