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9

G. Mathiassen

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1989

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A total of 29 pyrenomycetous species on *Salix* in Troms, N Norway are treated. Two new species are described: *Herpotrichiella collapsa* G. Mathiassen and *Lophiotrema boreale* G. Mathiassen. A new combination is proposed: *Platystomum curtum* (Fr.) G. Mathiassen. New to Scandinavia is *Glyphium schizosporum*. Nine species are new to Norway: *Anthostomella melanotes*, *Keissleriella cladophila*, *Lophiostoma quadrinucleatum*, *Lophiotrema nucula*, *Melanomma fuscidulum*, *Platystomum curtum*, *Rebentischia massalongii*, *Rhynchostoma minutum* and *Saccardoella transsylvanica*. Eleven species are new to Troms: *Amphisphaerella xylostei*, *Berlesiella nigerrima*, *Chaetosphaeria pomiformis*, *Cryptodiaporthe salicella*, *Diatrype bullata*, *Enchnoa infernalis*, *Hysterographium elongatum*, *Kirschsteiniothelia aethiops*, *Leptosphaeria hendersoniae*, *Lophiostoma macrostomoides* and *Platystomum compressum*. The remaining six species have previously been reported from Troms: *Arthropyrenia lapponina*, *Bertia moriformis* var. *moriformis*, *Cryptosphaeria subcutanea*, *Hypoxylon macrosporum*, *H. mammatum* and *Melanomma pulvis-pyrius*.

A dichotomous key is followed by descriptions of the species in alphabetic order. The ecology and systematics of the different species are discussed, and some difficult genera are commented upon. Comments are given on the ecology and distribution of the different *Salix* species in Troms.

Keywords: Ascomycetes, Distribution, Ecology, Norway, Pyrenomycetes, Salix, Taxonomy, Troms.

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CONTENTS

INTRODUCTION

HISTORY

Compared to that of the other Scandinavian countries, the Norwegian pyrenomycete flora is poorly known. This is especially true for North Norway, particularly the two northernmost counties Troms and Finnmark. Investigations published during the last 20 years have treated e.g., *Diatrype stigma* (Hoffm. : Fr.) Fr. and the distribution of some other pyrenomycetes in Norway (Foss 1971); *Hypoxylon* Bull. : Fr. (Granmo 1977); *Cordyceps* (Fr.) Link (Eckblad 1967); *Daldinia* Ces. et de Not., *Ustulina* Tul. & C. Tul. and *Xylaria* Hill : Schrenk (Eckblad 1969); and *Nummulariella* Eckblad & Granmo (Eckblad & Granmo 1978). Apart from these, little is known about the distribution and frequency of other pyrenomycete genera and species in the country. No recent outline of the Norwegian pyrenomycetes is available, and the most important works are still Sommerfelt's "Supplementum florae lapponicae" (Sommerfelt 1826), "Physisk-oeconomisk Beskrivelse over Saltdalen i Nordlandene" (Sommerfelt 1827), and Rostrup's "Norske Ascomyceter" (Rostrup 1904).

There are several other sporadic notes on Norwegian pyrenomycetes but, as a rule, very few species are mentioned by mostauthors. Such notes are found in e.g., Wahlenberg (1812) from Måsøy, Hammerfest and Polmak, Schröter (1886, 1888) from Bodø, Tromsø and Nordkapp, Rostrup (1886) from Finnmark and (1891) from Dovre, Trail (1889) from Hardanger, Hennings (1904) from Oslo, Jørstad (1925, 1928, 1945) from all of Norway, Størmer (1938) from Håøya in Oslofjorden, Hagen (1950) from Mølen in Hurum, O. Eriksson (1967a, 1967b), Lundqvist (1972), Eckblad & Torkelsen (1974), and B. Eriksson (1974) from all of Norway, Eckblad (1975, 1978, 1981) from western Norway, Strid (1975) from Trøndelag and Nordland, Lange (1976) and Holm & Holm (1977) from all of Norway, Sivertsen (1978) from Rana, Jensson (1978a) from western Norway, and Granmo (1981) from Tromsø.

A systematic investigation of the pyrenomycete flora on a tree genus with many species has not previously been carried out in Norway. However, the pyrenomycete flora on the two species of *Quercus* in S Norway was thoroughly examined by Hungnes (1982). In the Nordic countries, Holm & Holm (1977) have examined the ascomycete flora on *Juniperus communis*, and Jensson (1978b) studied the pyrenomycete flora on *Betula pubescens* in Iceland. In Central Europe, similar investigations have been carried out on *Salix* and *Populus* by Butin (1958, 1960), and on *Alnus viridis* by Hilber & Hilber (1978). I am not aware of any other similar investigations on woody plants.

CHOICE OF SUBSTRATE AND INVESTIGATION AREA

By restricting the investigation to a single genus and a single county, the field-work could be carried out systematically and efficiently. The genus *Salix* and Troms county (Fig. 1) was chosen because the genus is very common and represented by many species all over Troms. The ecological range within the genus is very wide; some species occur almost everywhere, while others have more specific ecological demands. The distribution of the

Fig. 1. The location of Troms county within Scandinavia.

majority of the *Salix* species in Troms is well known (see pp. 12). Furthermore, the vegetation in Troms is, in many respects, representative of N Norway. Most of the vegetation regions (Dahl et al. 1986) are present, and the E-W, or oceanic-continental gradient is pronounced. Altitudinal differences are also pronounced, both in the coastal and in the interior areas. By restricting the investigation to a rather small phytogeographical area, a close network of localities could be visited, thereby reducing the possibility of overlooking some species. In addition, such an investigation resulted in a more correct picture of the number and frequencies of the species, and of their vertical distribution. It also facilitated detection of possible continental or oceanic trends in species distributions.

MATERIALS, METHODS AND TERMINOLOGY

MATERIALS

The present work is based on material collected by me, and on material from the herbaria of BG, NPPI (Norwegian Plant Protection Institute), O, TRH, and TROM. Some collections from B, C, H, K, PAD, S, UME, UPS and W were also examined. My material is deposited in TROM. Duplicate collections will be transferred to the herbaria of K, MASS, UME and UPS.

The field-work in Troms was carried out in 1981-1983. Material was collected from 70 localities distributed as evenly as possible throughout the county, ranging from the lowland to the alpine regions (Fig. 2). All the municipalities were visited, and 4-7 hours were spent at each locality.

Pyrenomycetes were investigated on the following taxa of *Salix*: *S. arbuscula* L., *S. caprea* L. ssp. *caprea* and ssp. *coaetanea* (Hartm.) Hiit., *S. glauca* L. ssp. *glauca* and ssp. *stipulifera* (Flod. ex Häyren) Hiit., *S. hastata* L., *S. lanata* L. ssp. *lanata* and ssp. *glandulifera* (Flod.) Hiit., *S. lapponum* L., *S. myrsinites* L., *S. nigricans* Sm. ssp. *borealis* (Fr.) Flod. and ssp. *nigricans*, *S. pentandra* L., and *S. reticulata* L.

I have studied the following predominantly alpine species (see Benum 1958) without discovering pyrenomycetes: *Salix herbacea* L. and *S. polaris* Wg. In addition, *S. myrtilloides* L. and *S. xerophila* Flod. occur in Troms county. Both are continental (eastern), very rare (Benum 1958), and have not been investigated.

A complete annotated list of the material examined is available on inquiry to the author. Localities in Troms of species with 1-6 finds are listed, while the localities of more frequent species are shown on distribution maps. The number of all the examined collections of each species are given. The names of the Norwegian counties are abbreviated as follows: Østfold (Øf), Akershus (Ak), Oslo (O), Hedmark (He), Oppland (Op), Buskerud (Bu), Vestfold (Vf), Telemark (Te), Aust-Agder (AA), Vest-Agder (VA), Rogaland (Ro), Hordaland (Ho), Sogn og Fjordane (SF), Møre og Romsdal (MR), Sør-Trøndelag (ST), Nord-Trøndelag (NT), Nordland (No), Troms (Tr), Finnmark (Fi).

METHODS

The material was examined with a Zeiss SR Stereomicroscope with up to 50x magnification, and with a Zeiss Standard compound microscope (without phase contrast equipment) with up to 1250x magnification.

Unless otherwise stated, the microscopical characters were measured, drawn (Zeiss drawing tube) and observed using water as the mounting medium. Cotton blue was often used for the examination of hyaline, microscopical characters. For testing the amyloid character of unitunicate asci, Melzer's reagent was used (according to Hawksworth et al. 1983). If the blue reaction failed to appear, the material was pretreated with KOH and HNO_3 (cf. O. Eriksson 1966: 315). Cotton blue in lactophenol, or lactophenol alone, was used only for permanent mounts. Although mounts were sealed with nail varnish, Glyceel appears to be a much better sealing material.

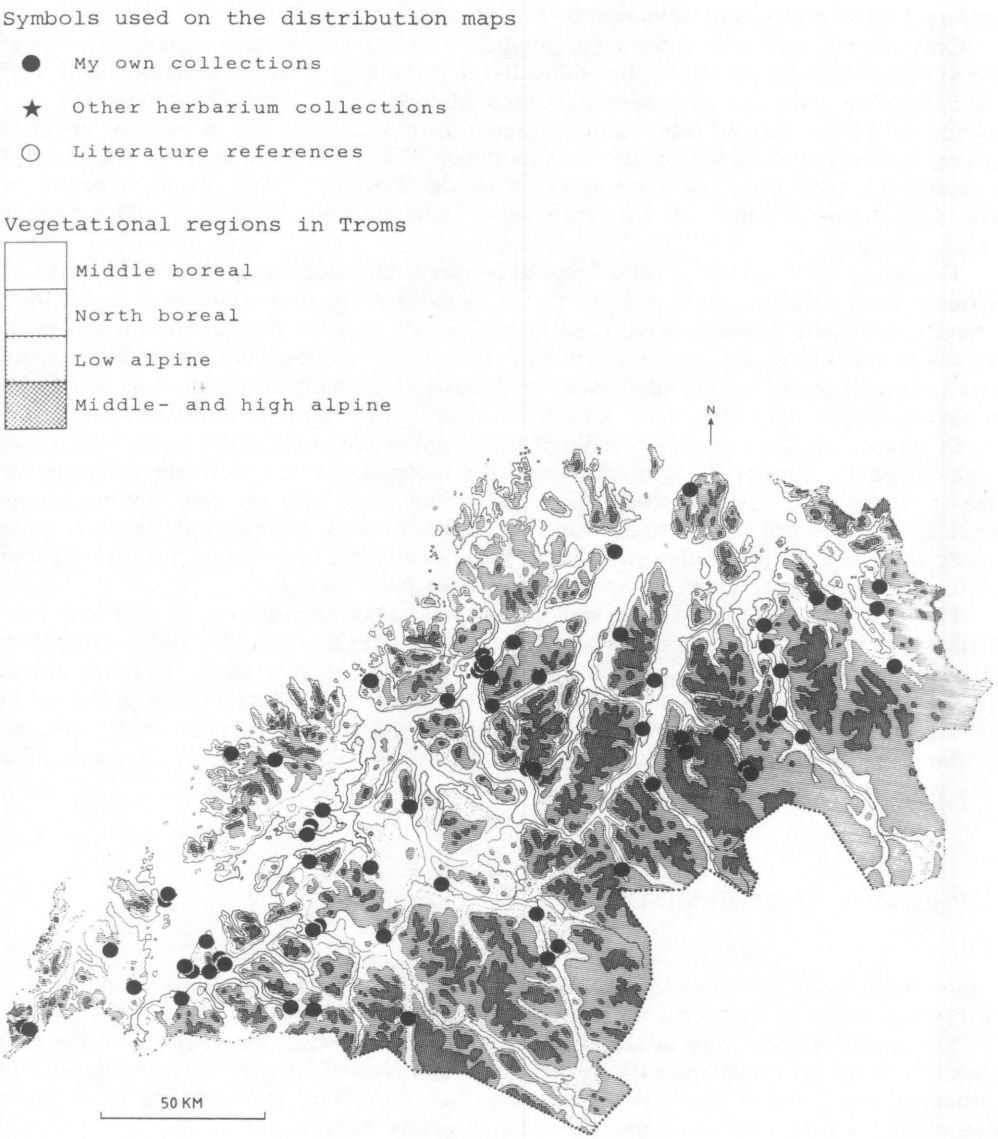


Fig. 2. Localities in Troms visited by the author.

The shape, position and colour of the ascomata are given. Their sizes are given as a variation of the diameter, with the extreme values in parentheses. The shape, and usually the sizes of the ostioles are also described. The diameter of the ostiolum was measured at its widest point. The thickness of the peridium is given, but not the size of the peridial cells. This character is, in my opinion, too variable to be of taxonomic importance. However, the cell structure in the peridium seems to be rather constant within each species.

Therefore I have given more attention to this character.

Only normal asci, with a complete number of ascospores, were measured. The length of the stipulum was not measured, but subjectively given as, e.g. short- or long-stiped. Only the sporebearing parts (p. sp.) were measured in long-stiped asci. The ascospores were measured at 1250x magnification (anisol immersion). Immature and obviously abnormal ascospores were not included in the measurements. The normal variation in sizes (length and width) of both asci and ascospores, with the extreme values in parentheses, are followed by the mean values. The measurements include 10-50 asci and 75-230 ascospores for each species.

The terms "new to Troms" and "new to Norway" are used for species which have not previously been published or noted. This also includes herbarium collections, correctly or incorrectly identified. It would have been natural to consider the distribution of the species in Troms in relation to the rest of Norway, but for most species, their distribution outside Troms is insufficiently documented, and the herbarium collections too few to justify any firm phytogeographical conclusions. As a result distribution maps are only given for Troms.

In addition to the taxonomic, ecological and phytogeographical considerations, I have also examined the fungus flora in relation to the taxonomy of the different *Salix* species, to see if it could be used as means for subdividing *Salix* into separate species groups. Correct identification of the substrate was thus very important, and substrates such as rotten stems or stumps, and dead, fallen twigs were intentionally not included in this investigation. As a result, several pyrenomycete species may have been missed.

The macrophotographs were taken with a Wild Photomicroscope M 400 and Ilford FP4 film. The scanning examinations were made with a JEOL JSM-840, and micrographed on Kodak Tri-X. These examinations did not reveal any details which had not already been observed with a compound microscope. However, scanning pictures are given for the following species: *Herpotrichiella collapsa* and *Lophiotrema boreale* (new species), *Glyphium schizosporum* (Maire) Zogg, (new to Scandinavia), and *Rhynchostoma minutum* Karst., with ornamented ascospores.

MORPHOLOGY AND TERMINOLOGY

The morphological terms used in this paper follow Hawksworth et al. (1983) and Snell & Dick (1957). Some of the terms are commented upon briefly below.

The stromata often vary in size and shape between species, but also within the same species (cf. *Berlesiella nigerrima* Bloxam ex Curr. and *Hypoxylon macrosporum* Karst.). On decorticated wood, the stromata of *H. macrosporum* are effuse and growing in elongated bands, while on bark they often are pulvinate to nearly hemispherical.

The ecto- and entostroma are in some species easy to separate from each other, e.g. in *Cryptosphaeria subcutanea* (Wahl. : Fr.) Rappaz. In other species or families, they are often more difficult to separate (e.g. within the Valsaceae).

In clypeate species, the development of the clypeus often varies, even within one species (cf. *Amphisphaerella xylostei* (Pers. : Fr.) Munk).

O. Eriksson (1981) recognized seven hamathecium categories, but I have only used five: paraphyses, pseudoparaphyses, periphysoids, periphyses and "hamathecial tissue absent". I have not distinguished between paraphysoids (trabecular pseudoparaphyses) and pseudoparaphyses (cellular pseudoparaphyses) thus hamathecia of these types are both named as pseudoparaphyses.

Despite their importance in modern mycology, cultural experiments and studies of anamorphs have not been carried out.

NOMENCLATURE

The nomenclature of the vascular plants except *Salix* follows Lid (1974). The nomenclature of *Salix* follows Tutin et al. (1964), except for the four cases of taxa pairs treated as subspecies: *Salix caprea* ssp. *caprea* and ssp. *coaetanea*, *S. glauca* ssp. *glauca* and ssp. *stipulifera*, *S. lanata* ssp. *lanata* and ssp. *glandulifera*, and *S. nigricans* ssp. *borealis* and ssp. *nigricans*.

Several important changes in the International Code of Botanical Nomenclature affecting the nomenclature of fungi were enacted at the XIII International Botanical Congress, Sydney, in 1981, e.g. the 1753 starting-point for all fungal groups, and the simplification of citing author's names. These changes are thoroughly commented upon by Hawksworth (1982) and Korf (1982a, 1982b, 1983), and are therefore not discussed further here. The use of nomenclature of the fungi in this study follows that in the latest edition of the Code (Voss 1983). Works published after 1986 have not influenced the taxonomic treatment.

ABBREVIATIONS

The following abbreviations have been used:

a.s.l. = above sea level
GM = Geir Mathiassen
M.r. = Melzer's reagent
n.v. = non vidi (not seen)
SEM = Scanning electron microscopy
± = more or less

RESULTS AND DISCUSSION

ECOLOGY

Ecology and distribution of *Salix* spp. in Troms county

The distribution and main habitats of the *Salix* species in Troms are presented by Benum (1958). His maps and/or descriptions of the following *Salix* species are still adequate to this discussion: *Salix arbuscula*, *S. myrsinites*, *S. myrtilloides*, *S. pentandra*, *S. phylicifolia*, *S. polaris* and *S. reticulata*. Information about the remaining species is given below.

The vegetational regions used here (Dahl et al. 1986) are abbreviated as follows:

MB - Middle boreal region
mMB - Middle boreal region, middle part
nMB - Middle boreal region, northern part (transitional zone towards the Northern boreal region)
NB - Northern boreal region
LA - Low alpine region
MA - Middle alpine region
HA - High alpine region

Salix caprea ssp. *caprea*. Fairly common, but limited towards the north and occurring most frequently along the coast. Thinning out through the mainland valleys, where *S. caprea* ssp. *coaetanea* predominates. Main distribution in MB. Less nutrient demanding, and resembles *S. nigricans* ssp. *nigricans* ecologically. Occurring in moist habitats, and quite common in riverside communities. Its habitat changes gradually to the south in Nordland, where it often occurs on dry, warm forested slopes.

Salix caprea ssp. *coaetanea*. Fairly common, but limited to the south and occurring most frequently in the mainland valleys. Main distribution in nMB-NB. Rather nutrient demanding, usually occurring in medium to nutrient rich habitats. Very common on dry, warm forested slopes, occasionally occurring in screes and beneath cliffs. Normally avoiding moist habitats, but may now and then occur on riversides.

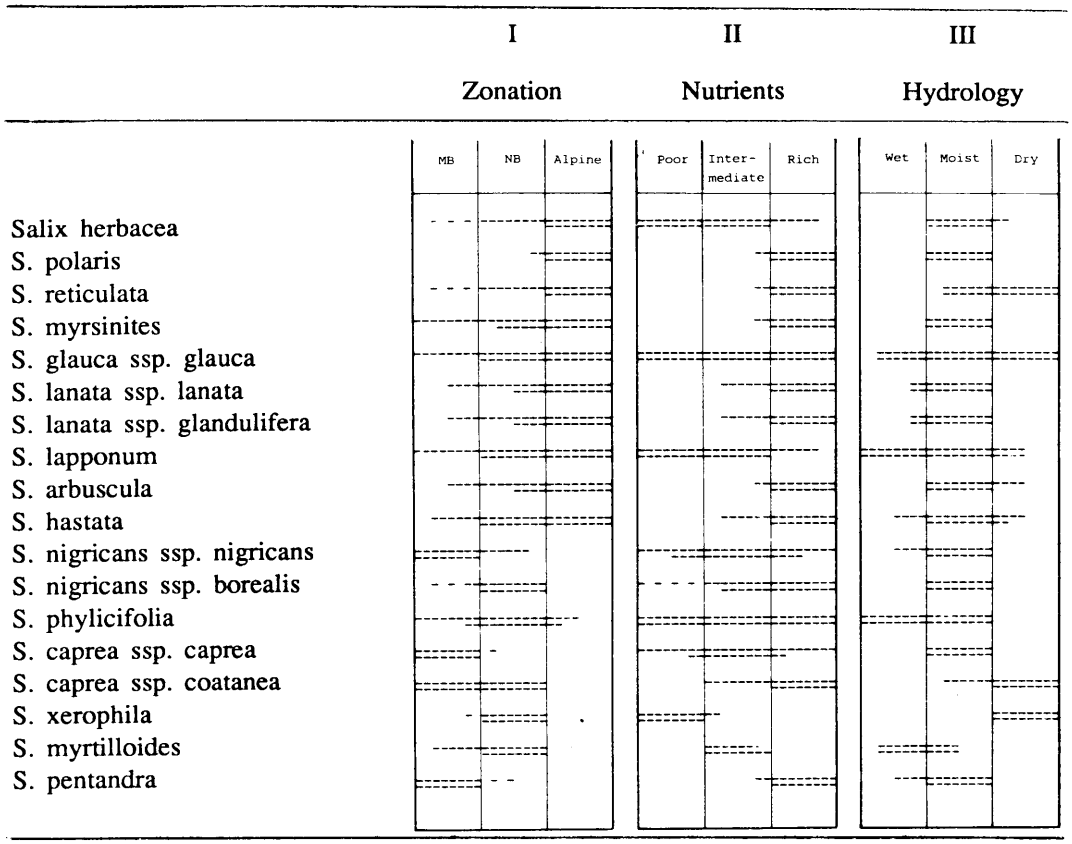
Salix glauca ssp. *glauca*. Occurring from near sea level and upwards in MA, but the main distribution falls in NB-LA. More scattered in the lowland areas in the southern part of the county. Ecological range very wide; seemingly without any particular preferences. Occurs in nutrient-poor as well as in nutrient-rich habitats. In NB, it occurs in all types of bogs, damp heaths and swampy forests.

Salix glauca ssp. *stipulifera*. Not mapped by Benum (1958). The distribution in the county is not satisfactorily known, but probably mainly in NB-LA. Ecological range probably the same as for ssp. *glauca*.

Salix hastata. The ecological range is very wide, but it prefers nutrient-rich habitats. Occurs in bogs, swampy forests, along brooks and rivers, and in nutrient-rich damp heaths (damp *Dryas* heaths and damp coastal heaths on shelly sand). Often occurring on unstable ground and on ledges.

Salix lanata ssp. *lanata*. Common and rather evenly distributed throughout the county. Mainly in NB-LA, but descending to the lowland, particularly in the middle and northern part of the county. Prefers intermediate to nutrient-rich habitats. Predominantly occurring

Tab. 1. Distribution of *Salix* species along the following gradients: I - Vegetational regions, II - Poor-nutritious, III - Moist-dry. ========= Common. --------- Less common. - - - - -Infrequent.



on unstable ground like screes, and river-, brook- and roadsides.

Salix lanata ssp. *glandulifera*. The map in Benum (1958) is not adequate. The distribution is poorly known. The taxon is recorded from scattered localities throughout the county. Occurs in the same habitats as ssp. *lanata*, but is much less frequent. It often hybridizes with ssp. *lanata* and with *S. hastata*. These hybrids are more frequent than "pure" ssp. *glandulifera*.

Salix lapponum. The ecological range is not so wide as that of *S. glauca* ssp. *glauca*. It is more moisture-demanding, and occurs more frequently in mires and along brooks and rivers. Predominantly occurring in nutrient-poor to intermediate habitats, rarely in nutrient-rich ones.

Salix nigricans ssp. *nigricans*. Common throughout the county. The distribution is not well known, but the taxon seems to be most frequent in the lowland and along the coast, where it becomes less frequent in the northern part of the county. Main distribution in MB. Less nutrient-demanding, and occurs in nutrient-poor to intermediate habitats. Prefers moist habitats, and is therefore very abundant in swamp forest and limnic shore

communities; typically occurring along riversides in the mainland valleys.

Salix nigricans ssp. *borealis*. The map in Benum (1958) is not adequate. The taxon is common throughout the county, ascending from the lowland up to LA, but predominantly in NB. Somewhat less frequent in the southern part of the county. Prefers intermediate to nutrient-rich habitats, but may also occur in nutrient-poor habitats. Occurs in moist forest types, on eutrophic bogs and along fresh-water shores. The range of habitats encountered is wider than for ssp. *nigricans*.

Parasites and saprophytes

The species treated in this paper are all saprophytes or weakly parasitic, although it is often difficult to separate the two. Often, many parasitic species are typically parasitic in their first developmental stage, but gradually phase into a more saprophytic mode of living (see below; (1) partly parasitic). Roll-Hansen & Roll-Hansen (1979) found some saprophytic ascomycetes living as endophytes in living trees. If this is common among ascomycetes, the distinction between parasites and saprophytes becomes diffuse. Our present knowledge of both host specificity and geographical distribution among fungi will also be affected. This set of problems falls beyond the scope of this paper.

I regard species capable of sporulating on dead, fresh substrates as "primary saprophytes", and those species found mainly on rather decayed substrates as "secondary saprophytes". Some species, however, do not fall into these categories, e.g. *Melanomma pulvis-pyrius* (Pers. : Fr.) Fuckel and *Platystomum curtum*. These are found in wounds on living twigs or stems, on dead, dry twigs, and on rotten, rather decayed stems and stumps.

(1) *Partly parasitic. Cryptosphaeria subcutanea* is often found on recently dead substrate, but also on living substrate. It seems to be partly parasitic, but also may take on a pure saprophytic mode of living. This is probably one of the species causing the most severe damage to *Salix*. The fungus penetrates the wood deeply (seen as black zones in the wood), and the stromata often cover considerable areas of the substrate. *Arthopyrenia lapponina* Anzi also grows on living substrates, but is most frequently found on dead twigs.

(2) *Primary saprophytes*. The following species can, with some confidence, be included in this group: *Anthostomella melanotes* (Berk. & Br.) Martin, *Chaetosphaeria pomiformis* (Pers. : Fr.) Müller, *Diatrype bullata* (Hoffm. : Fr.) Fr., *Hypoxylon macrosporum*, *Keissleriella cladophila* (Niessl.) Corbaz, *Leptosphaeria hendersoniae* (Fuckel) L. Holm, *Lophiostoma quadrinucleatum* Karst., *Rebentischia massalongii* (Mont.) Sacc. and *Saccardoella transsylvanica* (Rehm) Berl.

Hypoxylon mammatum (Wahl.) Karst. is most frequently found on rather fresh substrate, but also on decayed stems. It is able to exploit the substrate for a long time, and seems to cause severe damage to *Salix*.

(3) *Secondary saprophytes. Bertia moriformis* var. *moriformis* (Tode : Fr.) de Not. is mainly found on decayed substrates, but occasionally also on dry, dead twigs. *Lophiotrema boreale* and *Kirschsteiniothelia aethiops* (Berk. & Curtis) D. Hawksw. are only found on rather decayed stems and twigs, and are good examples of this group. However, this group is certainly larger than suggested here, because these kinds of substrates were omitted from the investigation (see p. 10).

Substrate types

Different species grow on different substrate types (Tab. 2).

Tab. 2. Distribution of some pyrenomycete collections on different type of substrate. b = bark, w = wood, str. = stromata of other pyrenomycetes.

	b	b & w	w	str.
Hypoxylon mammatum	91			
Cryptosphaeria subcutanea	75			
Arthopyrenia lapponina	58			
Rebentischia massalongii	31			
Diatrype bullata	6			
Cryptodiaporthe salicella	4			
Platystomum compressum		30	32	
Melanomma pulvis-pyrius	2	23	43	
Leptosphaeria hendersoniae	4	8	17	
Amphisphaerella xylostei		7	4	
Hypoxylon macrosporum	1	12	68	
Herpotrichiella collapsa		6	39	
Anthostomella melanotes			30	
Hysterographium elongatum		3	21	
Glyphium schizosporum		2	21	
Chaetosphaeria pomiformis		5	18	
Lophiostoma quadrinucleatum			10	
Platystomum curtum	3	19	63	5
Berlesiella nigerrima	2			2

Typical corticolous species are *Arthopyrenia lapponina*, *Cryptodiaporthe salicella* (Fr.) Petr., *Cryptosphaeria subcutanea*, *Diatrype bullata*, *Hypoxylon mammatum* and *Rebentischia massalongii*. Typical lignicolous species are *Anthostomella melanotes* and *Lophiostoma quadrinucleatum*. Predominantly lignicolous species are *Chaetosphaeria pomiformis*, *Glyphium schizosporum*, *Herpotrichiella collapsa*, *Hypoxylon macrosporum* and *Hysterographium elongatum* (Wahl.) Corda.

Some species, including *Amphisphaerella xylostei*, *Leptosphaeria hendersoniae*, *Melanomma pulvis-pyrius*, *Platystomum compressum* (Pers. : Fr.) Trev. and *P. curtum*, do not show preference for any substrate type, but grow on both bark and wood. *Melanomma pulvis-pyrius* and *P. curtum* are also capable of attacking both fresh and decayed substrates. With regard to distribution, these adaptations must be very favourable, and these species are among the most frequent on *Salix* in Troms. *Melanomma pulvis-pyrius* has in addition a wide range of hosts (see p. 77), and is probably one of the most frequent cosmopolitan pyrenomycetes.

The diameter of the substrate was recorded, but for most of the species this did not seem to be important. For example, *Platystomum compressum*, with its rather large ascomata, is found on twigs with diameters of down to 1 mm. Also the twigs of *Salix herbacea* and *S. polaris* should be large enough to accomodate pyrenomycetes, but I have not found any on either of the two species. The diameter of the substrate seems to be

important only for *Cryptosphaeria subcutanea* and *Platystomum curtum*. They are most frequently found on stems and thick twigs.

Choice of hosts, host specificity and substrate preference

A common feature among pyrenomycetes is that they are often restricted to one type of

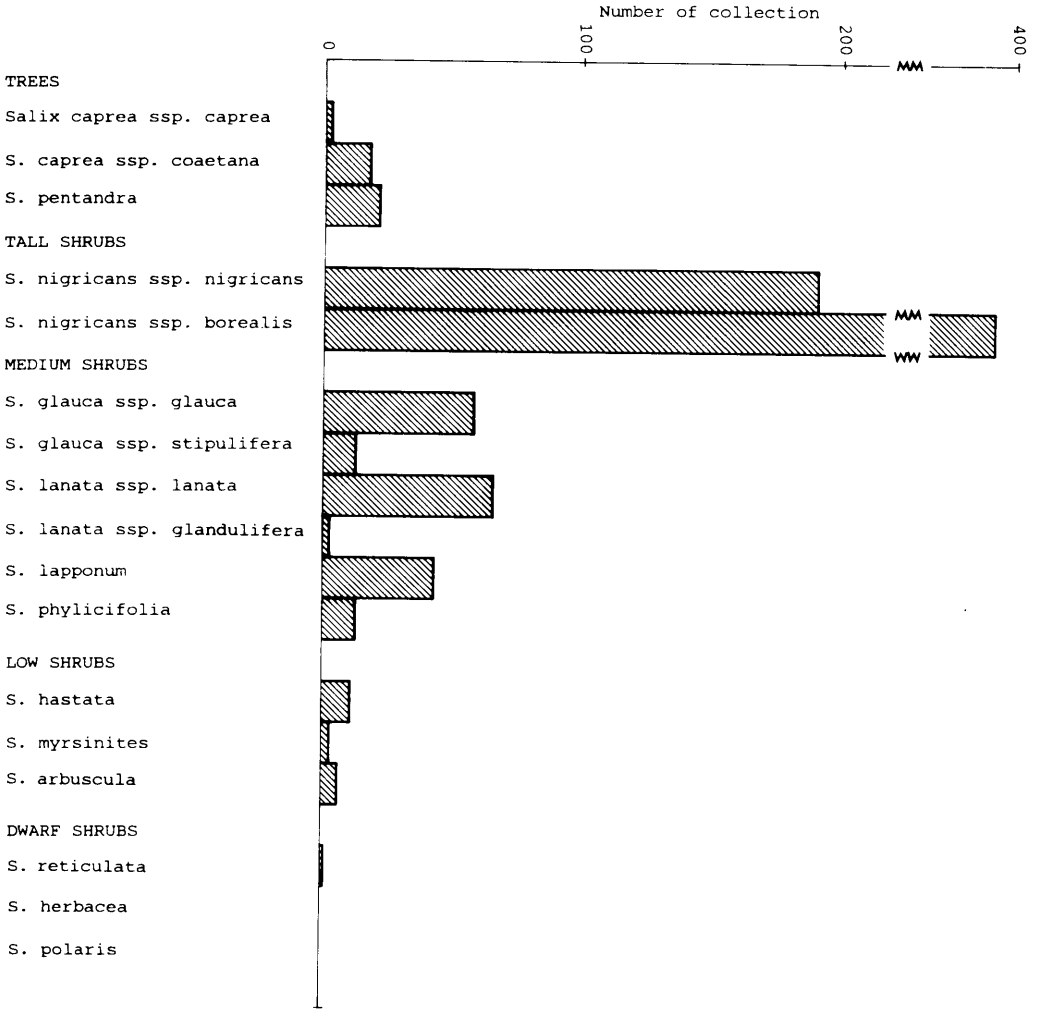


Fig. 3. Number of pyrenomycete collections on the different species of *Salix* (cf. Tab. 3). The *Salix* species are listed in order of decreasing size: trees (5-15 m), tall shrubs (3-5 m), medium-sized shrubs (1-3(-4)m), low shrubs (<1 m), dwarf shrubs (<5 cm).

Tab. 3. Distribution of all examined collections (n. coll./n. loc.) on the different species of *Salix*. Other collections (indet.) are also given. ARB = *Salix arbuscula*, CA CA = *S. caprea* ssp. *caprea*, CA CO = *S. caprea* ssp. *coaetanea*, GL GL = *S. glauca* ssp. *glauca*, GL ST = *S. glauca* ssp. *stipulifera*, HAS = *S. hastata*, HE/PO = *S. herbacea* and *S. polaris*, LAN LAN = *S. lanata* ssp. *lanata*, LAN GL = *S. lanata* ssp. *glandulifera*, LAP = *S. lapponum*, MYR = *S. myrsinites*, NI BO = *S. nigricans* ssp. *borealis*, NI NI = *S. nigricans* ssp. *nigricans*, PEN = *S. pentandra*, PHY = *S. phylicifolia*, RET = *S. reticulata*.

	ARB	CA CA	CA CO	GL GL	GL ST	HAS	HE PO	LAN LAN	LAN GL	LAP	MYR	NI BO	NI NI	PEN	PHY	RET	GL GL X NI BO	GL GL X NI NI	LAN GL X NI BO	LAN LAN X LAN GL	LAN LAN X HAS	MYR X NI NI	PHY X NI NI	
Number of localities	2	4	29	38	8	25	8	18	11	35	14	56	45	20	16	9	3	3	1	8	3	3	8	
Amphisphaerella xylostei				2/2				8/4							1/1									11
Anthostomella melanotes		1/1	3/2	4/2	1/1			1/1		1/1		9/5	7/7		2/1								1/1	30
Arthopyrenia lapponina	3/1			10/3	1/1	1/1		5/3		17/10	2/2	8/6	7/5	2/1			2/2							58
Berlesiella nigerrima												2/1												2
Bertia moriformis var. moriformis			2/2									13/11	5/4	3/2	1/1								1/1	25
Chaetosphaeria pomiformis												15/11	8/7											23
Cryptodiaporthe salicella				1/1						3/2														4
Cryptosphaeria subcutanea						1/1		1/1		1/1		51/22	18/10		1/1								2/2	75
Diatrype bullata												3/1	3/2											6
Enchnoa infernalis																						1/1		1
Glyphium schizosporum			2/2					4/2	1/1			8/4	3/2	2/1				1/1		2/2				23
Herpotrichiella collapsa				5/2		1/1		15/4		1/1		13/11	6/5	2/2			1/1						1/1	45
Hypoxylon macrosporum	2/1		1/1	7/6	2/1			8/4	1/1	4/2		40/13	12/8				1/1				1/1		2/2	81
Hypoxylon mammatum						2/1						52/20	34/11		2/1								1/1	91
Hysterographium elongatum		1/1	4/3									10/7	2/2	4/4	2/1								1/1	24
Keissleriella cladophila										1/1		17/8	6/3		1/1					1/1				26
Kirschsteiniothelia aetiops												2/2	2/1											4
Leptosphaeria hendersoniae			1/1			1/1				1/1		11/7	11/7	3/2						1/1				29
Lophiostoma macrostomoides														1/1		1/1								2
Lophiostoma quadrinucleatum				2/2								5/5	2/2	1/1										10
Lophiotrema boreale												3/3	3/2											6
Lophiotrema nucula			1/1									19/11	2/2	1/1									2/2	25
Melanomma fuscidulum												2/1	1/1	1/1										4
Melanomma pulvis-pyrius			2/2	2/2						5/5		33/18	22/12	1/1	1/1				1/1					67
Platystomum compressum				20/4	4/1	3/2		19/4		6/3	1/1	4/3									1/1		3/1	61
Platystomum curtum			1/1			1/1				2/2		58/20	25/12		2/1								1/1	90
Rebentischia massalongii				4/2	1/1			2/1		1/1		11/9	11/9										1/1	31
Rhynchostoma minutum												1/1												1
Saccardoella transsylvanica	1/1			1/1	3/1	1/1		2/2				2/2												10
Number of identified collections	6	2	17	58	12	11	0	65	2	43	3	391	191	21	13	1	4	1	1	4	2	1	16	865
Unidentified collections	2	2	21	47	5	15	0	42	4	35	8	248	129	35	26	5	2	1	0	13	2	2	16	660
Total number of collections	8	4	38	105	17	26	0	107	6	78	11	639	320	56	39	6	6	2	1	17	4	3	32	1525

host. Of the species treated in this paper, some were previously only known to grow on *Salix*, and could therefore be used as "taxonomes" on the genus. Such species were *Cryptodiaporthe salicella*, *Cryptosphaeria subcutanea*, *Diatrype bullata*, *Hypoxylon macrosporum* and *Leptosphaeria hendersoniae*. However, *D. bullata* is now reported on both *Acer* and *Alnus* (Glawe & Rogers 1984), and *H. macrosporum* is reported on *Alnus viridis* (Whalley & Petrini 1984). In my opinion, it is unlikely that *C. subcutanea* and *L. hendersoniae* are restricted to *Salix*, and I advise that care is taken when fungus-host relations are used as taxonomical indicators within the pyrenomycetes, although information concerning their hosts may be of great value in identification work.

Except for *Salix herbacea* and *S. polaris*, pyrenomycetes were found on all of the examined *Salix* species in Troms (Fig. 3, Tab. 3). The *S. nigricans* group was the preferred substrate and was quantitatively the most important host in Troms. Some species were exclusively found on this group, namely *Berlesiella nigerrima*, *Chaetosphaeria pomiformis*, *Diatrype bullata*, *Kirschsteiniothelia aethiops*, *Lophiotrema boreale* and *Rhynchostoma minutum*. Except for *C. pomiformis*, these species were all represented in a few collections from a small number of localities, and the limited host range may therefore be incidental.

Cryptosphaeria subcutanea, *Hypoxylon mammatum*, *Keissleriella cladophila*, *Lophiotrema nucula* (Fr.) Sacc., *Melanomma pulvis-pyrius* and *Platystomum curtum* were also mainly found on the *S. nigricans* group. These species were all represented in numerous collections and localities, and the preference for the *S. nigricans* group seems to be a true distribution pattern for these species, at least in Troms.

A few species do not seem to have the same kind of host specificity as those mentioned above, but are instead more evenly distributed on several different species of *Salix*. Such is the case for *Anthostomella melanotes*, *Arthopyrenia lapponina* and *Hypoxylon macrosporum*. They have all a wide ecological and geographical range in Troms (cf. Tabs 3-4).

Some species, e.g. *Amphispaerella xylostei*, *Cryptodiaporthe salicella*, *Lophiostoma macrostomoides* (de Not.) Ces. & de Not., *L. quadrinucleatum*, *Melanomma fuscidulum* Sacc. and *Saccardoella transsylvanica*, are more randomly distributed. They are, however, too infrequent on *Salix* in Troms to justify any further ecological or phytogeographical discussion.

Some pyrenomycetes show a marked preference for the *S. nigricans* group. Apart for this, there is not much evidence of a taxonomic relationship between the different *Salix* species, and the pyrenomycete flora in Troms cannot be used for subdividing *Salix* into separate species groups. For example, Platystomum compressum is most frequently found on *S. glauca* ssp. *glauca* and *S. lanata* ssp. *lanata*, but these species belong to different groups of species within *Salix* (Chmelař & Meusel 1976). The main distribution of both *P. compressum* and the two *Salix* species are in NB and LA (cf. Tabs 1, 4). Therefore, it is impossible to decide whether the distribution pattern of *P. compressum* in Troms is due to the temperature requirements of the fungus, or to the distribution of the hosts. More material from N Norway is obviously needed to justify any further discussion on this subject.

There may be several reasons why the *Salix nigricans* group is preferred as substrate (cf. Fig. 3, Tab. 3) within *Salix* in Troms. A systematic study of the biochemical contents of the bark and leaves of several *Salix* species was carried out by Thieme (1965). He found several different glycosides, and these substances in bark differed in composition between species and between seasons. Glycosides can have antifungal effects. Thus, the composition and concentration of the various glycosides may be of great importance in the extent to which pyrenomycetes can establish and undergo ecesis on the different *Salix* species. The antifungal activity of 11 species of *Salix* was examined by Hejtmánková et al. (1975) on

various kinds of yeasts and pathogenic fungi (fungi imperfecti). Paradoxically, the investigation revealed that *S. nigricans* coll. fell within the group with highest antifungal activity.

In addition, the anatomy of both bark and wood is important. The wood in dead twigs of e.g. *Salix pentandra* is harder, and seems to be drier than of the *S. nigricans* group, and has comparatively fewer pyrenomycetes (cf. Fig. 3). In *S. caprea* ssp. *coaetanea*, the bark is very thick and robust, and seems to be an unsuitable substrate. None of the typical corticolous pyrenomycetes (see p.00) were found on bark of this species.

The size of the trees does not seem to be of major importance, considering that more collections are found on the shrubs *Salix glauca* ssp. *glauca* and *S. lanata* ssp. *lanata* than on the large trees *S. caprea* ssp. *coaetanea* and *S. pentandra* (cf. Fig. 3).

The microclimate of a locality is also important. The saprobes invading and undergoing ecesis on fallen twigs in permanently moist conditions will normally differ from those growing on twigs lying on dry, well-drained slopes. *Salix caprea* ssp. *coaetanea* normally grows in dry habitats, while the *S. nigricans* group grows in moist localities (cf. Tab. 1).

DISTRIBUTION

Seventy localities in Troms have been examined by the author (Fig. 2). Thus, the distribution maps and Tab. 4 should give a rough but realistic picture of the distribution pattern for the majority of the treated species.

The area of Troms is too small to compare any changes in the horizontal distribution alone. Nor is the N-S phytogeographical gradient very pronounced, as all the different vegetational regions are scattered more or less throughout the county. More pronounced is the E-W, or oceanic-continental gradient.

The distribution patterns of the pyrenomycete species in Troms, in relation to the vegetational regions, seem to fall within five more or less separated groups (Tab. 4):

Group 1 contains species found only in MB. They are rare and mainly found in the southern part of the county.

Group 2 contains a large group of species mainly found in MB and NB. Most of them are common and more or less evenly distributed all over the county, but *Melanomma pulvis-pyrius* (Fig. 70) seems to be slightly oceanic and *Lophiotrema boreale* slightly continental. However, the latter species is represented by few collections. *Keissleriella cladophila* is not found in the outermost coastal areas, but is most frequent in the northern part of the county, where *Hysterographium elongatum*, curiously enough, is not found. Most of the species in this group are found on the *Salix nigricans* group (cf. Tab. 3). However, *Anthostomella melanotes* is also found on *Salix* species that are common in LA. The climatic conditions are probably more important for this species than the substrate.

Group 3. The species in group 3 are not confined to any particular region. They seem to be well adapted to the range of climatic conditions in Troms, and are common and evenly distributed all over the county.

Group 4. The same is also probably the case for the species in group 4, which are frequent in NB and LA. *Platystomum compressum* (Fig. 79) and *Amphisphaerella xylostei* (Fig. 6) tend towards being continental.

Group 5. The species in group 5 are infrequent, without any evident pattern.

Some of the treated species, e.g. *Cryptosphaeria subcutanea*, *Glyphium schizosporum*, *Hypoxylon macrosporum*, *Lophiotrema boreale* and *Platystomum curtum*, seem to be alpine

Tab. 4. Distribution of pyrenomycetes (n. coll./n. loc.) in the different vegetational regions in Troms.

	Region					
	MB	MB-NB	NB	NB-LA	LA	Number of municipalities
Number of localities	36	10	17	5	3	
Diatrype bullata	6/2					2
Kirschsteiniothelia aethiops	4/3					3
Cryptodiaporthe salicella	4/2					2
Platystomum curtum	61/15	11/5	15/5	3/2		15
Hypoxylon mammatum	56/15	26/4	8/3	1/1		13
Cryptosphaeria subcutanea	46/18	12/4	10/4	7/3		17
Melanomma pulvis-pyrius	37/14	10/5	14/6	6/1		16
Bertia moriformis var. moriformis	14/10	1/1	5/4	5/4		12
Hysterographium elongatum	11/8	8/4	1/1	4/2		13
Anthostomella melanotes	8/5	10/4	8/3	4/3		11
Chaetosphaeria pomiformis	8/6	9/5	3/2	3/1		11
Lophiotrema nucula	5/5	12/5	5/3	3/2		10
Lophiotrema boreale	3/3	2/1		1/1		5
Keissleriella cladophila	6/4	4/2	11/2	5/2		6
Lophiostoma quadrinucleatum	2/2	1/1	6/5	1/1		7
Glyphium schizosporum	6/3	2/2	5/4	10/2		10
Leptosphaeria hendersoniae	12/8	5/2	4/2	7/1	1/1	11
Rebentischia massalongii	13/10	2/2	9/7	2/2	5/1	14
Herpotrichiella collapsa	8/6	5/4	12/6	6/3	14/2	10
Hypoxylon macrosporum	7/3	14/3	34/9	20/5	6/2	14
Arthopyrenia lapponina	10/6	4/3	22/8	11/4	11/3	17
Saccardoella transsylvanica		1/1	1/1	2/2	6/2	4
Amphisphaerella xylostei			2/1	6/1	3/2	3
Platystomum compressum			15/3	13/2	33/2	6
Melanomma fuscidulum	4/1					1
Rhynchostoma minutum	1/1					1
Lophiostoma macrostomoides	1/1				1/1	2
Berlesiella nigerrima		2/1				1
Enchnoa infernalis	1/1					1

or arctic alpine in their distribution.

Both Granmo (1977) and Whalley & Knudsen (1985) suggested *Hypoxylon macrosporum* as an arctic alpine species. This agrees well with my investigation. It is very common in Troms (cf. Fig. 48), most frequent in NB and NB-LA (cf. Tab. 4). It is very rare in Nordland, only known from one collection from the northernmost part of the county. However, as it was already known from one collection from as far south as Nord-Trøndelag, Granmo (1977) suggested that it could also occur in the mountains even further south. In 1982, the species was found in the mountains west of Östersund (Sweden), and in 1984, in one collection from high altitudes (ca. 1270 m a.s.l.) in Sør-Trøndelag. Apart from Karsten's collections in the Murmansk Region, USSR, in 1861 (Karsten 1882), *H.*

macrosporum was not found in Europe outside Scandinavia until 1982. Now it is known from two stations in the Alps, both above 1800 m (L. Petrini, in litt.). Two years later (1984), H. Knudsen and T. Læssøe found *H. macrosporum* in SW Greenland on *Salix glauca* coll. One may speculate whether the occurrence in Greenland originates from North Scandinavia, as no species in the genus *Hypoxylon* are known from Iceland (E. Jensson pers. comm.). However, there can be little doubt that *H. macrosporum* is an arctic alpine species, and that its distribution pattern is determined by the temperature requirements of the fungus, rather than by the distribution of the hosts.

Glyphium schizosporum is, according to Zogg (1962), a very rare species, previously known from only a few localities in Switzerland and France, and from one locality in Algeria. They are all high altitude localities, situated between 1000 and 2000 m a.s.l. In Troms, where it is rather common, its main distribution is in NB and NB-LA. Therefore, like *H. macrosporum*, its distribution pattern is determined mainly by its temperature requirements. Although the climate in N Norway seems to suit both *G. schizosporum* and *H. macrosporum* very well, particularly *H. macrosporum*, the same does not seem to be the case in the Alps, where both species are very rare. Both *G. schizosporum* and *H. macrosporum* are easy to find in the field and it is thus very unlikely that they have been overlooked by mycologists in the rest of Europe and Scandinavia. In other words, they seem to have a disjunct distribution pattern which is phytogeographically very interesting.

Although A. Granmo (pers. comm.) claims to have observed *Cryptosphaeria subcutanea* in several localities in western Norway, I still consider *C. subcutanea* as a rather rare species in S Norway. I did not find it in 1982 when I examined the pyrenomycete flora on *Salix* in the southern part of Nordland, and from the remaining part of N Norway, it is only known from Troms. Its Norwegian distribution pattern is probably rather similar to that of *Hypoxylon macrosporum*. The southernmost find of *C. subcutanea* in Norway is at Oppdal (600 m a.s.l.). *Cryptosphaeria subcutanea* is, according to F. Rappaz (in litt.) very rare in Europe. It is not found in the Alps nor in central Europe, but probably in Germany, if Allescher's *Valsa salicicola* (cf. Rappaz 1984) really is the same fungus.

Both *Lophiotrema boreale* and *Platystomum curtum* may have a similar distribution pattern in Norway as *Hypoxylon macrosporum*. Like *Cryptosphaeria subcutanea*, these species are most frequent in MB in Troms. Thus, I expect these species to be more common further south in the country than *H. macrosporum* and *Glyphium schizosporum*.

The pyrenomycetes are most frequently found in MB and NB (cf. Tab. 4), and on the *Salix nigricans* group (cf. Tab. 3, Fig. 3). However, as the main distribution of *S. nigricans* ssp. *nigricans* and ssp. *borealis* is also in MB and NB (cf. Tab. 1), it is almost impossible to determine whether the distribution pattern of the pyrenomycetes is due to the temperature requirements of the fungi, or to the distribution of the hosts. Prior to any further discussions on this subject, the pyrenomycete flora in Nordland and Finnmark needs to be investigated. This is particularly important for the species that appear to have an alpine or arctic alpine distribution. It would also be interesting to see whether the pyrenomycete flora is different, and if other groups of *Salix* replace the *S. nigricans* group as the main host for the pyrenomycetes. Finnmark is perhaps more interesting than Nordland, because of the disappearance of the MB region (except for exclaves in Alta, Sør-Varanger and two small areas in Porsanger), and the dominance of the NB and LA regions. The distributional pattern of the various vegetation regions in Nordland is similar to that in Troms, except for the presence of a phytogeographically interesting southern boreal region in Nordland (Dahl et al. 1986).

GEOGRAPHICAL VARIATION

The ascospores in the material from Troms often turned out to be larger than those described in literature, and those found in the examined material from other herbaria, e.g. from Central Europe (cf. *Melanomma fuscidulum* and *Keissleriella cladophila*). This seems to be more pronounced further north, as observed and commented by several authors, e.g. Karsten (1872), Rostrup (1888) and Lind (1924). However, it probably involves species with rather low temperature optima, and with wide tolerances, as the same species are usually found in the lowland areas further south in Europe. At relatively low temperatures, the ascospores will develop at normal speed and reach typical spore sizes, while higher temperatures will result in liberation of premature ascospores. The problem is perhaps that many of these low temperature species were studied and described in the upper part of their temperature range. This is probably a common phenomenon in pyrenomycetes with relatively long-living ascomata. The study of these fungi has typically been carried out in Central Europe, while their main distribution may be arctic alpine (S. Sivertsen, in litt.). The arctic pyrenomycetes are actually long-living, usually requiring several seasons to mature (Savile 1972). This is also probably the case for many of the pyrenomycetes in N Norway. Thus it is important to clarify the relation between arctic alpine and lowland specimens. We need to be sure that we are dealing with the same taxa, and cultural experiments with species which are able to sporulate in culture will be important.

The delayed development of the ascomata in the arctic alpine regions is due to the low temperatures, often far below the temperature optimum, and the relatively short growing seasons. Furthermore, bacterial decay is slow, allowing the fungi to exploit the substrate for a long time (Savile 1963, 1972).

Another characteristic feature is that the arctic pyrenomycetes develop smaller ascomata than lowland specimens from temperate regions (Savile 1963). The ascomata of e.g. *Melanomma pulvis-pyrius* in Troms were 270-450 µm diam., those from Central Europe described by Hilber & Hilber (1978) were 750-850 µm diam. J. von Arx (in litt.) has also observed the same trend in alpine and lowland specimens.

The substrate (hosts) may also affect the development of the fungi, and some species may have several main hosts. For example *Anthostomella melanotes* seems to be most frequent on *Acer* and *Fraxinus* in Germany (Winter 1886), and on *Quercus* in England (P. Cannon, in litt.). In general, fungi often have different main hosts in marginal and central parts of their area, and in Troms *A. melanotes* is common on *Salix*. The tendency to emphasize the hosts was earlier very pronounced. A classic example is Lehmann (1886), who based his classification upon host relationships, and described 22 different "forma" of *Platystomum compressum*. However, his ideas have not been accepted.

In my opinion, some morphological variation has to be accepted within a species, and I do not support the tendency to erect new intraspecific taxa (e.g. forma, forma specialis, variety) as soon as a species is found on a new genus of host plants.

TAXONOMIC CONSIDERATIONS

Xylariaceae

Martin (1969, 1976 (rite publ.)) transferred *Anthostoma melanotes* to *Anthostomella*. I

question Martin's (1969) examination of this species. It appears from his description that the ascospores have prominent gelatinous sheaths, and the asci are clavate, long-stiped and amyloid. Any of these characters fit my observations of *A. melanotes*, and not those of Winter (1886) or Ellis & Everhart (1892). In the original description, Berkeley & Broome (1852) describe the asci as "linearibus", which is cylindrical, and not clavate.

Martin (1969) did not examine the type material, and so I think that he described another species erronously determined as *Anthostoma melanotes*. However, the species seems to fit in *Anthostomella* (Xylariaceae) (see pp. 27-28).

Amphisphaeriaceae

The three species in the genus *Amphisphaerella,* mentioned by O. Eriksson (1966), all seem to show host specificity. *Amphisphaerella xylostei* has previously only been reported on *Lonicera*, which in Norway is most frequent in the lowland areas in the southern parts of the country. In Troms the fungus is found on *Salix* in NB and LA. Jensson's (1978b) *Amphisphaerella* sp. with amyloid asci, found on *Betula pubescens* on Iceland, is closely related to *A. xylostei*, but is easily distinguished by its large ascospores.

In the group of species with amyloid asci, there are, in the Nordic countries, one species on *Lonicera* and one species on *Betula*. It is possible that the material on *Salix* represents a separate species, or perhaps only a forma specialis (see p. 27-28). Cultural studies could settle this.

Lophiostomataceae

Originally *Lophiostoma* contained both species with coloured and hyaline ascospores, but the hyalophragmosporous species were later segregated into *Lophiotrema* by Saccardo (1878). This classification has until recently been followed, among others by Munk (1957) and Dennis (1978). However, the classification is unnatural, and the colour of the ascospores alone is not sufficiently distinctive to be used as a criterion for generic differentiation. This was indicated by Chesters & Bell (1970), but in my opinion they went too far as they only maintain the genus *Lophiostoma*. Although some of the species in *Lophiotrema* have turned out to be nothing but immature stages of *Lophiostoma* spp. (see O. Eriksson 1967b), *Lophiostoma* and *Lophiotrema* are obviously two separate genera (L. Holm, in litt.). They are distinguished both by ascospore and ascus characters, but not by the colour of the ascospores (see pp. 72, 92).

Platystomum differs from *Lophiostoma* and *Lophiotrema* in usually having a longitudinal septum in one or more segments of the ascospores. Like Chesters & Bell (1970), I maintain *Platystomum* as a separate genus within Lophiostomataceae, but I am aware of the fact that *Platystomum* is very closely related to *Lophiostoma*, and that they probably should have been united. *Platystomum compressum* var. *pseudomacrostomum* is a taxon central to this discussion, as the majority of the ascospores in this variety often lack longitudinal septa, and are rather similar in shape to those in the *Lophiostoma caulium* group. My observations of longitudinal septa in some of the ascospores in *Lophiostoma macrostomoides* further weaken the limit between *Lophiostoma* and *Platystomum*. However, L. Holm & K. Holm (monograph, in prep.) is giving consideration to incorporating *Platystomum* in *Lophiostoma*. If this is done, the generic circumsciptions of both *Lophiostoma* and *Lophiotrema* (see p. 92) need to be altered, because *Platystomum* also contains species with cylindrical asci (e.g. *P. curtum*).

Herpotrichiellaceae

Dictyotrichiella is very closely related to *Berlesiella*. The main feature separating these two genera is the development of a stroma in *Berlesiella*, lacking in *Dictyotrichiella*. In the examined collections of *Berlesiella nigerrima* from Troms, the stromata were poorly developed in relation to the descriptions given by Munk (1957) and Dennis (1978). I was never able to detect a developed stroma on the separately growing ascomata, but could do so only when the ascomata were gregarious. My material matches well Jensson's (1978b) description of *B. nigerrima* from Iceland, although he did not observe stromata in his collections at all. Thus, because the development of the stromata seems to be very variable in *B. nigerrima*, perhaps only *Berlesiella* should be recognized for the dictyosporous species whose asci are octosporous. Cultural studies would probably help us solve this problem.

TAXONOMY

KEY TO THE TREATED SPECIES

1 Ascospores 1-celled 2
1 Ascospores 2- or more-celled 11
2(1) Ascospores allantoid, hyaline or light brownish 3
2 Ascospores elliptical, light to dark brown 7
3(2) Astromatic, ascomata subepidermal in subiculum, ascospores 17-21 x 3.5-5 µm, asci I- ..... *Enchnoa infernalis*
3 Stromatic 4
4(3) Stromata well developed, asci I- 5
4 Stromata moderately or poorly developed 6
5(4) Stromata always covered by periderm, usually pulvinate, ostioles prominent, sulcate, ascospores 11.5-15.5 x 3.5-4.5 µm, variable in shape... *Cryptosphaeria subcutanea*
5 Stromata erumpent through bark, disc-shaped, circular to irregular, often coalescing, surface rather smooth, ascospores 5-7.5 x 1-1.5 µm ..... *Diatrype bullata*
6(4) Ascomata immersed in bark, ostioles collectively erumpent ..... *Valsa* (p. 90)
6 Ascomata usually immersed in decorticated wood, ostioles separately erumpent ..... *Eutypa* (p. 89)
7(2) Ascospores with equatorially arranged germ pores ..... *Amphisphaerella xylostei*
7 Ascospores with a germ slit 8
8(7) Ascomata superficial, asci I+ ..... *Rosellinia* (p. 89)
8 Ascomata immersed, stromatic tissue present 9
9(8) Stromata poorly developed, clypeoid, ascospores 13-17 x 5.5-7.5 µm, asci I- ..... *Anthostomella melanotes*
9 Stromata well developed, asci I+ 10
10(9) Stromata usually growing in elongated bands close to bark on decorticated wood, ascospores 23-34 x 9-12.5 µm, germ slit indistinct ..... *Hypoxylon macrosporum*
10 Stromata erumpent through bark, orbicular to oval, strongly carbonized, ascospores 17.5-26 x 8-11 µm, germ slit distinct ..... *Hypoxylon mammatum*
11(1) Ascospores 2-celled 12
11 Ascospores 3- or more-celled 20
12(11) Asci unitunicate, asci I- 13
12 Asci bitunicate 16
13(12) Ascospores light brown, 8-10.5 x 3.5-4.5 µm, adorned with parallel, diagonally orientated ornaments, ostioles long and cylindrical ..... *Rhynchostoma minutum*
13 Ascospores hyaline 14
14(13) Ascomata immersed in bark, ascospores 14.5-18.5 x 4.5-7 µm ..... *Cryptodiaporthe salicella*
14 Ascomata superficial 15
15(14) Ascomata coarsly rough, resembling small blackberries, ascospores 33-46.5 x 4.5-7 µm ..... *Bertia moriformis* var. *moriformis*
15 Ascomata often collapsing to cup shape, ± shiny black, ascospores 12-16.5 x 4.5-6.5 µm ..... *Chaetosphaeria pomiformis*
16(12) Ascospores olive-brown, 24-30 x 8-10.5 µm, ± slipper shaped in outline, ascomata superficial and often ± conical ..... *Kirschsteiniothelia aethiops*

16 Ascospores hyaline 17
17(16) Ostioles covered with setae, ascospores 14-18.5 x 6-8 µm. *Keissleriella cladophila*
17 Ostioles without setae 18
18(17) Ostioles not prominent, ascomata scattered on bark, shiny black, ascospores 15-19.5 x 4.5-7.5 µm ..... *Arthopyrenia lapponina*
18 Ostioles prominent, laterally flattened, ascospores later on 4-celled and light brownish 19
19(18) Ascospores 13-16 x 3-5 µm ..... *Lophiotrema boreale*
19 Ascospores 18.5-24 x 5.5-7.5 µm ..... *Lophiotrema nucula*
20(11) Ascospores with transverse septa only 21
20 Ascospores with transverse and longitudinal septa 32
21(20) Ascospores 3 to 8-septate, greyish to light brown or brown at maturity 23
21 Ascospores multiseptate, ellipsoid or filiform 22
22(21) Ascospores ellipsoid to broadly fusiform, 40-55 x 8-10.5 µm, 11 to 18-septate, hyaline, ascomata immersed ..... *Saccardoella transsylvanica*
22 Ascospores filiform, 250-350 x 3-5 µm, multiseptate, fragmenting before maturity into cylindrical, pale brown 3 to 7-septate units, ascomata superficial, ax-head shaped ..... *Glyphium schizosporum*
23(21) Ascospores with a hyaline basal appendage, main body of ascospore 21-26.5 x 7.5-10 µm, 4(-5)-septate, light brown ..... *Rebentischia massalongii*
23 Ascospores without such an appendage 24
24(23) Ascospores cylindrical, 18-33 x 3-5 µm, 3 to 7-septate, pale brown, ascomata ax-head shaped ..... *Glyphium schizosporum*
24 Ascospores ± ellipsoid to fusiform 25
25(24) Ascomata setose, ascospores 11-16.5 x 4-6 µm, 3-septate, olive-greyish ..... *Herpotrichiella collapsa*
25 Ascomata glabrous 26
26(25) Ostioles laterally flattened 29
26 Ostioles not so, ascomata ± globose 27
27(26) Ascospores 20.5-27 x 7-9.5 µm, 3(-5)-septate, light brown, ascomata shiny black, often coalescing ..... *Leptosphaeria hendersoniae*
27 Ascospores smaller 28
28(27) Ascospores 14.5-17.5 x 5-6 µm, 3-septate, slightly curved, brown, ostioles prominent, cylindrical ..... *Melanomma fuscidulum*
28 Ascospores 16-20 x 6-7 µm, 3-septate, olivaceous grey to pale brown, ostioles not prominent, ascomata usually densely gregarious ..... *Melanomma pulvis-pyrius*
29(26) Asci clavate 31
29 Asci cylindrical, ascospores at first 2-celled and hyaline, later on 4-celled and light brownish 30
30(29) Ascospores 13-16 x 3-5 µm ..... *Lophiotrema boreale*
30 Ascospores 18.5-24 x 5.5-7.5 µm ..... *Lophiotrema nucula*
31(29) Ascospores 20-27 x 7.5-9.5 µm, 3(-4-5)-septate, light ochre brown to dark brown ..... *Lophiostoma quadrinucleatum*
31 Ascospores 27-36 x 7-9 µm, 5-8-septate, golden brown ..... *Lophiostoma macrostomoides*
32(20) Ascomata ± elliptical to fusiform, 0.8-2.2 mm long, ascospores 38-55 x 13.5-19 µm, with 9-12(-14) transverse septa and several longitudinal septa, orange brown to dark reddish brown ..... *Hysterographium elongatum*
32 Ascomata not so, ± globose 33
33(32) Ascomata setose, ascospores 13-16 x 4.5-6 µm, light olive-greyish, basal stroma

present, saprophytic on old stromata of members of Diatrypaceae..... ..... *Berlesiella nigerrima*

33 Ascomata glabrous.....34

34(33) Ostioles laterally flattened.....35

34 Ostioles not so.....36

35(34) Ascomata 550-800(-1050) µm diam., ascospores 21.5-30 x 8-12 µm, with 3-5(-8) transverse septa and (0-)1-3(-5) segments with 1(-2) longitudinal septa, ochre brown to brown, uni- to biseriate..... *Platystomum compressum*

35 Ascomata 300-450(-600) µm diam., ascospores 15.5-19.5 x 5.5-8 µm, with 3-5 (-6) transverse septa and (0-)1-2(-4) segments with one longitudinal septum, light ochre brown to brown, uniseriate..... *Platystomum curtum*

36(34) Ascomata immersed beneath periderm, usually in small groups on other ascomycetes ..... *Fenestella* (not treated)

36 Ascomata superficial, at least when mature, solitary, not on other ascomycetes..... ..... *Teichospora* (p. 90)

DESCRIPTION OF THE SPECIES IN ALPHABETICAL ORDER

Amphisphaerella cf. *xylostei* (Pers. : Fr.) Munk (Figs 4, 6, 13)

Dansk bot. Ark. 15: 2: 89, 1953. - Basionym: *Sphaeria xylostei* Pers. : Fr., Syst. mycol. 2: 487. 1823. - *Anthostoma xylostei* (Pers.) Sacc., Fungi ital. t. 162, 1881. - Other synonyms; see von Arx & Müller (1954). - Anamorph: *Nodulisporium* sp. fide Martin (1969).

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, partly to completely immersed, each beneath a clypeus. The clypeus covers a single perithecium or more often several perithecia growing close together. Ostioles periphysate and papillulate. Porus circular, 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 ostiolum, the cells in the outer cell layer gradually turn to be ± isodiametric. **Asci** (125-)140-170(-185) x (11.5-)12-15 µm, mean 154.4 x 13.5 µm, cylindrical, short-stiped, unitunicate, 8-spored. Amyloid apical ring with wide opening. **Paraphyses** 2-3(-3.5) µm wide at base, but gradually tapering towards apex, numerous, very long, septate, dissolving. **Ascospores** (14.5-)15.5-20(21.5) x 8-10.5 µm, mean 18.1 x 9.0 µm, broadly ellipsoid to oblong-elliptical, one-celled, often with granular content, brown to dark brown, and provided with (3-)4-5 distinct, equatorial germ pores. The spore-wall seems to be thickened around the pores. Unseriate.

Substrate. *Salix lanata* ssp. *lanata* (8 coll.), *S. glauca* ssp. *glauca* (2 coll.), *S. phylicifolia* (1 coll.), on wood and bark. Previously reported on *Lonicera* spp. (von Arx & Müller 1954).

Comments. *Amphisphaerella xylostei* has not previously been recorded from Troms, but is mentioned from S Norway by Rostrup (1904) as *Anthostoma xylostei* (Pers.) Sacc. on *Lonicera xylosteum*. It is fairly rare on *Salix* in Troms, hitherto only found in four localities. As far as I know, *Amphisphaerella xylostei* has not been reported on *Salix* before.

My material from Troms matches well the descriptions of *Amphisphaerella xylostei*

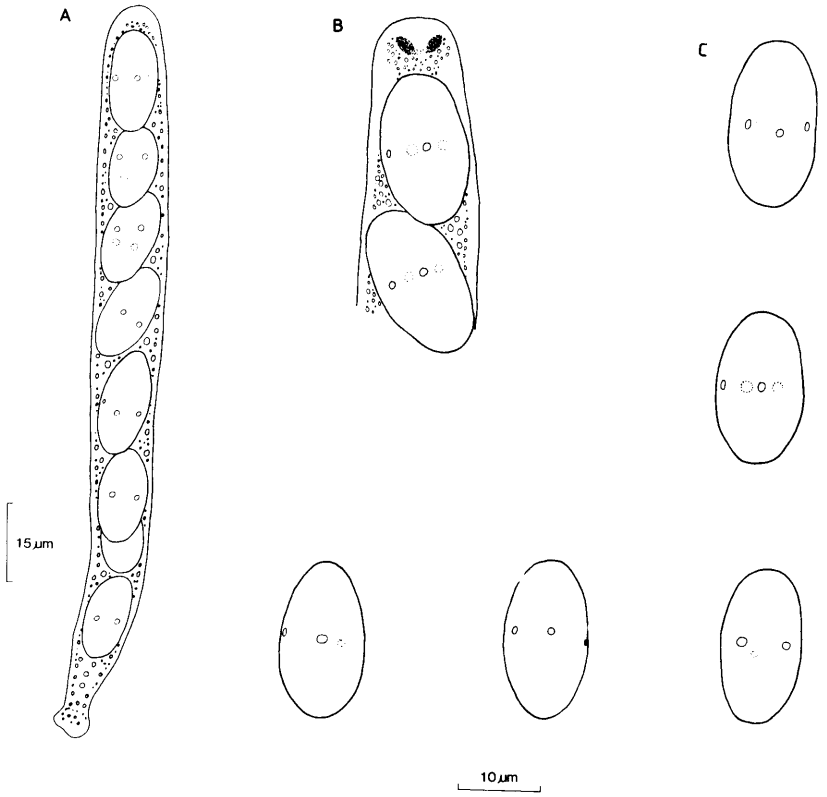


Fig. 4. *Amphisphaerella xylostei*. A. Ascus with eight ascospores. B. Ascal apex. Treated with M.r. C. Ascospores.

given by Munk (1957), Dennis (1978) and von Arx & Müller (1954). However, the examined collections of this species on *Lonicera* turned out to be variable and often slightly different from my collections. Additional comments on p. 23.

Martin (1969, 1976 rite publ.) transferred this species to *Anthostomella*, but I do not agree with his emendation. Neither the ascospores nor the asci are typically xylarioid, so it cannot be included in *Anthostomella* (Xylariaceae).

Amphisphaerella dispersella (Nyl.) O. Eriks., which grows on *Populus*, resembles *A. xylostei*, but has non-amyloid asci. The ascospores are variable in shape, size, and in number and location of the germ pores. Pores can sometimes be observed near the ends of the spores. According to O. Eriksson (1966), *Amphisphaerella dispersella* has ascospores with (3-)4(-several) pores, *A. xylostei* with (4-)5-6(-several) pores.

Amphisphaerella xylostei and *Anthostomella melanotes* are macroscopically often confusingly similar, but are easily distinguished microscopically.

Material examined: Norway: s.loc.: 1 coll. (O). O: 4 coll. (O). Op: 1 coll. (O). Tr: 11 coll. (TROM), see Fig. 6. Sweden: 1 coll. (O), 1 coll. (UME). Denmark: 3 coll. (C).

Anthostomella melanotes (Berk. & Br.) Martin (Figs 5, 7, 14)

S. afr. J. Bot. 42: 1: 71, 1976. - Basionym: *Sphaeria melanotes* Berk. & Br., Ann. Mag. nat. Hist. Ser. 2: 9: 321 (Nr. 623), 1852. - *Anthostoma melanotes* (Berk. & Br.) Sacc., Michelia 1: 326, 1878.

Stromata clypeoid and black, but carbonized and rather well developed only around the ostioles. Large areas of the surface of the wood are often blackened, but this is only due to a thin network of hyphae in the upper part of the decorticated wood. **Perithecia** 400-550(-800) µm diam., ± globose to oval, immersed, scattered or several close together in small groups, each beneath a clypeus. The clypeus is penetrated by a conical to hemispherical black, shiny and carbonized ostiolum. **Peridium** 25-45 µm thick, consisting of an outer layer of thick-walled, elongated, brown cells, and an inner hyaline layer of thin-walled, elongate cells. Towards the ostiolum, the outer cell-layer gradually turns into textura angularis. **Asci** 100-125(-135) x 8-10.5 µm, mean 112.6 x 9.3 µm, cylindrical, rather short-stiped, unitunicate, non-amyloid and 8-spored. **Paraphyses** up to 5 µm wide at base, but gradually tapering towards apex, numerous, very long and septate. **Ascospores** (11.5-)13-

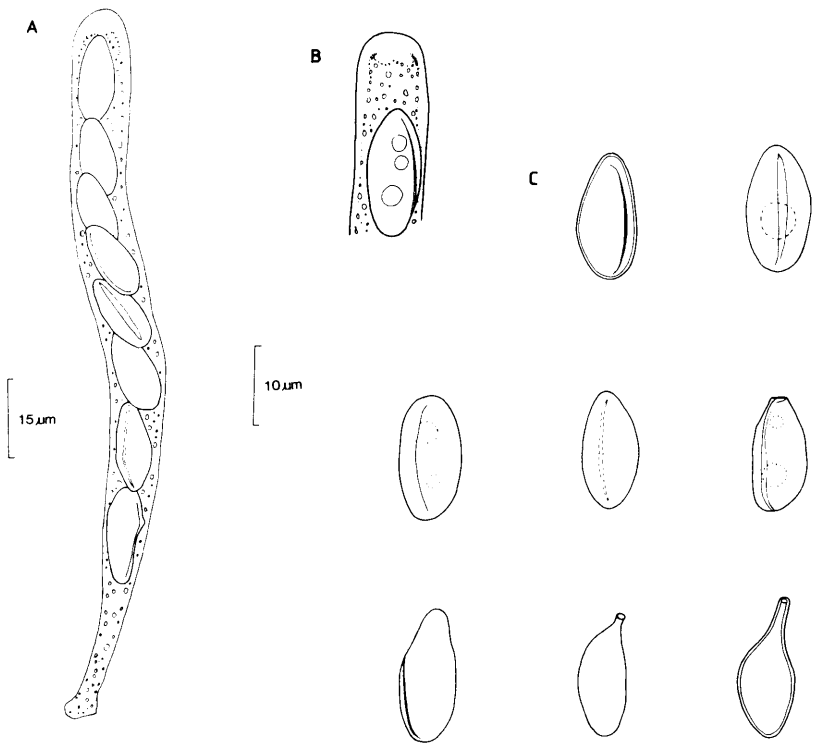
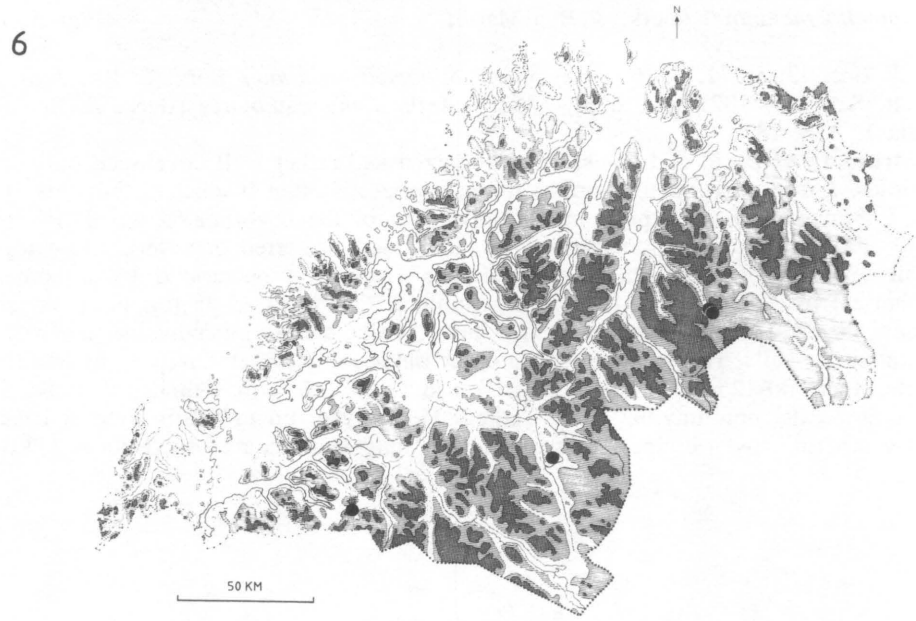
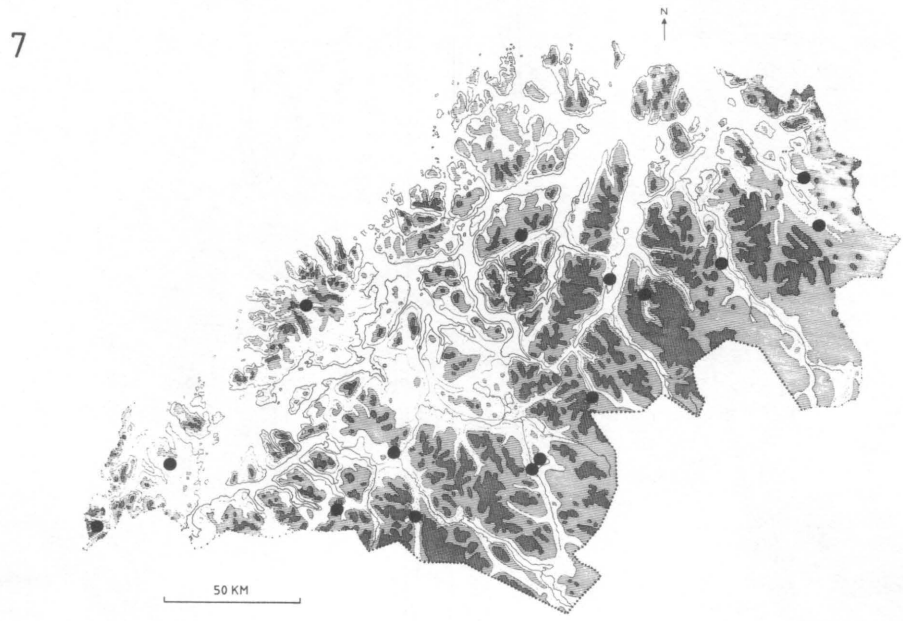


Fig. 5. *Anthostomella melanotes*. A. Ascus with eight ascospores. B. Ascal apex. C. Ascospores.





Figs 6-7. Distribution maps. Fig. 6. *Amphisphaerella xylostei*. Fig. 7. *Anthostomella melanotes*. For symbols see Fig. 2.

17(-18.5) x 5.5-7.5(-8.5) µm, mean 14.7 x 6.7 µm, ± oval, gibbose or broadly ellipsoid, one-celled, brown and uniseriate. A protuberance is often observed at one end of the spores. Germ slit longitudinal and indistinct, usually as long as the whole spore.

Substrate. *Salix nigricans* ssp. *borealis* (9 coll.), *S. nigricans* ssp. *nigricans* (7 coll.), *S. glauca* ssp. *glauca* (4 coll.), *S. caprea* ssp. *coaetanea* (3 coll.), *S. phylicifolia* (2 coll.), *S. caprea* ssp. *caprea* (1 coll.), *S. glauca* ssp. *stipulifera* (1 coll.), *S. lanata* ssp. *lanata* (1 coll.), *S. lapponum* (1 coll.), *S. nigricans* ssp. *nigricans* x *phylicifolia* (1 coll.), on wood. Previously reported on *Acer*, *Fraxinus* and *Quercus* (Berkley & Broom 1852, Winter 1886). Also seen on other substrates in the examined material.

Comments. *Anthostomella melanotes* has not been found in Norway before. However, it is common on *Salix* in Troms and evenly distributed all over the county.

Both Petrak (1923) and Miller (1928) stated that it is often difficult to separate *Anthostomella* from *Anthostoma* Nits. Both genera have immersed ascomata, which in *Anthostomella* are covered by a clypeus, in *Anthostoma* aggregated in a stroma. In my opinion, the stromatic arrangement in this species must be regarded as clypeoid. The asci are inamyloid, but obviously xylarioid. Several taxa in the Xylariaceae have been reported to have consistently iodine-negative apical rings (cf. e.g. Rogers 1979, Hawksworth & Lodha 1983), and the lack of an iodine reaction does not necessarily hinder putting this species in *Anthostomella*. In her monograph, Francis (1975) accepted five species with negative reaction in this genus.

My collections from Troms matched perfectly nearly all the examined collections from other herbaria labelled *Anthostoma melanotes* or *A. schmidtii* Nits. The deviant collections had slightly different ascospores and asci with iodine-positive rings.

Typical of *Anthostomella melanotes* are the blackening of the wood surface and the completely immersed ascomata, with only the small, black and ± conical ostioles visible. Among the species treated here, it is macroscopically often confusingly similar to *Saccardoella transsylvanica* (Rehm.) Berl. and *Amphisphaerella xylostei* (Pers. : Fr.) Munk, but microscopically easy to separate. Additional comments on p. 22-23.

Material examined: Norway: Tr: 30 coll. (TROM), see Fig. 7.
Sweden: 2 coll. (C). East Germany: 3 coll. (C). Austria: 1 coll. (C). Italy: 1 coll. (B), 1 coll. (C). U.S.A.: 1 coll (B), 1 coll. (BG), 2 coll. (C).

Arthopyrenia lapponina Anzi (Figs 8, 11, 15-16)

Comm. Soc. critt. ital. 2: 25, 1864. - *Verrucaria epidermis* var. *fallax* Nyl., Bot. Not.: 178, 1852. - *Arthopyrenia fallax* (Nyl.) Arn., Verh. zool.-bot. Ges. Wien 23: 505, 1873 (n.v.). - *Leiophloea fallax* (Nyl.) Riedl. Sydowia 23: 234, 1971. - Other synonymes; see Harris (1975).

Illustration: Harris 1975: Figs 53-59.

Pseudothecia 230-450 µm diam., scattered in the upper layer of periderm, subglobose to hemispherical, often slightly collabent with age and shiny black. Ostioles not prominent. **Peridium** varying in thickness, but usually 10-25 µm. Consisting of a thin, outer zone of textura intricata, gradually turning into textura epidermoidea, an inner layer of thick-walled, brown cells, ± textura globulosa, and a thin innermost hyaline layer, ± textura porrecta. Upper part thick, compact and black, often splitting and growing somewhat outwards, resembling a small clypeus, gradually attenuating and becoming paler towards the base. Basal tissue very thin or lacking. **Asci** (57-)65-95 x (11.5-)12.5-17(-18) µm, mean 79.3 x 14.9 µm, clavate or ± elliptical, short stiped, almost sessile, bitunicate, thick-walled and 8-spored. **Pseudoparaphyses** 2-2.5 µm diam., abundant, branched, anastomosing and septate.

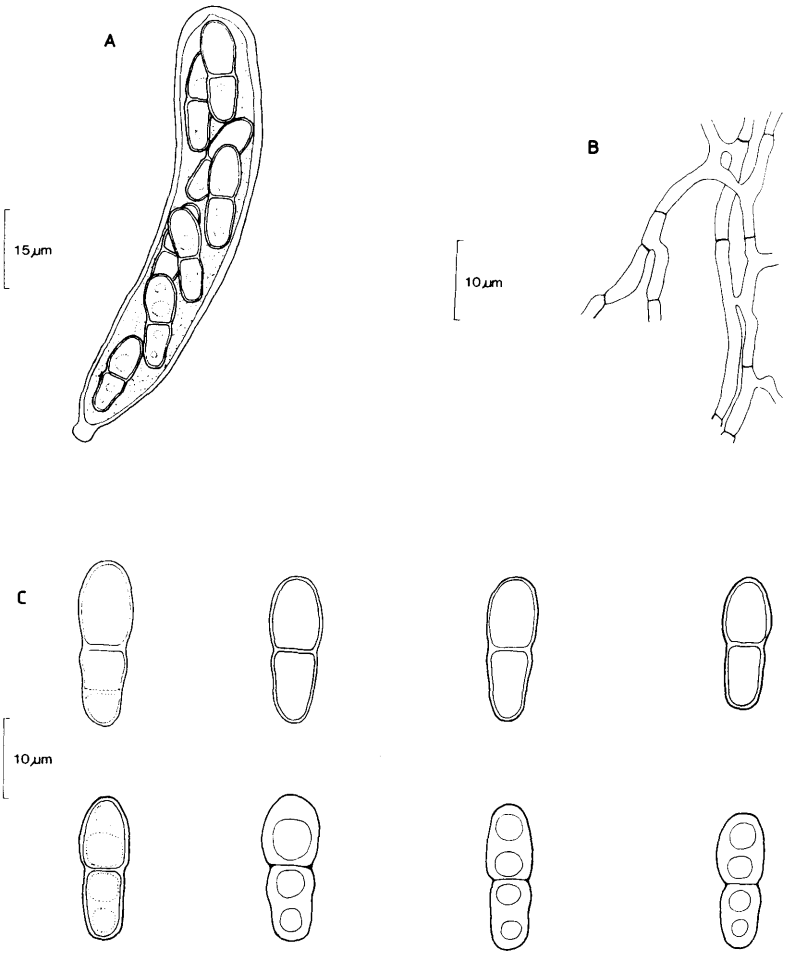


Fig. 8. *Arthopyrenia lapponina*. A. Ascus with eight ascospores. B. Part of pseudoparaphyses. C. Ascospores.

Ascospores 15-19.5(-22) x 4.5-7.5 µm, mean 17.5 x 5.7 µm, narrowly ovoid to oblong-elliptical, two-celled, with upper hemispore broader, and slightly constricted at the septum. Hyaline, often with 1-2 large guttulae in each cell and sometimes enclosed in thick gelatinous sheath, irregularly biseriate.

Substrate. *Salix lapponum* (17 coll.), *S. glauca* ssp. *glauca* (10 coll.), *S. nigricans* ssp. *nigricans* (8 coll.), *S. nigricans* ssp. *borealis* (7 coll.), *S. lanata* ssp. *lanata* (5 coll.), *S. arbuscula* (3 coll.), *S. myrsinites* (2 coll.), *S. pentandra* (2 coll.), *S. glauca* ssp. *stipulifera* (1 coll.), *S. hastata* (1 coll.), *S. nigricans* ssp. *borealis* x *glauca* ssp. *glauca* (2 coll.), on bark. Previously reported on several different deciduous trees (Santesson 1984).

Comments. *Arthopyrenia lapponina* is previously mentioned from Troms by Øvstedal (1980) and Santesson (1984). It is very common on *Salix* in Troms and evenly distributed

all over the county.

Øvstedal (1980, in litt.) has pointed out that *Arthopyrenia lapponina* grows at the base of trunks, "snow-covered in winter and shadowed by large ferns and herbs in summer". However, according to my observations on *Salix*, it is also commonly found above the snow line.

The differences between *Arthopyrenia* and *Massarina* seem to be subtle to many mycologists, and the first is often mistaken for the second. However, differences are found in the position of the ascomata (in *Massarina* usually immersed in cortical tissue), and in the structure of the peridial tissue. In addition, the peridium in *Massarina* usually has ± the same thickness at the sides and the bottom.

Arthopyrenia lapponina is typically seen as scattered, small, shiny black patches on bark.

Material examined: Norway: Tr: 58 coll. (TROM), see Fig. 11.

Berlesiella nigerrima (Bloxam ex Currey) Sacc. (Figs 9, 17)

Rev. mycol. 10: 7, 1888. - Basionym: *Sphaeria nigerrima* Bloxam ex Currey, Trans. Linn. Soc. Lond. 22: 272, 1852 (n.v.). - *Pleospora nigerrima* (Bloxam) Sacc., Syll. fung. 2: 276, 1883.

Illustration: Bigelow & Barr 1969: Figs 1-5.

Stromata 70-90 µm thick, consisting of a brown-celled textura angularis, turning into textura epidermoidea around the edges, superficial, poorly developed, only observed when the ascomata were growing closely crowded over the tips of the ostioles of *Cryptosphaeria subcutanea*. **Pseudothecia** 90-180 µm diam., subglobose, black, mostly crowded in small groups, slightly immersed with their bases in a stroma or superficially on old stromata of *C. subcutanea*. Densely covered with short, dark brown protuberances, which gradually become longer towards the ostiolum where they may be characterized as setae, 20-25 x 3-4 µm. **Peridium** ca. 25 µm thick, consisting of a brown-celled textura angularis. **Asci** 38-54 p.sp. x 8.5-11.5(-13.5) µm, mean 45 x 10.5 µm, oblong to saccate, short-stiped, almost sessile, bitunicate, thick-walled, particularly towards apex, 8-spored. **Ascospores** (12.5-)13-16(-17.5) x 4.5-6(-6.5) µm, mean 14.6 x 5.3 µm broadly ellipsoidal-fusiform, straight or inequilateral, with (3-4-)5-6 transverse septa and one longitudinal septum in one or two of the middle cells, slightly constricted at septa and light olive-greyish. Overlapping biseriate or crowded in ascus.

Substrate. *Salix nigricans* ssp. *borealis* (2 coll.), on stromata of *Cryptosphaeria subcutanea*. Previously reported on stromata of Diatrypaceae (Bigelow & Barr 1969).

Comments. *Berlesiella nigerrima* has not previously been recorded from Troms, but is mentioned from S Norway by Foss (1971) and Jensson (1978b). It has hitherto been found in only one locality on *Salix* in Troms. However, the ascomata are very small and may easily be overlooked. Foss (1971) characterized *B. nigerrima* as a very rare saprophyte on old stromata of *Diatrype stigma*, and Jensson (1978b) mentioned only two finds; on stromata of *Eutypa* sp. and *Diatrypella*.

My material from Troms deviate somewhat from the descriptions of *Berlesiella nigerrima* given by Munk (1957) and Dennis (1978) in having a poorly developed stroma and somewhat larger ascomata. I have discussed my collections with M. Barr, and they fit within her concept of *B. nigerrima* (M. Barr, in litt.). Previously she accepted only one species in *Berlesiella* and synonymized among others *Dothidea episphaeria* Peck with *B. nigerrima* (Bigelow & Barr 1969). After a review, she now regards it as a separate species within *Berlesiella* (M. Barr, in litt.). *Berlesiella nigerrima* is distinctive with its light olive-

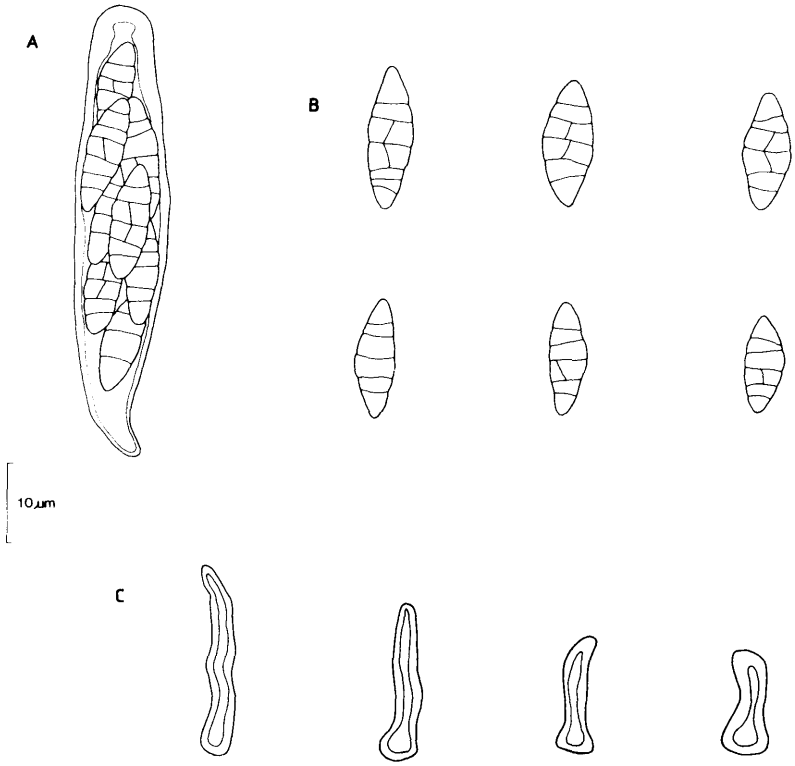


Fig. 9. *Berlesiella nigerrima.* A. Ascus with eight ascospores. B. Ascospores. C. Setae, different sizes.

greyish ascospores and its small, setose ascomata, typically growing on old stromata of members of Diatrypaceae. However, it may be mistaken for species of *Dictyotrichiella* Munk, but these lack stromata. Additional comments on p. 24.

Material examined: Norway: Tr: Nordreisa: Reisadalen EC 10,17 6 Sep 1982 2 coll. *Salix nigricans* ssp. *borealis* (associated with *Cryptosphaeria subcutanea*) GM 1909a, 1912a (TROM). Italy: 1 coll. (PAD).

Bertia moriformis (Tode : Fr.) de Not. var. *moriformis* (Figs 10, 12, 18)

G. bot. ital. 1: 335, 1844. - Basionym: *Sphaeria moriformis* Tode : Fr., Syst. mycol. 2: 458, 1823. - *Sphaeria claviformis* Sowerby, Col. Fig. engl. Fungi, plate 337, 1801. - Other synonyms; see Corlett & Krug (1984).

Description and illustrations: Corlett & Krug 1984: Figs 1, 2, 6, 7, 11-13.

Perithecia up to 950 µm high and 600 µm diam., scattered to gregarious, superficial, ± cylindrical and black. The upper fertile portion of perithecium coarsely rough or tuberculate and sometimes laterally collapsed, born on a well-developed base. Ostiolum not visible externally, but can be traced in median longitudinal section of the perithecium. **Asci**

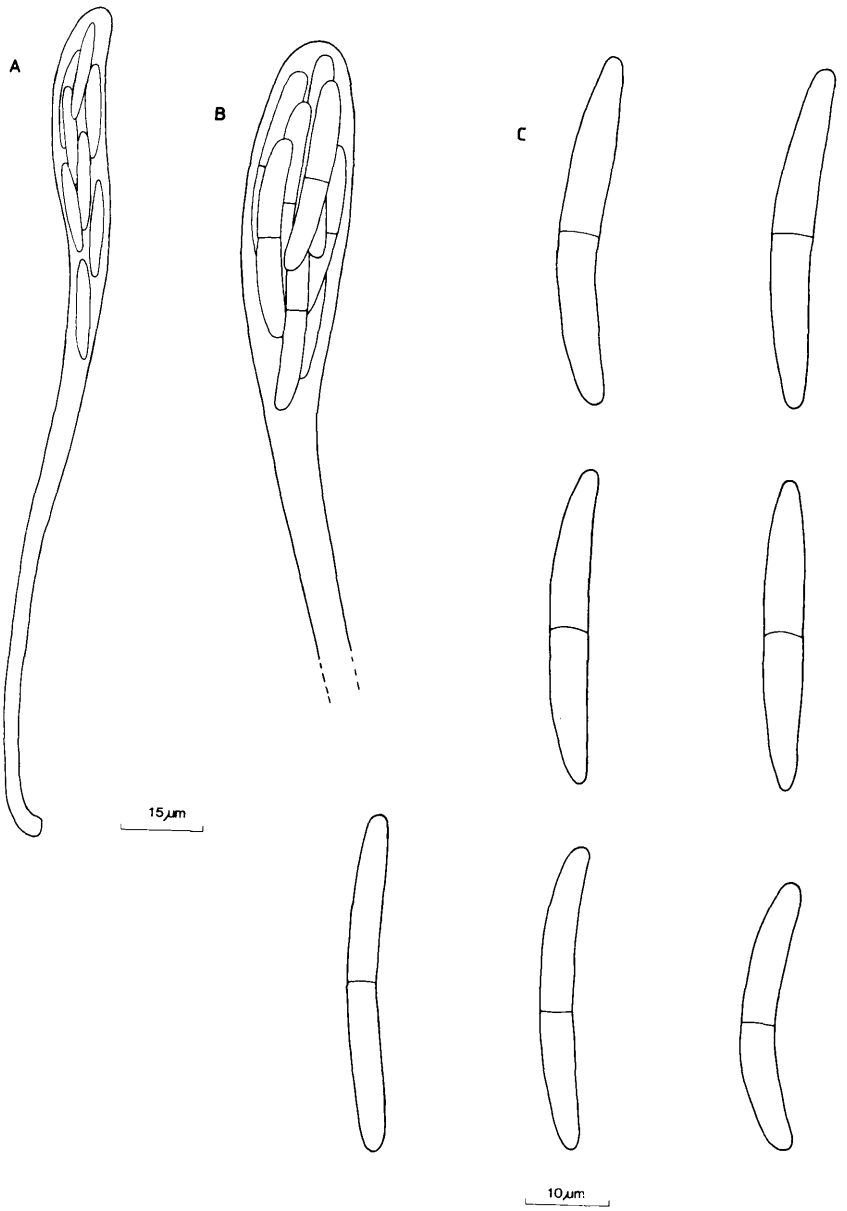
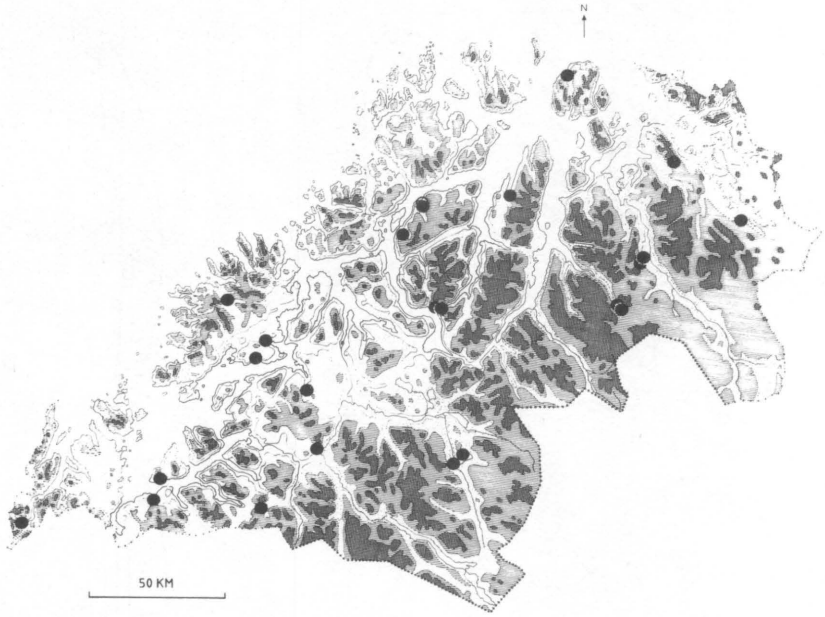


Fig. 10. *Bertia moriformis* var. *moriformis*. A. Immature ascus. B. Apical part of a mature ascus with eight ascospores. C. Ascospores.

60-85(-92) p.sp. x (11.5-)13-17.5(-19.5) µm, mean 75.1 x 15.3 µm, clavate, long-stiped, unitunicate, thin-walled, non-amyloid and 8-spored. **Ascospores** (27-)33-46.5(-50) x 4.5-7

11



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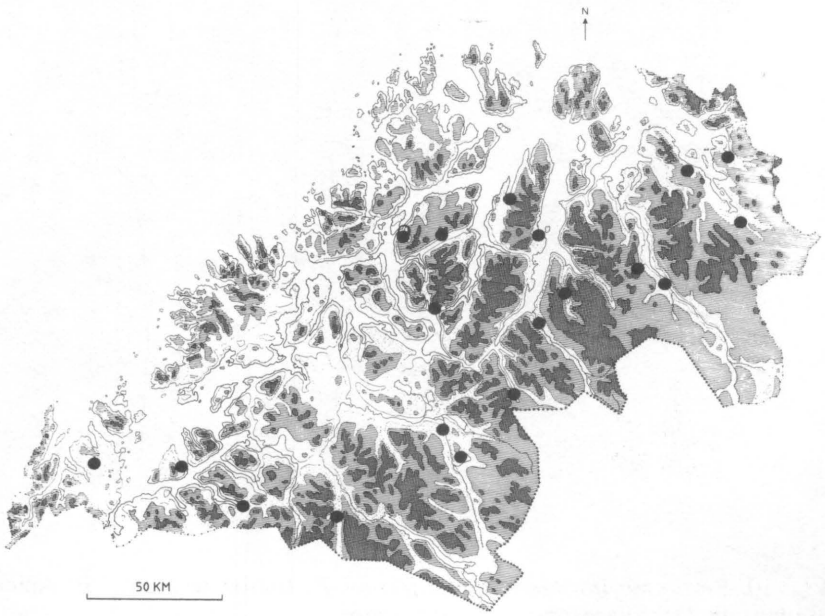
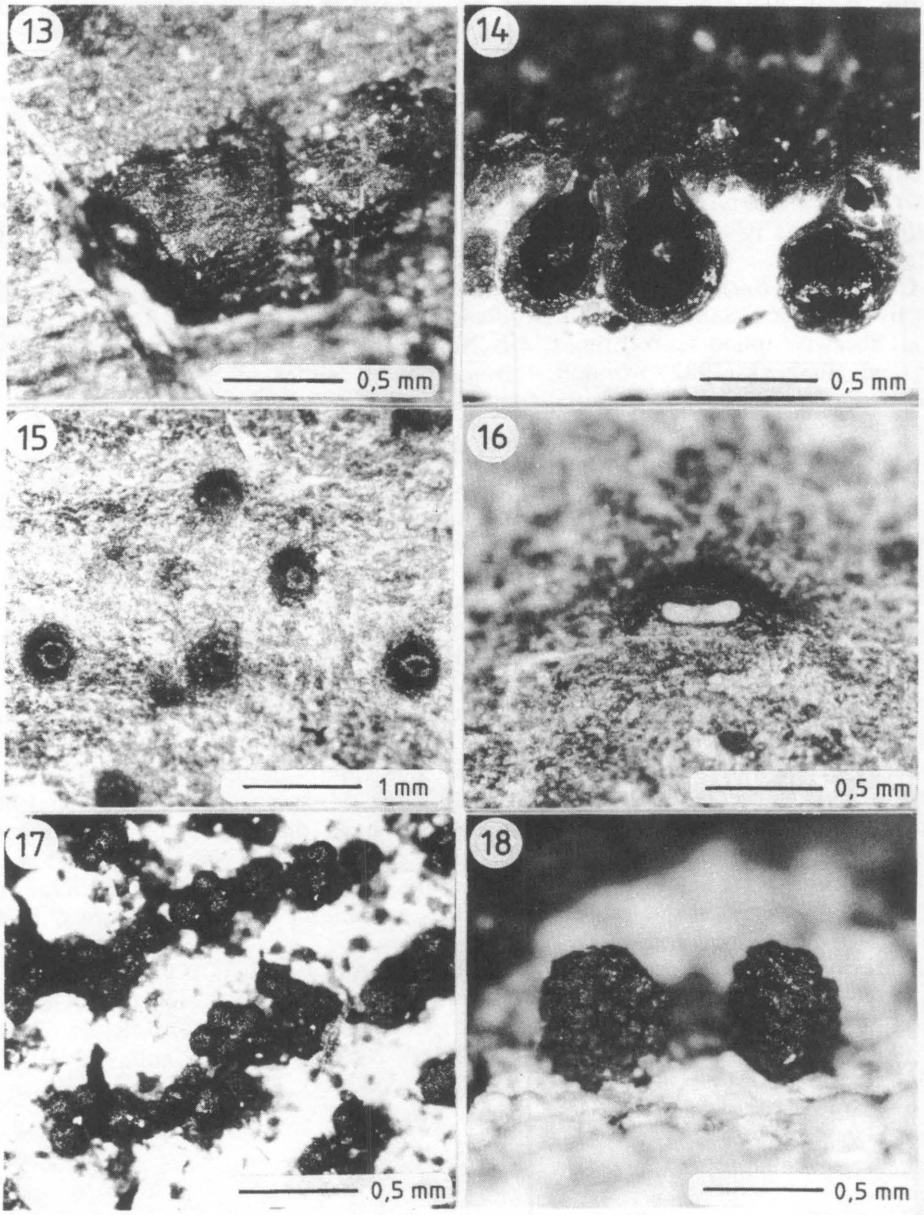


Figs 11-12. Distribution maps. Fig. 11. *Arthopyrenia lapponina*. Fig. 12. *Bertia moriformis* var. *moriformis*. For symbols Fig. 2.



Figs 13-18. Photographs of ascomata. Fig. 13. *Amphisphaerella xylostei*. Fig. 14. *Anthostomella melanotes*. Figs 15-16. *Arthopyrenia lapponina*. Fig. 17. *Berlesiella nigerrima*. Fig. 18. *Bertia moriformis* var. *moriformis*.

(-7.5) µm, mean 39.3 x 5.3 µm, ± fusiform and often slightly curved, septate at the middle, not constricted, hyaline and often with 2-6 large and many small guttulae, usually arranged in upper part of ascus.

Substrate. *Salix nigricans* ssp. *borealis* (13 coll.), *S. nigricans* ssp. *nigricans* (5 coll.), *S. pentandra* (3 coll.), *S. caprea* ssp. *coaetanea* (2 coll.), *S. phylicifolia* (1 coll.), *S. nigricans* ssp. *nigricans* x *phylicifolia* (1 coll.), on wood, occasionally on bark. Previously reported on *Abies*, *Acer*, *Alnus*, *Betula*, *Corylus*, *Fagus*, *Fraxinus*, *Picea*, *Pinus*, *Populus*, *Quercus*, *Rhododendron*, *Salix*, *Sambucus*, *Tilia*, and on the basidiomycet-genera *Coriolus* and *Hirschioporus* (Corlett & Krug 1984). Also seen on other substrates in the examined material.

Comments. *Bertia moriformis* var. *moriformis* was recorded from one locality in Troms by Schröter (1886), and from Nordland by Sommerfelt (1826, 1827) and Sivertsen (1978). Otherwise found several times in N Norway by A. Granmo (pers. comm.). Rostrup (1904) and Hungnes (1982) mention it from some localities in S Norway, and Jensson (1978a) from W Norway. It is fairly common on *Salix* in Troms and evenly distributed all over the county.

The examination by Corlett & Krug (1984) of N American and European collections filed as *Bertia moriformis*, revealed two distinct varieties. The variety *B. moriformis* var. *latispora* was described as new. It is distinguished from var. *moriformis* only by the morphology of mature and free ascospores, which are wider (6-8.5(-10.5) µm), and often geniculate below the middle. The differences in ascospore morphology cannot be seen as long as the ascospores are within asci. *Bertia moriformis* var. *moriformis* occurs mainly on deciduous trees, while var. *latispora* mainly occurs on conifers. The collections of var. *latispora* are, with one exception (Switzerland), from North America. In my opinion such small but consistent differences justify the division into two varieties.

To which family *Bertia* truly belongs is uncertain. Smyk (1981) erected the family Bertiaceae for *Bertia moriformis*, but his illustrations of the ascomata and ascospores do not fit with any of the varieties. However, the family is validly described and has to be used for *Bertia*, if it is accepted as separate from the Nitschkiaceae s.str. (O. Eriksson 1984). I am unable to draw any firm conclusions, and I have therefore chosen to regard *B. moriformis* var. *moriformis* as belonging in Nitschkiaceae (sensu Nannfeldt 1975).

Bertia moriformis var. *moriformis* is an easily recognizable taxon with its large, black and coarsely rough ascomata, often described as resembling small blackberries. It has a wide range of hosts, including other fungi.

Material examined: Norway: Øf: 1 coll. (O). Ak: 7 coll. (O). O: 5 coll. (O). He: 1 coll. (O). Op: 5 coll. (O). Bu: 3 coll. (O). Vf: 2 coll. (O). Te: 1 coll. (O). AA: 1 coll. (O). Ro: 2 coll. (BG). Ho: 8 coll. (BG), 1 coll. (NPPI). SF: 4 coll. (BG). MR: 2 coll. (BG), 1 coll. (TRH). ST: 1 coll. (BG). NT: 2 coll. (TRH). No: 1 coll. (O), 3 coll. (TRH), 3 coll. (TROM). Tr: 26 coll. (TROM), see Fig. 12. Fi: 1 coll. (O). Finland: 1 coll. (O).

Chaetosphaeria pomiformis (Pers. : Fr.) Müller (Figs 19, 22, 26)

Beitr. KryptogFlora Schweiz 11: 2: 588, 1962. - Basionym: *Sphaeria pomiformis* Pers. : Fr., Syst. mycol. 2: 455, 1823. - *Melanopsamma pomiformis* (Pers. : Fr.) Sacc., Michelia 1: 347, 1878. - Other synonymes; see Müller & von Arx (1962). - Anamorph: *Stachybotrys* sp. fide Booth (1957); *S. socia* (Sacc.) Sacc. fide Kirk & Spooner (1984).

Illustration: Booth 1957: Figs 6, 7.

Perithecia 210-300 µm diam., superficial, densely gregarious, globose, but upper half usually collapses when dry, carbonized and ± shiny black. Ostiolum periphysate and papillu-

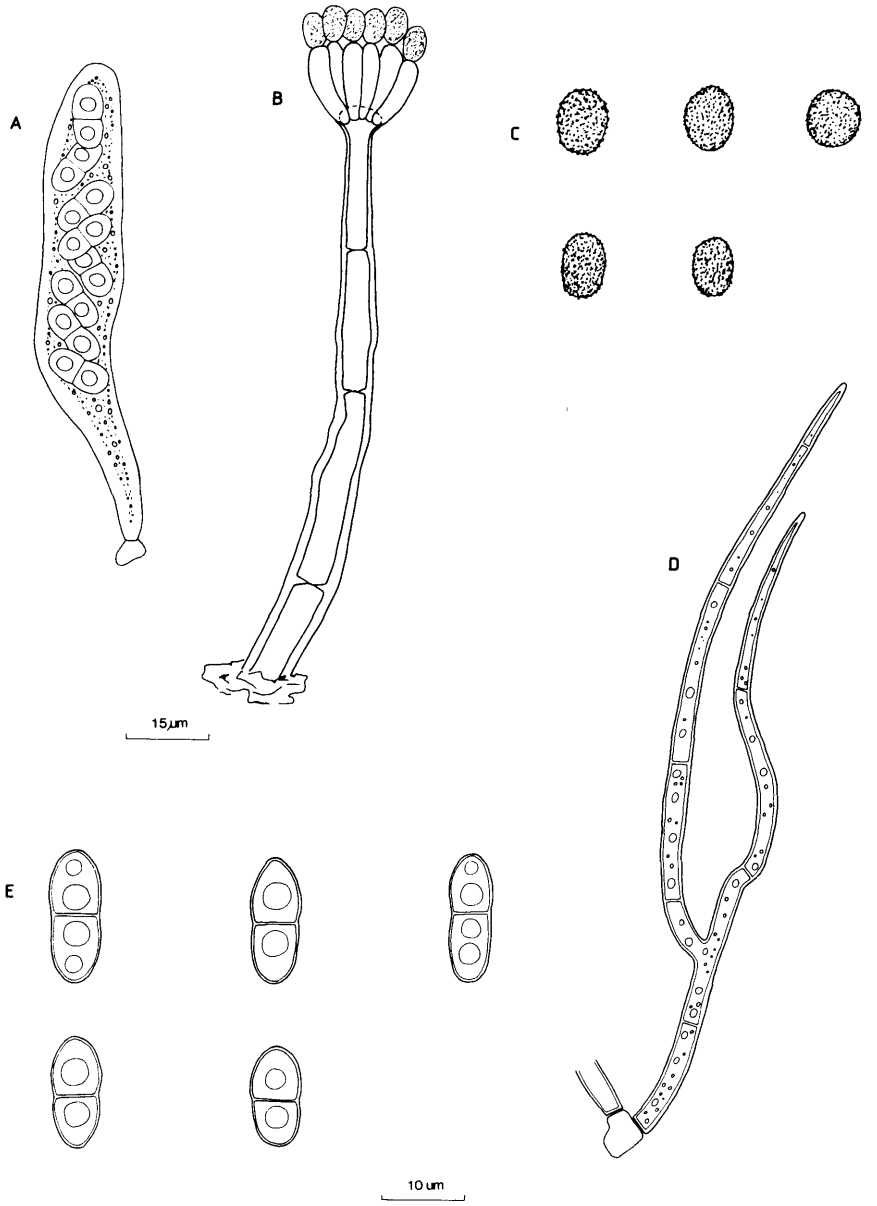


Fig. 19. *Chaetosphaeria pomiformis*. A. Ascus with eight ascospores. B. Conidiophor. C. Conidia. D. Paraphyse. E. Ascospores.

late. Hyaline and septate conidiophores are often sparsely dispersed over the surface of the perithecium, but primarily develop and grow on the surface of the host near the perithecia.

Peridium 35-55 µm thick, compact and somewhat brittle when dry. Consisting of a ± reddish-brown outer layer of thick-walled and somewhat flattened cells with narrow lumen, and a hyaline inner layer of more thin-walled and elongated cells. **Asci** 60-85(-95) x (9-) 10.5-16 µm, mean 75 x 12.1 µm, variable in shape, but mostly cylindrical-clavate, rather short-stiped, unitunicate, non-amyloid and 8-spored. Without a distinct apical structure in the slightly thickened apex. **Paraphyses** 2.5-3.5 µm wide at base, but gradually tapering towards apex. Longer than the asci, branched and septate. Disintegrate as the asci mature, and can be seen in young, immature perithecia only. **Periphyses** ca. 15 x 1 µm, numerous, hyaline, and tend to disintegrate as the asci mature. **Ascospores** (11-)12-16.5 x 4.5-6.5 µm, mean 13.6 x 5.4 µm, oblong-eliptic to broadly ellipsoid, two-celled, slightly constricted at the septum, hyaline and irregularly biseriate. Often with 1-2 large guttulae in each cell. **Conidiophores** 100-180(-210) µm long, tapering from 8.5-11.5 µm diam. at base to 4.5-6 µm below the bulbous apex, septate and hyaline. **Phialides** 9.5-13 x 3.5-4.5 µm, ± reniform to obovate or obpyriform, hyaline and developing from the upper part of the bulbous apex. **Conidia** 6-8 x 4.5-6 µm, subglobose to oval, one-celled, verrucose and grey-greenish. Develop from the tip of each phialide, aggregating here to form a ± globose, black and slimy mass.

Substrate. *Salix nigricans* ssp. *borealis* (15 coll.), *S. nigricans* ssp. *nigricans* (8 coll.), on wood, occasionally on bark. Previously reported on *Aesculus*, *Fagus*, *Fraxinus*, *Pyrus*, *Populus* and *Ulmus* (Booth 1957, Munk 1957). Also seen on other substrates in the examined material.

Comments. *Chaetosphaeria pomiformis* has not previously been recorded from Troms, but is mentioned from Saltdal in Nordland county by Sommerfelt (1826) as *Sphaeria pomiformis* and from Oslo by Rostrup (1904) as *Melanopsamma pomiformis*. It is rather common on *Salix* in Troms and evenly distributed all over the county, only found on the *S. nigricans* group.

My material from Troms matches Booth's (1957) description of *Melanopsamma pomiformis*. Although, the phialides and the conidia from Troms are somewhat smaller than Booth's (1957) (probably not completely mature), they both fall within the range of his cultural measurements.

Typical of *Chaetosphaeria pomiformis* are the gregarious, collabent, ± shiny black ascomata and the easily recognizable conidiophores.

Material examined: Norway: Ak: 1 coll. (BG). O: 4 coll. (O). Ro: 1 coll. (TROM). No: 1 coll. (O). Tr: 23 coll. (TROM), see Fig. 22. Sweden: 6 coll. (S). Denmark: 1 coll. (C). East Germany: 1 coll. (S).

Cryptodiaporthe salicella (Fr.) Petr. (Figs 20, 27)

Annls mycol. 19: 180, 1921. - Basionym: *Sphaeria salicella* Fr., Syst. mycol. 2: 377, 1823. - *Cryptodiaporthe salicina* (Curr.) Wehm., Univ. Michig. scient. Ser. 9: 194, 1933 (n.v.). - *Diaporthe salicella* (Fr.) Sacc., Myc. Ven. Soc.: 135, 1873 (n.v.). - Other synonyms; see Butin (1958). - Anamorph: *Diplodina microsperma* (Johnston) Sutton, Mycol. Pap. 141: 69, 1977. - *Discella salicis* (Westd.) Boerema, Neth. J. Pl. Path. 76: 165, 1970 (n.v.).

Perithecia (300-)400-540(-660) µm diam., densely scattered or gregarious, immersed in the bark, globose, but often collapsing. The ostiolum forms a characteristic "disc" through which a conical to hemispherical, black beak is erumpent, in apex 100-140 µm diam. The disc often broader than the perithecium, slightly lifting and splitting the periderm. The outer layer of textura intricata, the inner layer of textura angularis/globulosa, the innermost layer (lining the ostiolar channel) of ± elongated cells. Ostiolar channel up to 400 µm long

and strongly periphysate. **Peridium** 20-30 µm thick, consisting of a thick, outer layer of thick-walled, brown cells, ± textura angularis, and a thin inner layer of thin-walled, elongated, hyaline cells. **Asci** 70-90 x 11.5-13.5 µm, mean 76.3 x 12.5 µm, cylindrical-clavate, sometimes thickest below the middle, almost sessile, loosening, unitunicate and 8-spored. Non-amyloid, but with two distinct, refractive bodies in the thickened apex. **Paraphyses** not observed. **Ascospores** (14-)14.5-18.5(-20.5) x 4.5-7 µm, mean 16.8 x 5.6 µm, oblong-ellipsoid and often slightly bent. Two-celled, constricted at septum, hyaline and biseriate. **Conidia** 8.5-16 x 2-2.5 µm, mean 10.9 x 2.2 µm, ellipsoid, one- or two-celled, hyaline.

Substrate. *Salix lapponum* (3 coll.), *S. glauca* ssp. *glauca* (1 coll.), on bark. Previously reported only on *Salix* (Butin 1958).

Comments. *Cryptodiaporthe salicella* has not previously been recorded from Troms, but is mentioned from Norway by Rostrup (1904) as *Diaporthe salicella*. It is very rare

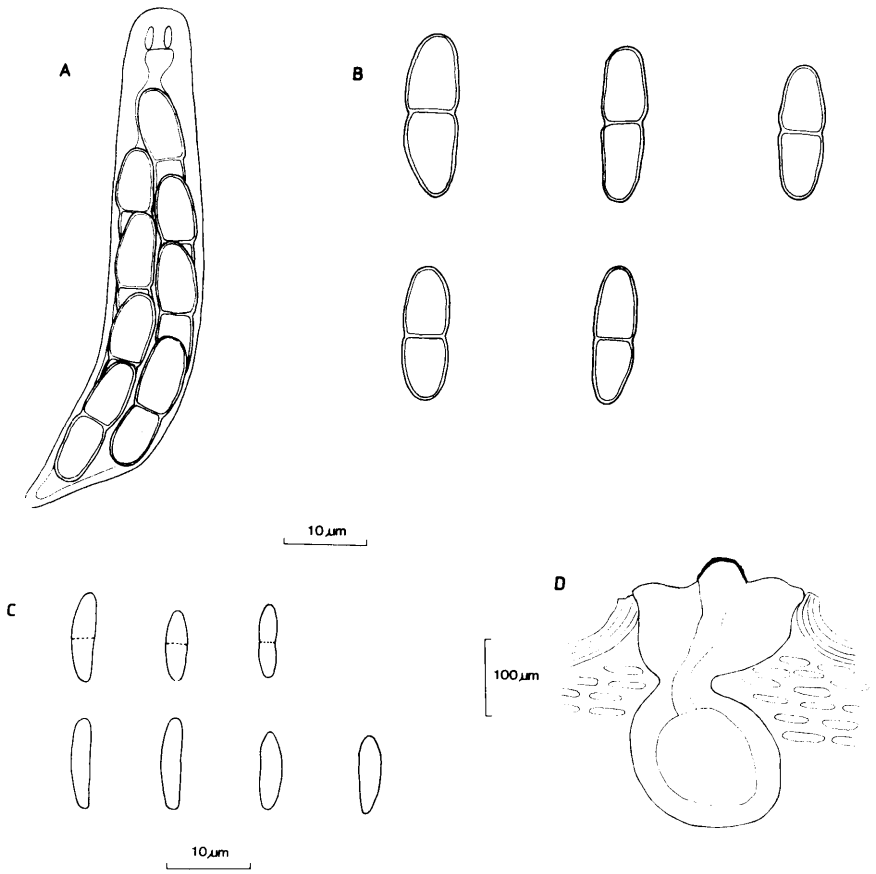


Fig. 20. *Cryptodiaporthe salicella*. A. Ascus with eight ascospores. B. Ascospores. C. Conidia. D. Habit sketch of one ascoma.

on *Salix* in Troms, so far only found in the coastal area in the southern part of the county.

My material matches Butin's (1958) description of *Cryptodiaporthe salicella*, but the conidia are somewhat smaller (immature?) than specified by him. *Cryptodiaporthe pulchella* (Sacc.) Butin is closely related to *C. salicella* and can, according to Butin (1958), not be separated on the ascomata, asci or ascospores, but only on substrate (*Populus*) and conidia. The distinction between these two species seems very diffuse to me, and *C. pulchella* should probably be regarded as a forma specialis only. However, *C. salicella* grows only on *Salix*.

The genus has previously been treated by several authors, see Kobayashi (1970). Nevertheless, the nomenclature has until recently (e.g. Dennis 1978) been very confusing. Dennis (1978) describes *Cryptodiaporthe salicella* (Fr.) Petr., but this description is obviously of *C. apiculata* (Wallr.) Petr. The other species he mentions is *C. salicina* (Curr.) Wehm., a synonym of *C. salicella*.

Material examined: Norway: s. loc.: 1 coll. (O). Ak: 2 coll. (NPPI). Ro: 1 coll. (NPPI). Tr: Kvæfjord: Gullesfjordbotn WS 29,02 5 Jul 1981 2 coll. *Salix glauca* ssp. *glauca* GM 133a (TROM), *S. lapponum* GM 134 (TROM), Dyrøy: Brøstadbotn XS 07,65 11 Jul 1981 2 coll. *S.lapponum* GM 402, 403 (TROM). Denmark: 5 coll. (C).

Cryptosphaeria subcutanea (Wahl. : Fr.) Rappaz (Figs 21, 23, 28-29)

Mycotaxon 10: 581, 1984. - Basionym: *Sphaeria subcutanea* Wahl. : Fr., Syst. mycol. 2: 371, 1823. - *Diatrype vicinula* (Nyl.) Berl., Icon. fung. 3: 98, 1902. - *Eutypa ontariensis* (Ell. & Everh.) Tiff. & Gill., Iowa St. J. Sci. 15: 126, 1965 (n.v.). - Other synonymes, see Rappaz (1984).

Nomenclatural note. The systematic position of this species is not clear, but I follow Rappaz (1984).

Stromata immersed in bark, moderately developed when extensive, rather well-developed when pulvinate. Entostroma ± compact and dark brown when young, looser and more greyish as the perithecia develop, often mixed with bark cells. Dorsally always covered with periderm. Ectostroma formed as a 90-150 µm thick, black, compact ventral zone deep in the bark. Black ventral zones in the underlying wood always present. **Perithecia** (450-)600-750(-960) µm diam., globose to subglobose, gregarious, immersed in the stroma in 1-2 layers. Ostioles separately erumpent, 400-750 µm long, 100-300 µm above the bark. In apex 200-360 µm diam., 3-5 sulcate, black and carbonized. **Peridium** 30-50 µm thick, consisting of an outer layer of thick-walled, brown cells with undeterminable structure, a thin inner layer of ± flattened cells, and a 10-25 µm thick innermost layer of thin-walled, hyaline cells, textura angularis. **Asci** 45-65(-70) p.sp. x 7-9.5(-10.5) µm, mean 54.3 x 8.7 µm, clavate, long-stiped, unitunicate and mostly 8-spored. Non-amyloid, but with ± distinct apical structure. **Paraphyses** 1.5-2.5 µm diam., long and septate. **Ascospores** (10-)11.5-15.5(-17) x 3.5-4.5(-5) µm, mean 13.5 x 4.0 µm, mostly reniform to allantoid, but often variable in shape. One-celled, brown and uni-biseriate.

Substrate. *Salix nigricans* ssp. *borealis* (51 coll.), *S. nigricans* ssp. *nigricans* (18 coll.), *S. hastata* (1 coll.), *S. lanata* ssp. *lanata* (1 coll.), *S.lapponum* (1 coll.), *S. phylicifolia* (1 coll.), *S. nigricans* ssp. *nigricans* x *phylicifolia* (2 coll.), on bark. Previously reported on "*Alnus*" and *Salix* (Karsten 1873).

Comments. *Cryptosphaeria subcutanea* was first depicted and described from Troms by Granmo (1981) as Anthostoma sp. Granmo found the first specimen of this species in Norway at Oppdal, later also in Narvik (Granmo pers. comm.). It is very common on *Salix* in Troms and evenly distributed all over the county.

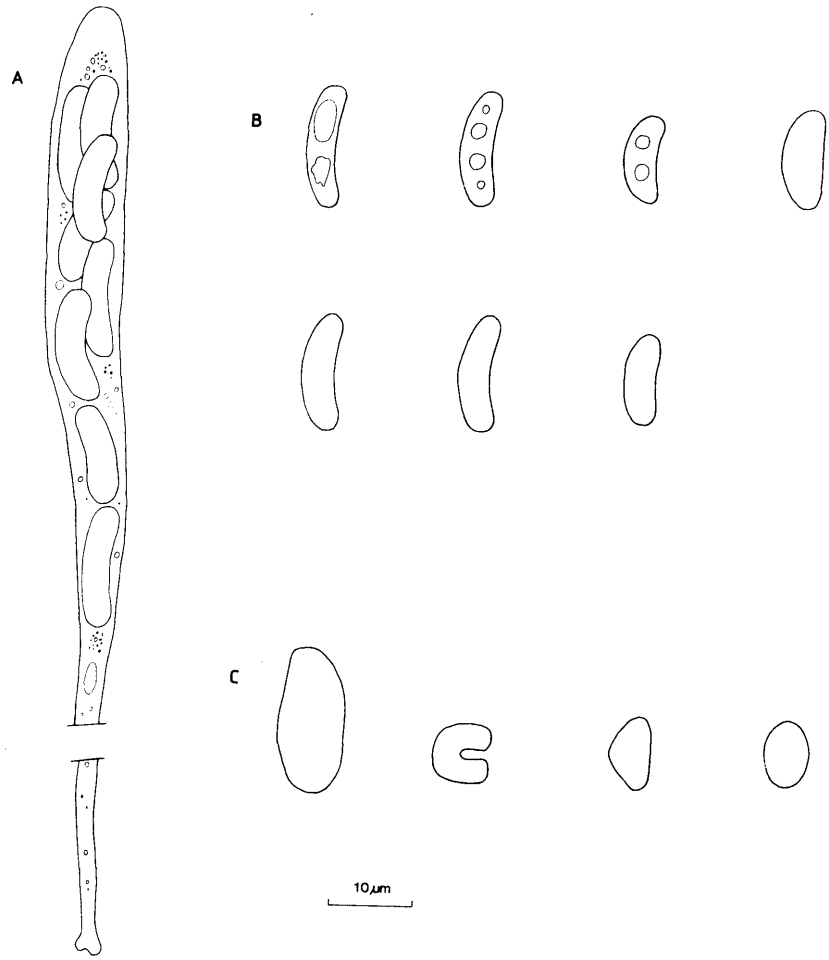
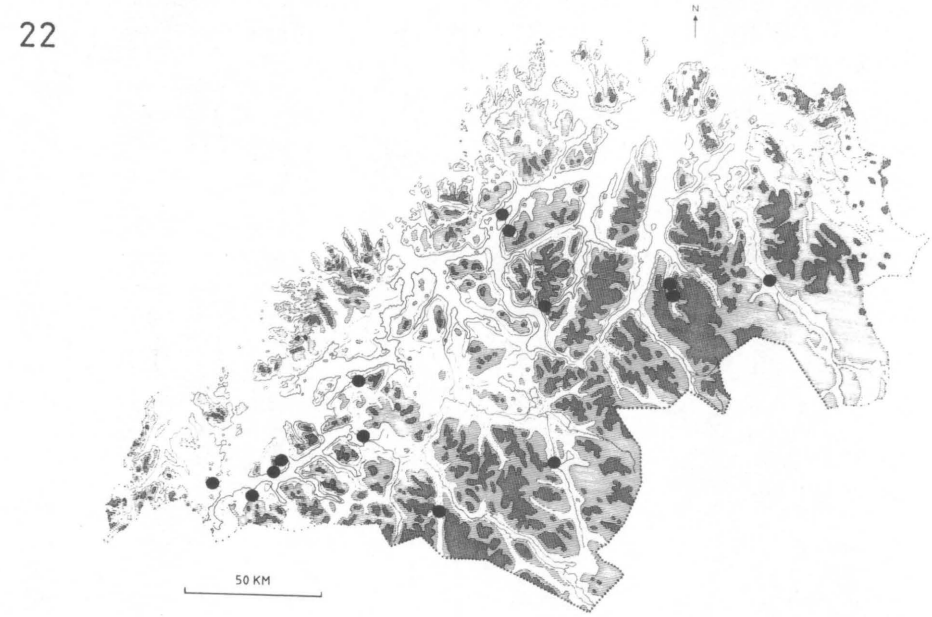
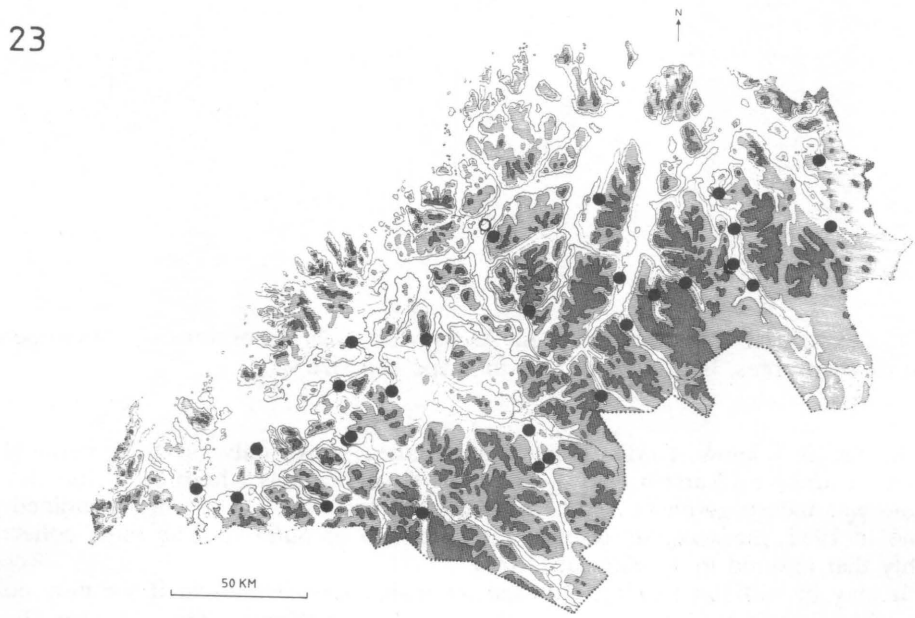


Fig. 21. *Cryptosphaeria subcutanea*. A. Ascus with eight ascospores. B. Ascospores. C. Abnormal ascospores, both with respect to shape and size.

As far as I know, *Cryptosphaeria subcutanea* grows only on *Salix* although it is reported on *Alnus* by Karsten (1873). In one of the collections I have seen from Kola, the substrate was indeed given as *Alnus* (in sched. "ad cort. alni"), but when examined by A. Granmo in 1982, the substrate actually turned out to be *Salix* sp. The same collection is probably that referred to by Karsten (1873).

It may be difficult to place this species within *Cryptosphaeria* if we only consider the classical descriptions of the genus (Saccardo 1882, Winter 1886, see also Glawe & Rogers 1984), which state that it has a poorly developed stroma. However, there are divergent opinions of how well the stroma is developed in *Cryptosphaeria populina* (Pers. : Fr.) Sacc., a commonly accepted species of this genus. Munk (1957) describes the stroma as "... distinct, effuse, with a faint, greyish dorsal zone in and just beneath the distinctly





Figs 22-23. Distribution maps. Fig. 22. *Chaetosphaeria pomiformis*. Fig. 23. *Cryptosphaeria subcutanea*. For symbols see Fig. 2.

lifted peridermis, and a stout, 30-40 µm thick, opaque black ventral zone deeply in the bark, ..." and Winter (1886) among others as "..., der Rinde eingesenkt, oft das Rindenparenchym bis auf den Holzkörper schwärzend, ...", while Glawe & Rogers (1984) describe it as "... poorly developed, immersed in bark and evident only as a blackening of the host tissue ...". Common to these descriptions is the blackening zone in the host tissue. I regard this black ventral zone as an important characteristic of *Cryptosphaeria*; usually well-developed in *C. subcutanea*, moderately developed in *C. populina* and ± poorly developed in *C. eunomia* (Fr. : Fr.) Fuckel, the type-species of the genus. Other important characters common to all these species are the persistent periderm, and the host specificity.

The classic generic descriptions are, in my opinion, valid only for *Cryptosphaeria eunomia* and perhaps *C. pullmaniensis* Glawe, an American species. However, these four species seem to fall into one natural group, and the generic definition should therefore be emended.

Our knowledge of the Diatrypaceae is still limited. The genera are not easily separated from each other, and several species are difficult to classify. *Eutypa flavovirens* (Pers. : Fr.) Tul., with often rather well-developed stromata, could easily be placed in *Diatrype*. The same perhaps also holds true for *Cryptosphaeria subcutanea*, which has been classified in several different genera, including *Diatrype* (Rappaz 1984). Glawe (1982) mentions that some *Eutypa* collections form stromata in bark, thus resembling *Cryptosphaeria*.

Better generic definitions could perhaps be obtained by using additional characters. F. Rappaz (in litt.) hopes that this could be attained with the help of ecological characters and stromatal ontogeny. Culturing is also important. J.D. Rogers has now succeeded in culturing my collection GM 1999, and the anamorph of *Cryptosphaeria subcutanea* is described (Glawe & Rogers 1986).

Cryptosphaeria subcutanea is very characteristic and easily recognizable by the pulvinate or wide-spreading, black swellings in bark. The ascospores are very variable in shape and size, and different developmental stages are often seen within the same locule. **Asci** mostly 8-spored, but fewer spores (1-4) are not unusual. In that case, the spores are large and abnormal.

Material examined: Norway: ST: 1 coll. (TROM). Tr: 75 coll. (TROM), see Fig. 23. Finland: 3 coll. (H). Soviet Union: 4 coll. (H).

Diatrype bullata (Hoffm. : Fr.) Fr. (Figs 24, 30)

Summ. veg. Scand. 2: 385, 1849. - Basionym: *Sphaeria bullata* Hoffm., Veg. Crypt. 1: 5, 1787 (n.v.). - *Diatrype macounii* Ell. & Everh., Proc. Acad. nat. Sci. Phil.: 224, 1890.

Description and illustrations: Glawe & Rogers 1984: Figs 27, 28, 30.

Stromata erumpent through bark, the upper surface slightly convex, rarely flat-topped. The smaller stromata circular to oval, the larger ones somewhat elongated or irregular, often coalescing. Surface reddish-brown to blackish-brown and finely punctuated by the black ostioles. **Perithecia** 200-280 µm diam., crowded, immersed in the stroma in 1-2 layers. Ostioles 100-120 µm diam., 3-4 sulcate, circular, flattened to subconical and black. **Asci** (14-)16-25 p.sp. x 3-5 µm, mean 19.1 x 4.1 µm, narrowly clavate, long-stiped, unitunicate and 8-spored. Nonamyloid, but with a distinct refractive apical structure (invagination). **Ascospores** 5-7.5(-8) x 1.0-1.5 µm, mean 6.3 x 1.3 µm, allantoid, subhyaline to subolivaceous, appearing slightly brown when clustering. Usually arranged in the upper portion of ascus.

Substrate. *Salix nigricans* ssp. *borealis* (3 coll.), *S. nigricans* ssp. *nigricans* (3 coll.),

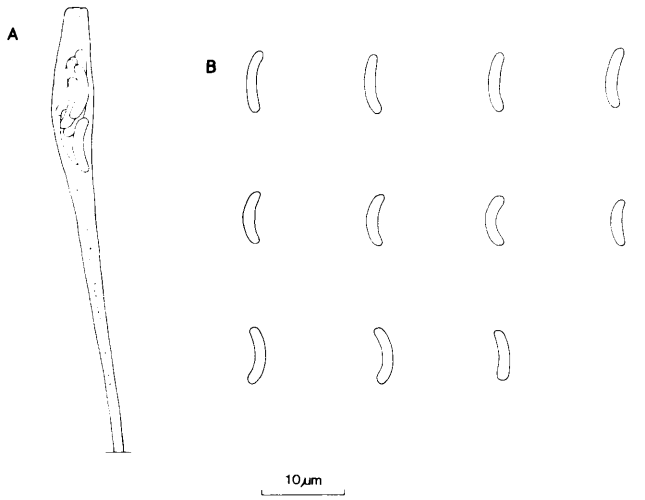


Fig. 24. *Diatrype bullata*. A. Ascus with eight ascospores. B. Ascospores.

on bark. Previously reported on *Acer*, *Alnus* and *Salix* (Glawe & Rogers 1984). Also seen on other substrates in the examined material.

Comments. *Diatrype bullata* has not previously been recorded from Troms, but is mentioned from Norway by Rostrup (1904) and Strid (1975). Sommerfelt's (1826, 1827) *Sphaeria disciformis* on *Salix* and *Alnus* from Saltdalen in Nordland county, seems actually to be *Diatrype bullata*.

As this species, with its rather large and easily visible stromata, is found in two localities only, I regard it as very rare on *Salix* in Troms. It seems to prefer the *S. nigricans* group.

Diatrype bullata is sometimes confusingly like *D. disciformis*. However, the stromata of the latter are usually smaller and more regularly circular, and have a nearly flat upper surface. It grows mainly on *Fagus*, on which *Diatrype bullata* has not been found. They are microscopically very similar.

Material examined: Norway: s. loc.: 1 coll. (O). Øf: 5 coll. (O). Ak: 3 coll. (O), 1 coll. (NPPI). O: 4 coll. (O). He: 1 coll. (O). Op: 3 coll. (O). Bu: 3 coll. (O), 2 coll. (TROM), Vf: 1 coll. (O). Te: 2 coll. (BG), 1 coll. (O). AA: 1 coll. (O). Ro: 3 coll. (O). Ho: 6 coll. (BG), 2 coll. (O). SF: 7 coll. (BG), 2 coll. (O). MR: 4 coll. (BG). ST: 3 coll. (BG), 4 coll. (TRH). NT: 1 coll. (BG), 1 coll. (TRH). No: 1 coll. (BG), 6 coll. (O), 1 coll. (TRH), 4 coll. (TROM). Tr: Gratangen: Gratangsbotn XR 09-10,19 8 Jul 1981 2 coll. *Salix nigricans* ssp. *nigricans* GM 279, 281 (TROM). Lyngen: Kvalvik DC 69,11 14 Sep 1982 4 coll. *S. nigricans* ssp. *borealis* GM 2083, 2094, 2099 (TROM), *S. nigricans* ssp. *nigricans* GM 2111 (TROM).

Enchnoa infernalis (G. Kunze : Fr.) Fuckel (Figs 25, 31)

Symb. mycol.: 302, 1871. - Basionym: *Sphaeria infernalis* G. Kunze : Fr., Syst. mycol. 2: 371, 1823.

Perithecia 400-850(-1000) µm diam., subglobose, but often collapsing and becoming cupulate with age, black. Solitary or rather densely scattered in small groups beneath the raised and often undulating periderm, which is split and penetrated by a small, periphysate ostiolum. Surrounded by and seated upon a brown subiculum, hyphae 4.5-6 µm diam., thick-walled, branched, septate and dark brown. **Peridium** 50-70 µm thick. Cells in the outer half large, thin-walled, slightly elongated or irregularly angular, ± textura angularis, in the inner half gradually flattening inwards. Towards the ostiolum, the cells gradually become smaller. **Asci** 45-65 p.sp. x 11.5-15 µm, mean 56.4 x 13.1 µm, clavate, long-stiped, thin-walled and 8-spored. Unitunicate and non-amyloid. **Paraphyses** 2.5-6 µm diam., mostly ca. 4 µm. Long, branched, septate and early deliquescent. **Ascospores** (16-)17-21 x 3.5-5 µm, mean 18.7 x 4.4 µm, allantoid or ± canoe-shaped, one-celled, very light brownish, usually with granular content and one to several guttulae. Biseriate to crowded in the upper portion of ascus.

Substrate. *Salix nigricans* ssp. *nigricans* x *myrsinites* (1 coll.), on bark. Previously reported on *Quercus* (Munk 1957).

Comments. *Enchnoa infernalis* has not previously been recorded from Troms, but is mentioned from S Norway by Rostrup (1904), and by Hungnes (1982), who regarded it as common on *Quercus*. It is obviously very rare on *Salix* in Troms, hitherto only found in one locality in the north of the county. The collection from Troms matches very well Winter's (1886) description of *Enchnoa infernalis*, but deviates from Munk's (1957) description in many distinctive features.

The genus *Enchnoa* has been included in several families in the past, e.g. Diapor-

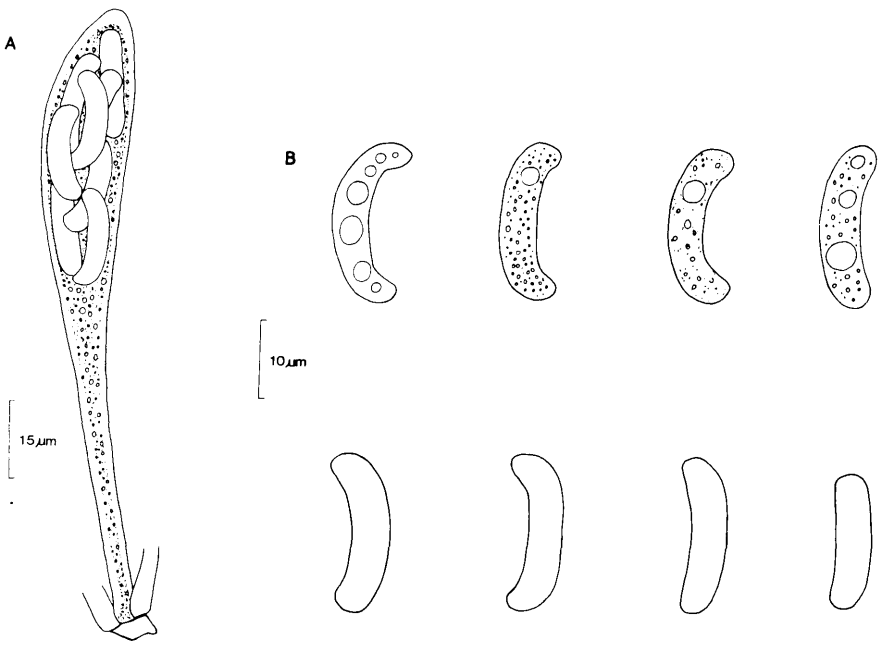
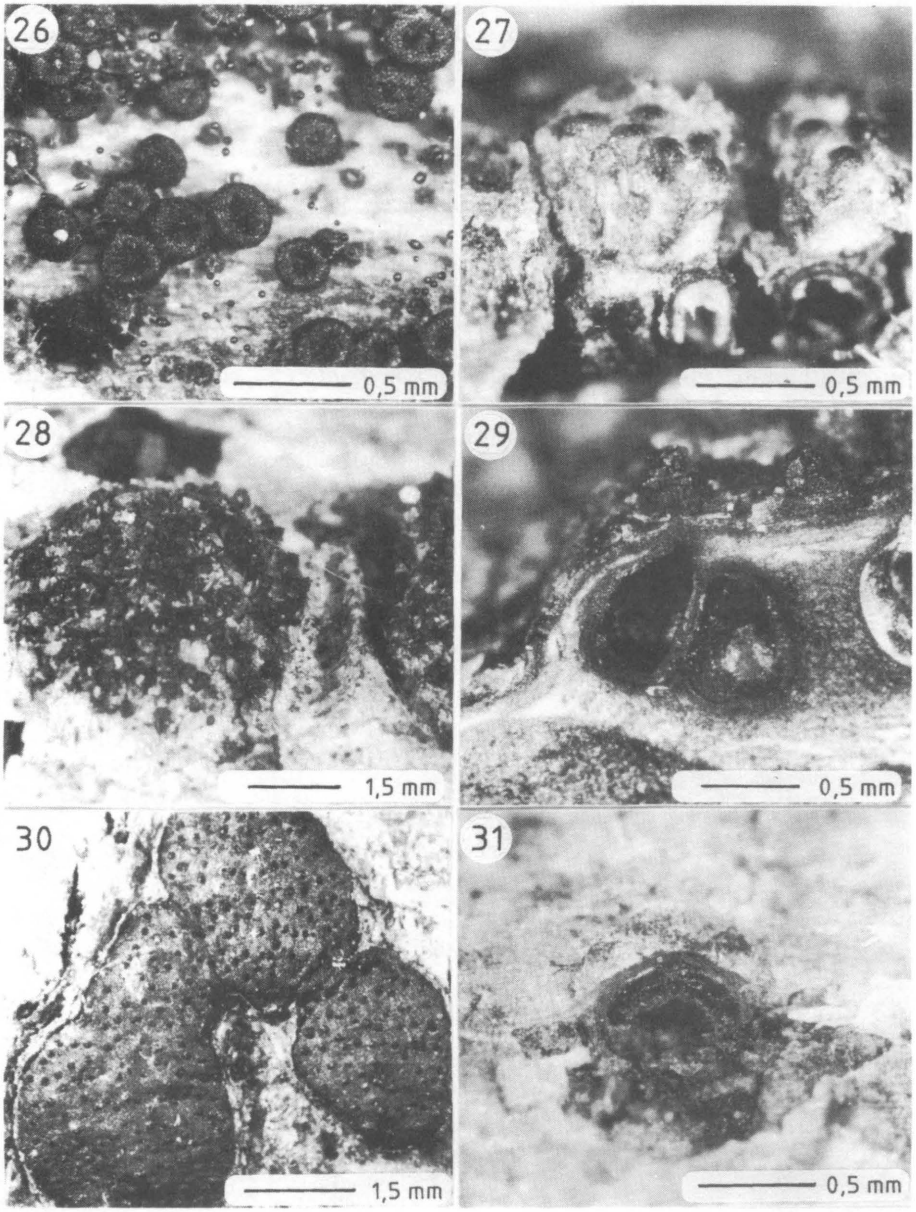


Fig. 25. *Enchnoa infernalis*. A. Ascus with eight ascospores. B. Ascospores.



Figs 26-31. Photographs of ascomata. Fig. 26. *Chaetosphaeria pomiformis*. Fig. 27. *Cryptodiaporthe salicella*. Figs 28-29. *Cryptosphaeria subcutanea*. Fig.30. *Diatrype bullata*. Fig. 31. *Enchnoa infernalis*.

thaceae (Munk 1957) and Diatrypaceae (Dennis 1978), although Höhnel (1909, 1918) suggested a close relationship between *Enchnoa* and *Calosphaeria* Tul. & C. Tul. Barr (Bigelow & Barr 1969) placed this genus in the family Calosphaeriaceae, and later (Barr 1983b) erected the order Calosphaeriales for the family.

The characteristics of *Enchnoa infernalis* and the other species of the genus are the relatively large, depressed and subperidermal ascomata, the raised periderm, the subiculum and the allantoid ascospores.

Material examined: Norway: O: 1 coll. (O). Tr: Kvænangen: Badderen EC 39,50 5 Sep 1982 *Salix nigricans* ssp. *nigricans* x *myrsinites* GM 1869a (TROM). East Germany: 1 coll. (C), 1 coll. (K).

Glyphium cf. *schizosporum* (Maire) Zogg (Figs 32-36, 38)

Beitr. KryptogFlora Schweiz 11: 3: 101, 1962. - Basionym: *Lophium schizosporum* Maire, Bull, Soc. Hist. nat. Afr. N. 8: 172, 1917. - Anamorph: *Peyronelia* sp. fide Sutton (1970).

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-like ostiolum 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 (O. Eriksson 1981), thus uncovering larger parts of the inner layer as the pseudothecium develops (see Fig. 33). Inner layer 35-60 µm thick, consisting of ± isodiametric, thin-walled, dark brown cells, the innermost usually becoming narrower and somewhat lighter. **Asci** (280-)300-440 x 13.5-18.5(-19.5) µm, mean 351.2 x 16.6 µm, cylindrical-clavate, gradually tapering towards base, bitunicate, thick-walled, at first 8-spored, later polysporous. **Pseudoparaphyses** ca. 1.5 µm diam., numerous, long, branched, anastomosing, septate, usually with many small guttulae. **Ascospores** 250-350 µm long, filiform, multiseptate, parallel, fragmenting before maturity into cylindrical, pale olive to pale brown (2-)3-7(-11)-septate units, measuring (16-)18-33(-40) x 3-5(-6) µm, mean 23.9 x 3.9 µm. **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.

Substrate. *Salix nigricans* ssp. *borealis* (8 coll.), *S. lanata* ssp. *lanata* (4 coll.), *S. nigricans* ssp. *nigricans* (3 coll.), *S. caprea* ssp. *coaetanea* (2 coll.), *S. pentandra* (2 coll.), *S. lanata* ssp. *glandulifera* (1 coll.), *S. lanata* ssp. *lanata* x ssp. *glandulifera* (2 coll.), *S. nigricans* ssp. *nigricans* x *glauca* ssp. *glauca* (1 coll.), on wood, occasionally on bark. Previously reported on *Betula*, *Ilex*, and *Rhamnus* (Sutton 1970).

Comments. *Glyphium schizosporum* has not been found in Norway before, and it seems to be new to Scandinavia. It is however quite common on *Salix* in Troms.

My material matches well Zogg's (1962) description of *Glyphium schizosporum*, but the asci and spores are somewhat larger than he specified. It is very distinctive with the large, black and upright ascomata, the subiculum, the anamorph and the fragmenting ascospores. The anamorph is usually found growing together with the ascomata; in Troms, it was found on 18 out of 23 collections.

Glyphium schizosporum is very similar to the North American species *G. corrugatum* (Ell.) Goree, which also has ascospores which fragment while within ascus. *Glyphium*

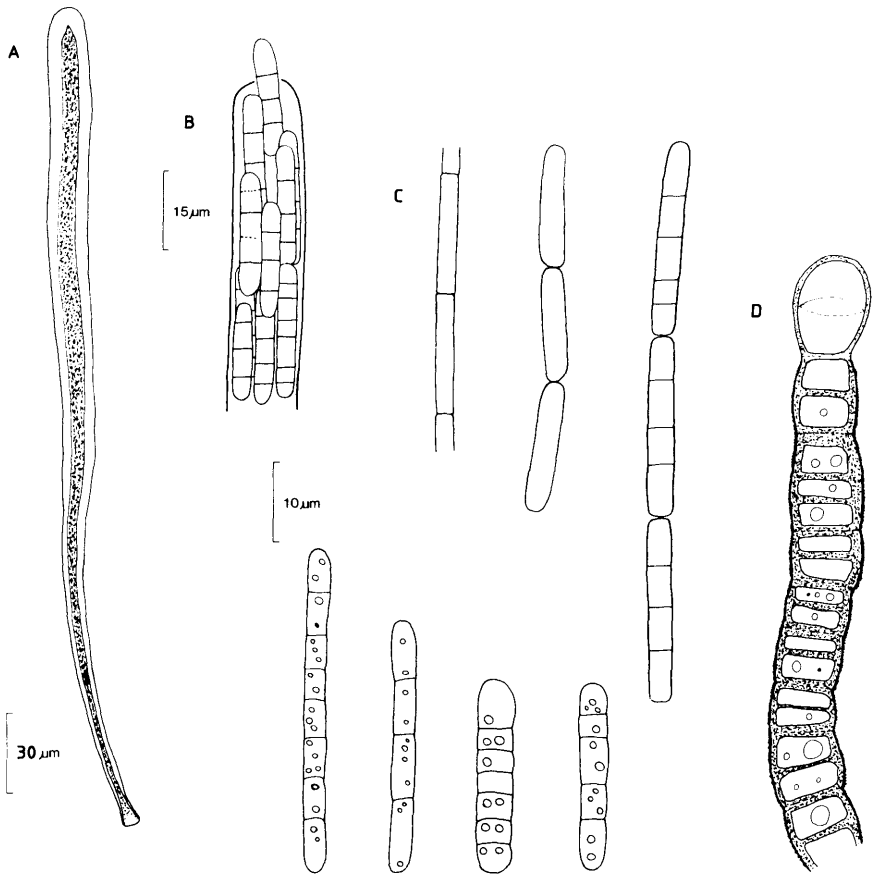
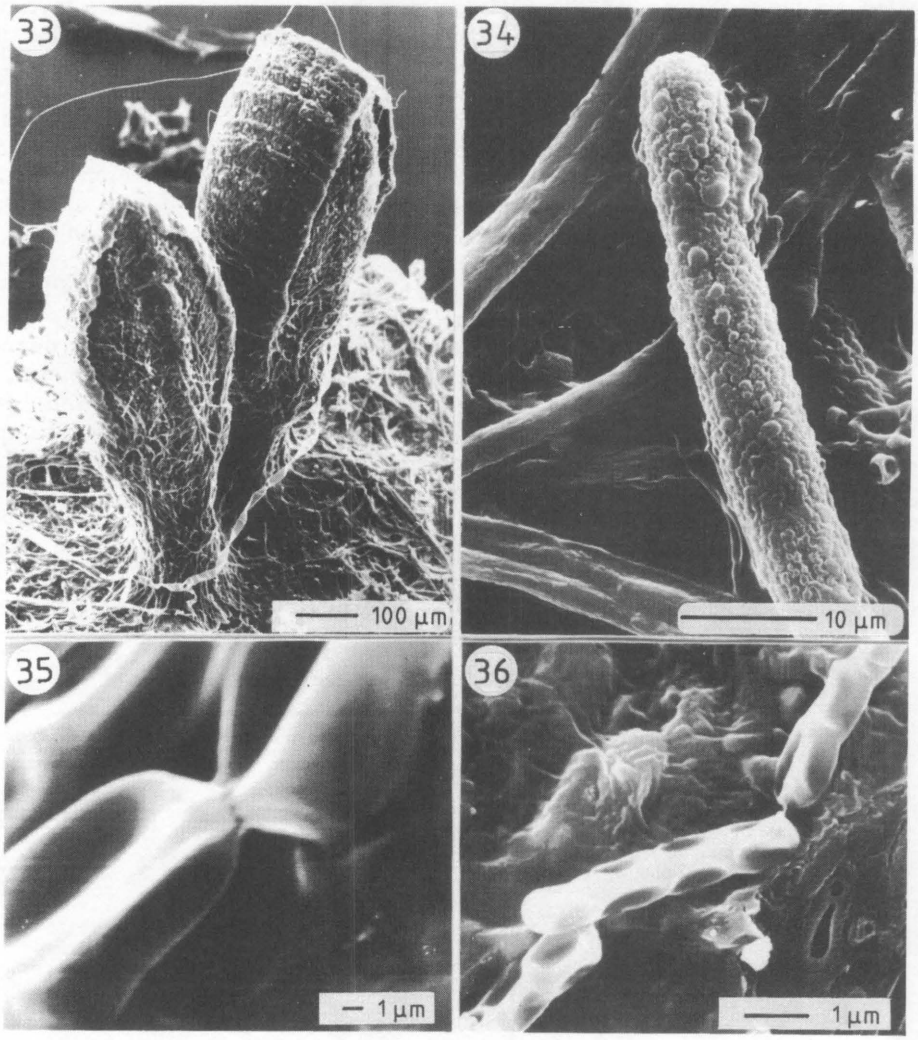


Fig. 32. *Glyphium schizosporum*. A. Immature ascus. B. Apical part of a mature ascus with fragmented ascospores. C. Part of an ascospore, and ascospore fragments. D. Apical part of a conidial chain.

corrugatum is separated from *G. schizosporum* by the ascospore fragments which are narrower and almost constantly 3-septate or less, and the conidial chains which are broader, branched, longitudinally septate and reddish brown (Sutton 1970). *Glyphium corrugatum* is known only from western Canada and United States (Goree 1974), and *G. schizosporum* from Algeria, France, Switzerland (Zogg 1962), and Norway. *Glyphium schizosporum* is also reported from Idaho in the United States (Shaw 1973), but I think this refers to an erroneous identification of *G. corrugatum*. *Glyphium elatum* is similar, but has non-fragmenting ascospores.

O. Eriksson (1981) pointed out that the correct name of the family was Mytilinidiaceae Kirschst., but proposed later (O. Eriksson 1982) that the younger name



Figs 33-36. SEM photographs of *Glyphium schizosporum*. Fig. 33. Ascomata. Fig. 34. Part of a conidial chain. Fig. 35. Part of a fragmenting ascospore. Fig. 36. Ascospore fragments.

Lophiaceae should be conserved against Mytilinidiaceae.

Material examined: Norway: Tr: 23 coll. (TROM), see Fig. 38.

Herpotrichiella collapsa G. Mathiassen, sp. nov. (Figs 37, 39, 41-44)

Pseudothecia 120-240(-300) µm diam., per superficiem ligni (interdum ligni corticati) sparsa, globularia vel paulum complanata sed plerumque collapsa, nigra. Papilla parva. Setae nigro-

fuscae, plus minusve acutae, 15-70 x 3-4 µm magnae pseudothecium dense investientes, etiam porum cingentes super conum conniventes. Pseudoparaphyses apicales breves (periphysoides) praesentes. Peridium 15-30(-35) µm crassum; cellulae superficiales satis magnae, ellipsoides vel subglobulares, parietibus crassis, fuscis, plerumque impellucidis, subjacentes minores, isodiametricae, eodem colore, interiores sensim plus minusve complanatae, parietibus tenuibus, minus coloratis, pellucidis. Asci 48-65 x 10-12(-13.5) µm magni, subcylindrici vel saccati, subsessiles, 8-spori, parietibus crassis, praesertim ad apices versus. Sporae 11-16.5 x 4-6 µm magnae, ellipsoides vel fusiformes, saepe subcurvae, ad septa tria paulum constrictae, pallide olivaceo-cineracentes, saepe irregulariter in duas series dispositae.

Holotypus: Norway: Tr: Kåfjord: Kåfjorddalen 2 km SE of Sabitjåkka EB 02,97 7 Sep 1982 ad lignum *Salix lanata* ssp. *lanata* GM 1969a (TROM).

Pseudothecia 120-240(-300) µm diam., globose or slightly flattened, but more often typically collapsing, superficial, scattered and black. Densely covered with ± pointed, thick-walled, dark brown setae 15-70 x 3-4 µm, being orientated around the porus with their free ends meeting at the top of the cone. Locule with numerous short apical pseudoparaphyses (periphysoids), but no interascal hyphae observed. Ostioles periphysate. **Peridium** 15-30(-35) µm thick, consisting of an outer cell layer of opaque, dark brown cells (from where the setae develop), an inner layer of ± isodiametric, thick-walled, brown cells, gradually becoming more flattened inwards, and an innermost hyaline layer of thin-walled, polygonal cells. **Asci** 48-65 x 10-12(-13.5) µm, mean 57.5 x 11.2 µm, subcylindrical or saccate, short-stiped to almost sessile, bitunicate, thick-walled, particularly towards apex, 8-spored. **Asco-**

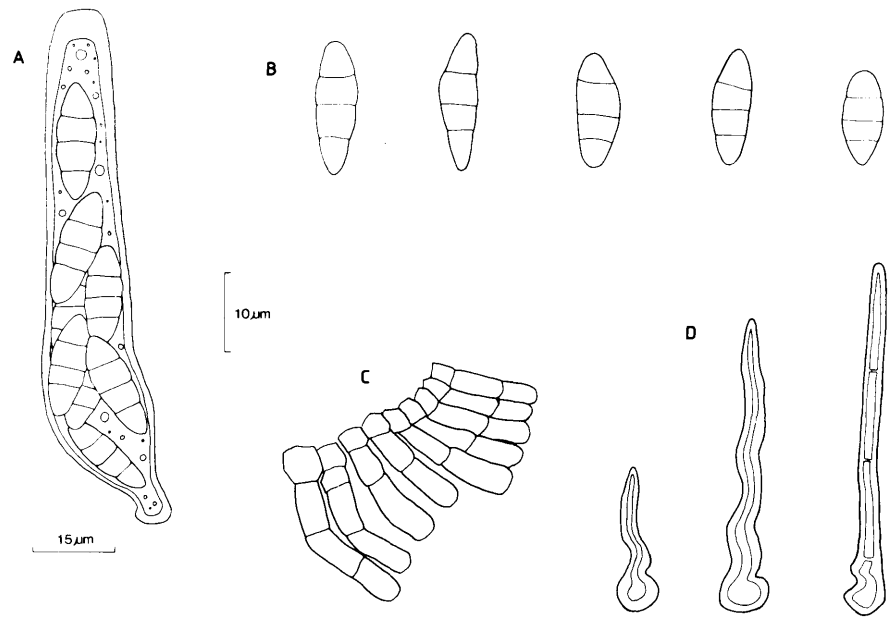
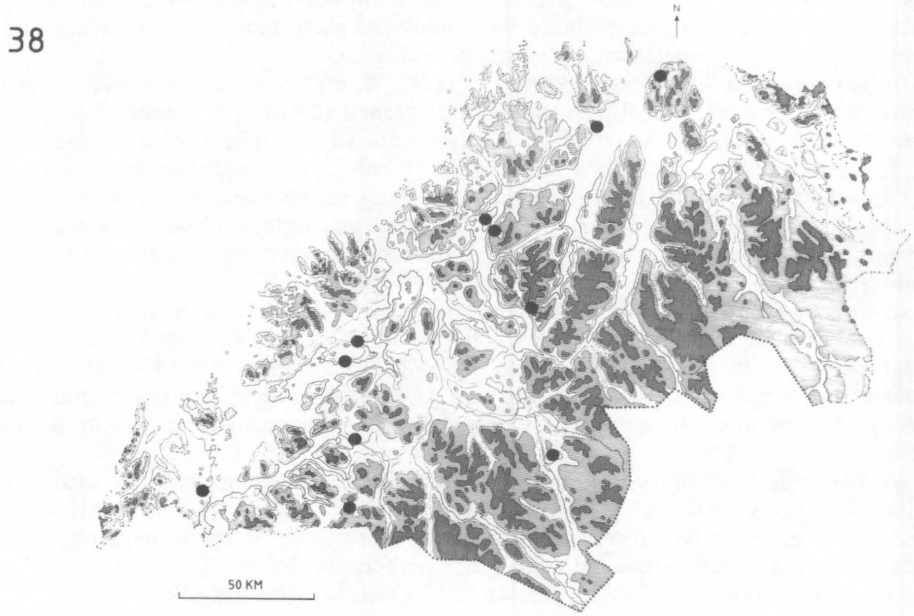
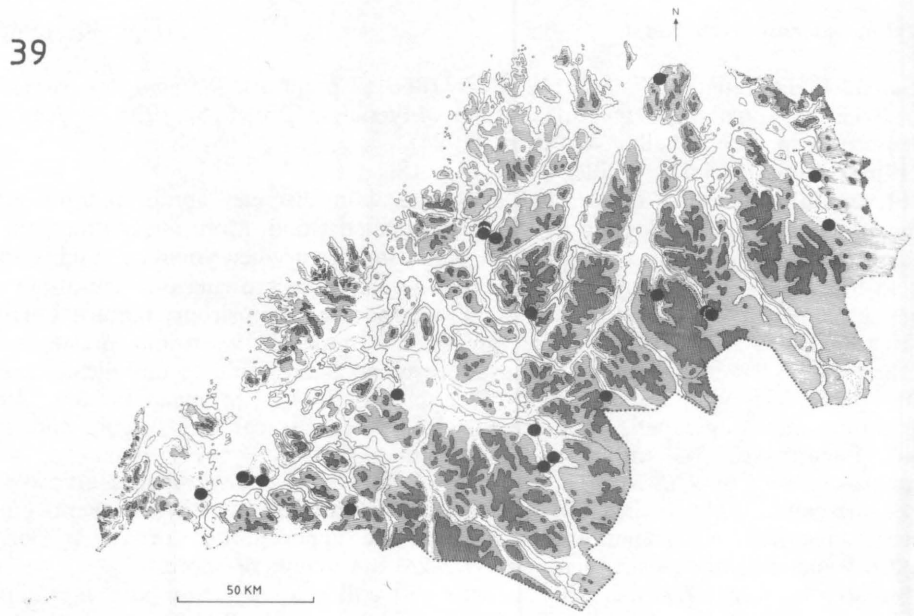


Fig. 37. *Herpotrichiella collapsa*. A. Ascus with eight ascospores. B. Ascospores. C. Periphysoids. D. Setae, different sizes.





Figs 38-39. Distribution maps. Fig. 38. *Glyphium schizosporum*. Fig. 39. *Herpotrichiella collapsa*. For symbols see Fig. 2.

spores 11-16.5 x 4-6 µm, mean 13.5 x 5.0 µm, broadly ellipsoid-fusiform, straight or inequilateral, 3-septate, broadest above the middle, slightly constricted at septa and light olive-greyish. Overlapping biseriate or crowded in ascus.

Substrate. *Salix lanata* ssp. *lanata* (15 coll.), *S. nigricans* ssp. *borealis* (13 coll.), *S. nigricans* ssp. *nigricans* (6 coll.), *S. glauca* ssp. *glauca* (5 coll.), *S. pentandra* (2 coll.), *S. hastata* (1 coll.), *S. lapponum* (1 coll.), *S. nigricans* ssp. *borealis* x *glauca* ssp. *glauca* (1 coll.), *S. nigricans* ssp. *nigricans* x *phylicifolia* (1 coll.), on wood, occasionally on bark.

Comments. *Herpotrichiella collapsa* is an easily recognizable taxon with its typically collapsing, setose ascomata. However, the setae vary in length, and on some ascomata the ascomatal wall, particularly the upper half, may be covered only with short setae and protruding cells.

Herpotrichiella collapsa is microscopically very similar to *H. pilosella* (Karst.) Munk, but easily separated by other characters. The ascomata of the two species differ in both size and shape: In *H. pilosella* (Holotype, PAK 1284) they are 100-140(-150) µm diam., ± globose and never collapsing, whereas in *H. collapsa* they are larger and typically collapsing. In addition, the peridium is considerably thinner in *H. pilosella* than in *H. collapsa*.

Herpotrichiella collapsa is found on several *Salix* species and is distributed in all the vegetational regions (MB-LA) in Troms (cf. Tab. 4). It is common and seems to be well adapted to the climatic conditions in this part of Norway. It is most frequently found on decorticated wood, often associated with other pyrenomycetes.

Material examined: Norway: Tr: 45 coll. (TROM), see Fig. 39.

Hypoxylon macrosporum Karst. (Figs 40, 45-46, 48)

Not. Sällsk. F. Fl. fenn. Förh. 8: 211, 1882 (1866 as preprint). - *Hypoxylon vogesiacum* (Pers.) Sacc. var. *macrosporum* J.H. Miller, Mycologia 25: 325, 1933. - Anamorph: *Nodulisporium* sp. fide Whalley & Petrini (1984).

Illustration: Petrini & Müller 1986: Fig. 18.

Stromata superficial, effuse and applanate with discrete, abrupt margin, usually growing in elongate bands close to bark on decorticated wood. More rarely erumpent from bark, then pulvinate to nearly hemispherical. Reddish-brown when young, changing to dark brown to black with age. Often weakly greyish-purple when growing on bark, more rarely so when growing on wood. Ectostroma weakly carbonized, entostroma porous. **Perithecia** 330-510 µm diam., ± globose to ovoid, gregarious, immersed in stroma in one layer on wood, and in 2-3 layers in the pulvinate stromata on bark. Ostioles umbilicate, but also papillate, particularly with age. **Asci** 130-175 p.sp. x 12.5-17.5 µm, mean 145.5 x 14.8 µm, cylindrical-clavate, long-stiped, unitunicate and 8-spored. Apical ring discoid and weakly amyloid. **Paraphyses** 3-5 µm diam., longer than the asci, rarely branched, septate. **Ascospores** 23-34(-36) x (8.5-)9-12.5 µm, mean 27.4 x 10.3 µm, broadly ellipsoid to ± gibbose, one-celled, light to dark brown (± brownish red) and often with several guttulae. Obliquely uniseriate, but sometimes biseriate in the upper portion of ascus. Germ slit longitudinal and indistinct, usually running 1/3-2/3 the length of spore.

Substrate. *Salix nigricans* ssp. *borealis* (40 coll.), *S. nigricans* ssp. *nigricans* (12 coll.), *S. lanata* ssp. *lanata* (8 coll.), *S. glauca* ssp. *glauca* (7 coll.), *S. lapponum* (4 coll.), *S. arbuscula* (2 coll.), *S. glauca* ssp. *stipulifera* (2 coll.), *S. caprea* ssp. *coaetanea* (1 coll.), *S. lanata* ssp. *glandulifera* (1 coll.), *S. nigricans* ssp. *nigricans* x *phylicifolia* (2 coll.), *S. lanata* ssp. *lanata* x *hastata* (1 coll.), *S. nigricans* ssp. *borealis* x *glauca* ssp. *glauca* (1 coll.), on wood and bark. Previously reported on *Alnus viridis* and *Salix* spp. (Whalley &

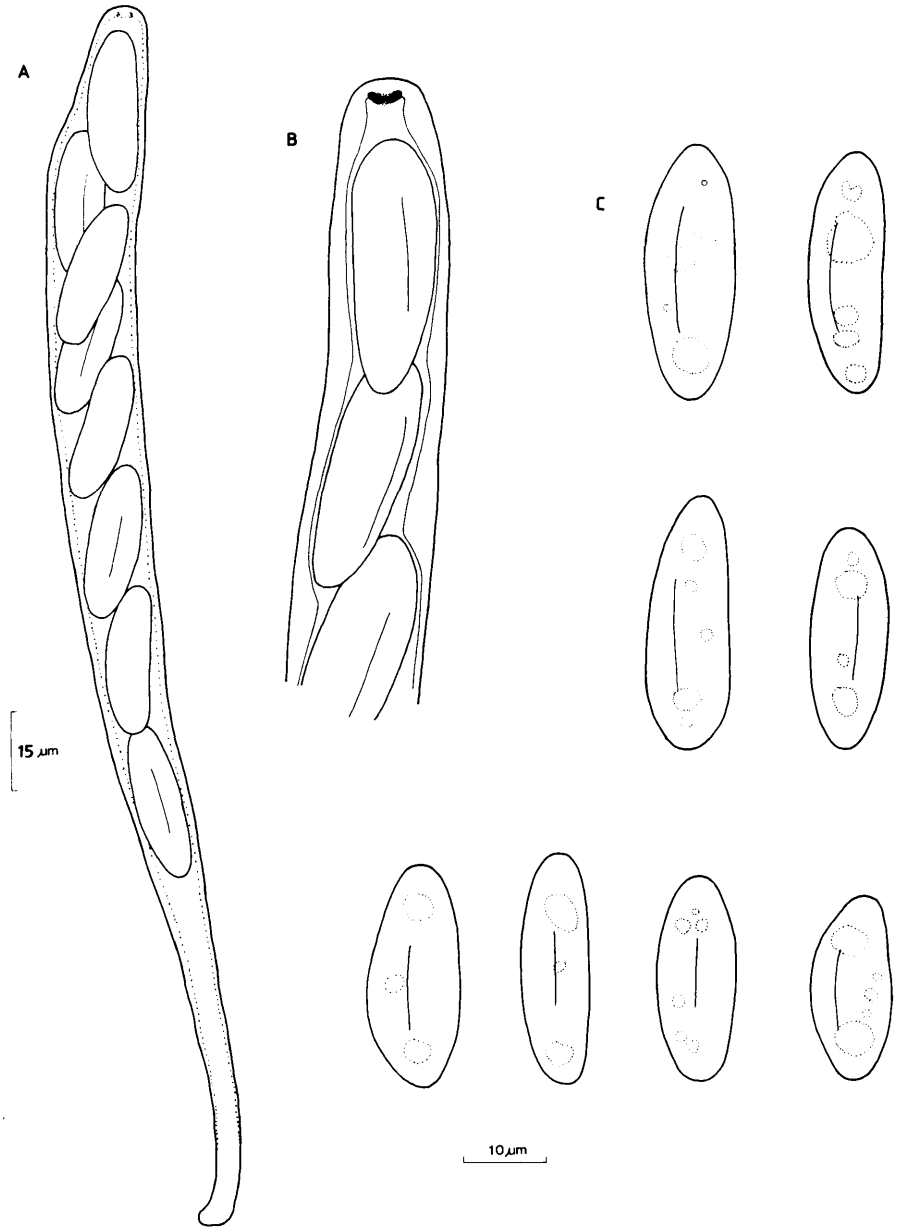
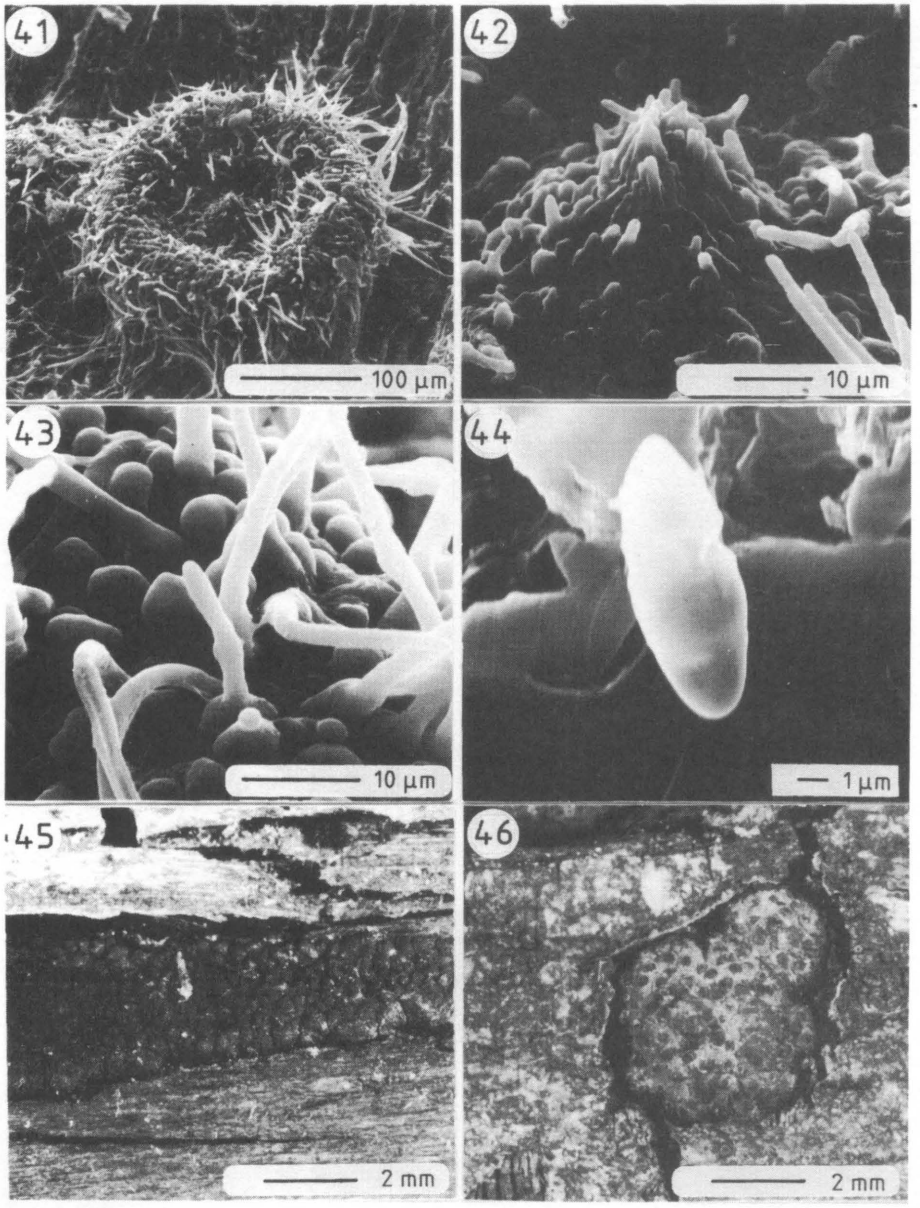


Fig. 40. *Hypoxylon macrosporum*. A. Ascus with eight ascospores. B. Ascal apex. Treated with M.r. C. Ascospores.



Figs 41-46. Photographs. Figs 41-44. *Herpotrichiella collapsa* (SEM). Figs 45-46. *Hypoxylon macrosporum*. Fig. 41. Ascoma. Fig. 42. Setae around the ostiolar opening. Fig. 43. Setae on the ascoma wall. Fig. 44. Ascospore. Fig. 45. Stromata on wood. Fig. 46. Stromata on bark.

Petrini 1984).

Comments. *Hypoxylon macrosporum* was first depicted and described from Norway by Granmo (1977). From Troms he mentioned three finds of this species. It is however very common on *Salix* in Troms and evenly distributed all over the county, mainly found on the *S. nigricans* group.

Hypoxylon macrosporum was treated as a variety of *H. vogesiacum* Pers. : Sacc. by Miller (1933), and later maintained at varietal rank by Whalley & Petrini (1984). The species was validly published by Karsten in 1866 as *H. macrosporum*, and for a number of reasons (see below) I still consider this taxon as a distinct species, and not as a variety of *H. vogesiacum*.

The weak greyish-purple colour which sometimes can be seen on some of the stromata of *Hypoxylon macrosporum*, particularly when growing on bark, could indicate a relationship to *H. vogesiacum*. However, Granmo (1977) found chromatographic differences in the stromatal pigments of the species. He examined the typical dark brown stromata on wood, and new examinations of the more pigmented stromata on bark might give us new information. The anamorph of both species seems to belong to *Nodulisporium* Preuss (Whalley & Petrini 1984, Jong & Rogers 1972).

On the other hand, both species differ morphologically (micro- and macroscopic characters), ecologically and geographically. In addition to the differences in colour, the stromata of *Hypoxylon vogesiacum* are often smoother and usually without the marked perithecial elevations found in *H. macrosporum*. The spores are also smaller and slightly different in shape. The germ slit is more distinct and runs the whole length of the spore, and the annulus stains more deeply blue with iodine. In contrast to *Hypoxylon vogesiacum*, the spores of *H. macrosporum* appear finely verruculose under high magnification (1250x, oil immersion). However, SEM does not show any roughness, and these "warts" might only represent dense granules in the spore wall (J. Rogers, in litt.).

Apart from a single collection on *Alnus viridis* from Cheren, near Davos in the Swiss Alps (Whalley & Petrini 1984), *Hypoxylon macrosporum* has hitherto only been found on *Salix*, and I still regard *Salix* to be its main host. *Hypoxylon vogesiacum* has been found on several different host genera, but never on *Salix*. Its main host in Norway is *Ulmus glabra* (Granmo 1977), and it seems to be a more typical lignicolous species than *H. macrosporum*.

Hypoxylon vogesiacum has been found several places in S Norway, but never in N Norway. *Hypoxylon macrosporum* becomes more frequent in the north and is most common in the northern parts of N Norway. *Hypoxylon macrosporum* obviously has an arctic alpine distribution, as suggested by Whalley & Knudsen (1985). For additional comments, see pp. 18-20.

In my opinion, the differences between these two taxa are sufficiently pronounced to justify the rank of different species. They are easily separated on their morphology, ecology and geographical distribution.

Material examined: Norway: No: 1 coll. (TROM). Tr: 81 coll. (TROM), see Fig. 48. Fi: 2 coll. (TROM).

Hypoxylon mammatum (Wahl.) Karst. (Figs 47, 49, 55)

Not. Sällsk. F. Fl. fenn. Förh. 8: 212, 1882 (1866 as preprint). - Basionym: *Sphaeria mammata* Wahl., Fl. suec.: 1003, 1826. - *Sphaeria mammiformis* Wahl., Fl. lapp.: 520, 1812, non Persoon, Syn. meth. Fung.: 64, 1801, nec Fries, Syst. mycol. 2: 455, 1823. - Other synonymes; see Petrini & Müller (1986). - Anamorph: *Geniculosporium* sp. fide

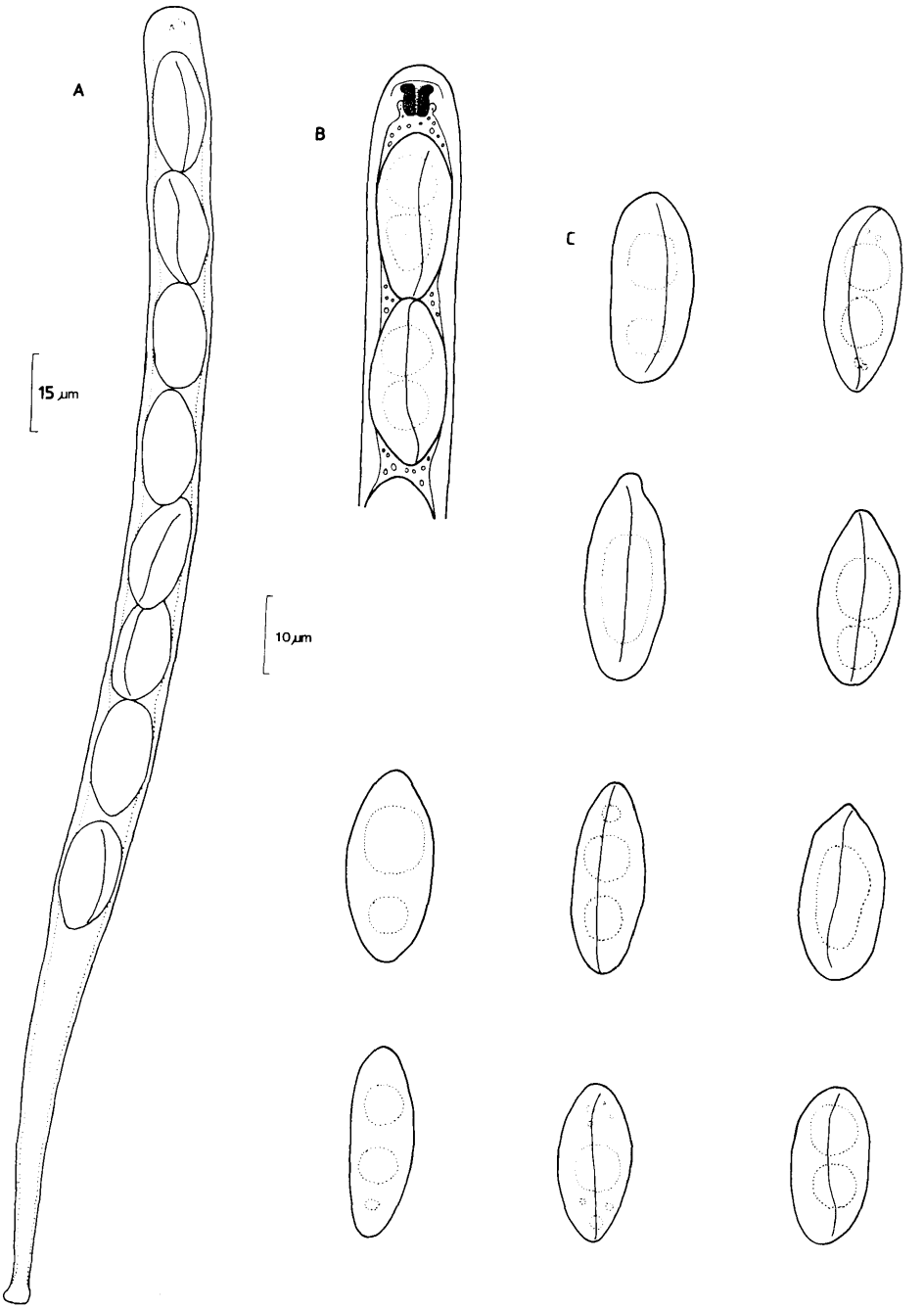
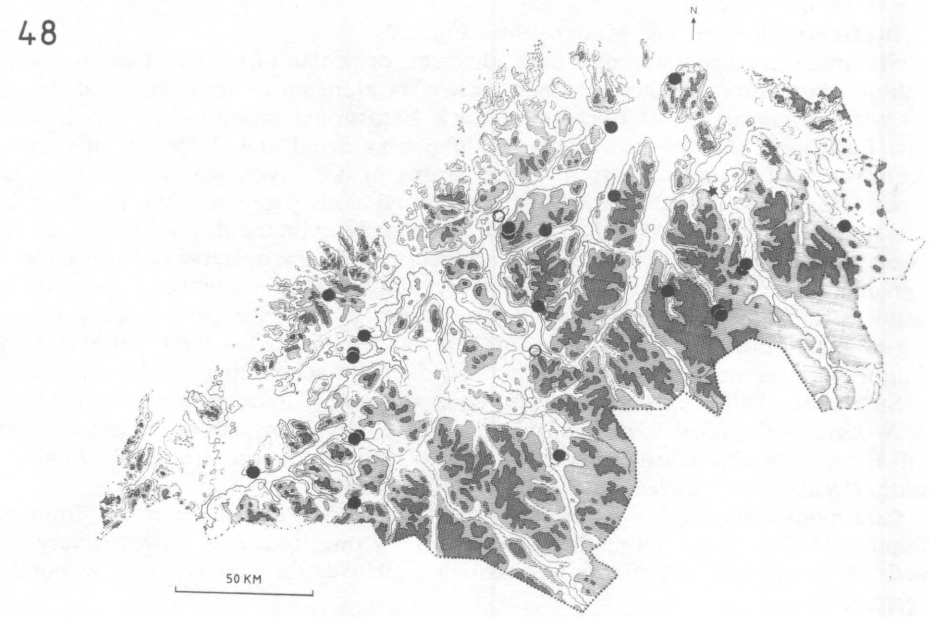
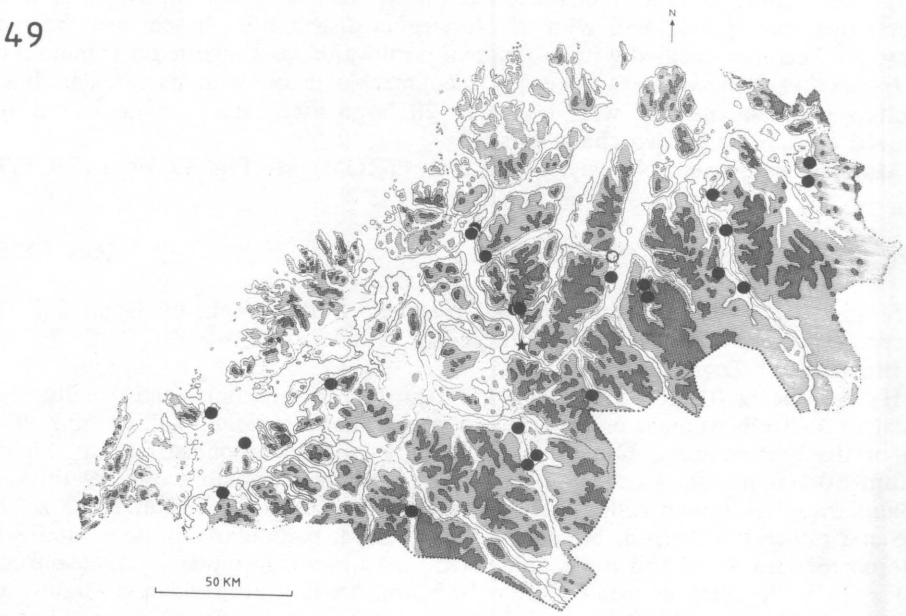


Fig. 47. *Hypoxylon mammatum*. A. Ascus with eight ascospores. B. Ascal apex. Treated with M.r. C. Ascospores.





Figs 48-49. Distribution maps. Fig. 48. *Hypoxylon macrosporum*. Fig. 49. *Hypoxylon mammatum*. For symbols see Fig. 2.

Petrini & Müller (1986).

Illustration: Petrini & Müller 1986: Fig. 29.

Stromata erumpent through bark, discrete, orbicular to oval and often collabent in the middle. Sometimes coalescing, then somewhat elongate or irregular in shape. Surface at first white pruinose, but later becoming black. Ectostroma strongly carbonized, entostroma porous. **Perithecia** 0.8-1.6 mm diam., ± globose to ovoid and 2-35(-50) in each stroma. Adjacent, gregarious and immersed in the stroma in one layer, seated with their bases in the underlying bark. Upper portion prominent and with papillate ostioles. **Asci** 130-165 p.sp. x 10-14(-17) µm, mean 148.3 x 12.3 µm, mostly cylindrical, long-stiped, unitunicate, 8-spored. Apical ring amyloid and ± like an inverted hat. **Paraphyses** 3-4 µm wide at base, but gradually tapering towards apex. Very long, rarely branched, sparsely septate. **Ascospores** 17.5-26(-28.5) x 8-11(-12) µm, mean 21.7 x 9.5 µm, broadly ellipsoid or oblong-elliptical, one-celled, brown to dark brown, often with 1-2 large guttulae. Uniseriate or obliquely uniseriate. Germ slit longitudinal, distinct and running the length of the spore.

Substrate. *Salix nigricans* ssp. *borealis* (52 coll.), *S. nigricans* ssp. *nigricans* (34 coll.), *S. hastata* (2 coll.), *S. phylicifolia* (2 coll.), *S. nigricans* ssp. *nigricans* x *phylicifolia* (1 coll.), on bark. Previously reported on *Acer*, *Alnus*, *Betula*, *Carpinus*, *Fagus*, *Picea*, *Populus*, *Pyrus*, *Salix*, *Sorbus*, and *Ulmus* (Miller 1961).

Comments. *Hypoxylon mammatum* was first depicted and described from Norway by Granmo (1977). From Troms he mentioned only one find. It is however very common on *Salix* in Troms and rather evenly distributed all over the county, mainly found on the *S. nigricans* group.

Karsten (1866) found *Hypoxylon mammatum* all over "Lapponiam ad Kola usqve non rarum", and Nannfeldt (1969) characterized it as very common in North and Central Sweden. This corresponds well with its Norwegian distribution. It seems to be rare in S Norway, but becomes decidedly more frequent northwards, as suggested by Granmo (1977).

Hypoxylon mammatum is an easily recognizable taxon with its circular, black and corticolous stromata, usually with less than 20 large ascomata. The thick and strongly carbonized ectostroma is also characteristic.

Material examined: Norway: Tr: 91 coll. (TROM), see Fig. 49. Fi: 1 coll. (TROM).

Hysterographium elongatum (Wahl.) Corda (Figs 50, 52, 56)

Icon. fung. 5: 77, 1842. - Basionym: *Hysterium elongatum* Wahl., Fl. lapp.: 523, 1812. - Anamorph: *Hysteropycnis confluens* Hilitzer fide Hilitzer (1929).

Illustration: Zogg 1943: Fig. 23d.

Hysterothecia 0.8-2.2(-3.7) x 0.3-0.6(-1.1) mm, ± superficial and usually scattered, elliptical to fusiform, straight or curved, with a central, longitudinal slit, running the whole length of the hysterothecia. Usually longitudinally striate, carbonized and ± shiny black. **Peridium** 50-100 µm thick, dense and somewhat brittle, consisting of very thick-walled, ± isodiametric, dark brown cells. **Asci** (140-)160-185 x 25-37 µm, mean 171.2 x 29.6 µm, clavate and rather short-stiped, bitunicate, thick-walled, particularly in apex, and 8-spored. **Pseudoparaphyses** 1-1.5 µm diam., branched, anastomosing, septate. **Ascospores** 38-55 (-66.5) x 13.5-19(-22) µm, mean 47.9 x 16.5 µm, broadly ellipsoid and slightly curved, muriform, divided by (8-)9-12(-14) transverse septa and several longitudinal septa, constricted at primary septum, less so at the other septa. Verruculose, orange brown to dark reddish brown, biseriate.

Substrate. *Salix nigricans* ssp. *borealis* (10 coll.), *S. caprea* ssp. *coaetanea* (4 coll.), *S. pentandra* (4 coll.), *S. nigricans* ssp. *nigricans* (2 coll.), *S. phylicifolia* (2 coll.), *S.*

caprea ssp. *caprea* (1 coll.), *S. nigricans* ssp. *nigricans* x *phylicifolia* (1 coll.), on wood, occasionally on bark. Previously reported on *Populus*, *Quercus*, *Rhamnus*, *Salix*, and *Rosa* (Zogg 1943).

Comments. *Hysterographium elongatum* has not previously been recorded from Troms. It was first reported from Norway by Sommerfelt (1826) as *Hysterium elongatum*, on *Populus* and *Salix* in Saltdalen. Later mentioned from S Norway by Rostrup (1904) and from W Norway by Jensson (1978a). It is common on *Salix* in Troms and rather evenly distributed all over the county. However, it is more frequent on *Salix* than the 24

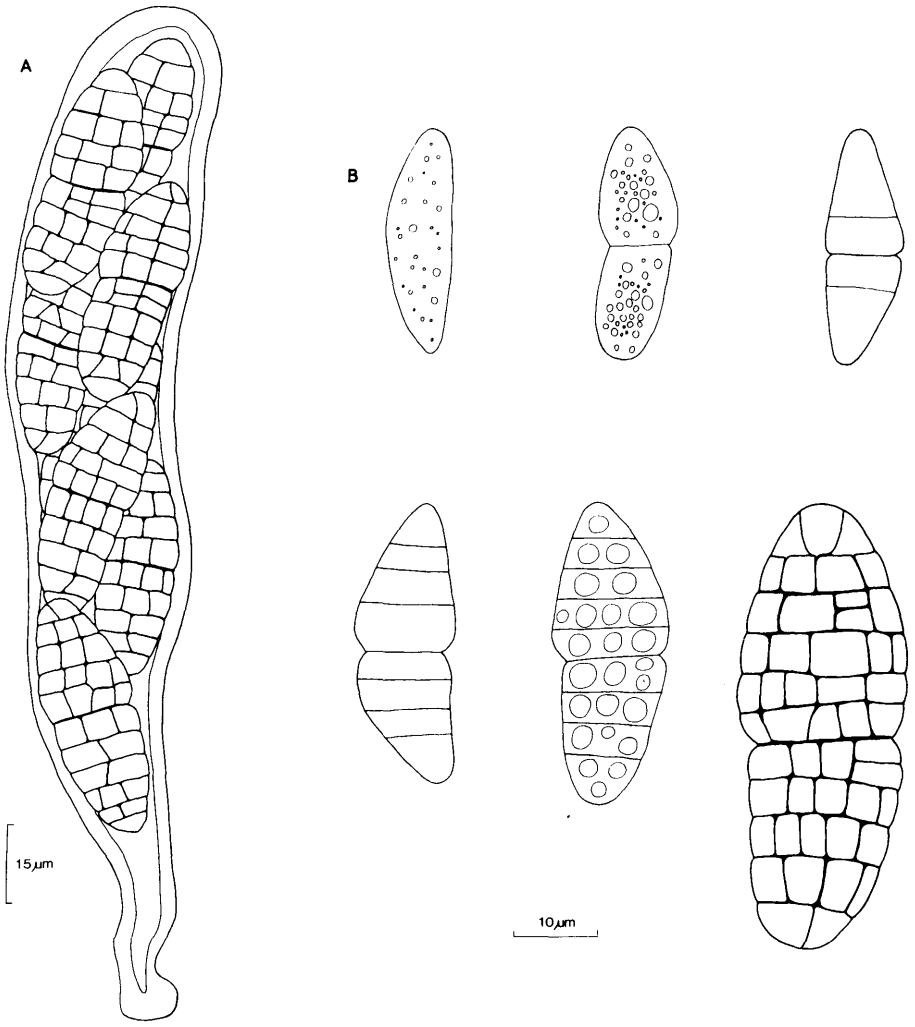


Fig. 50. *Hysterographium elongatum*. A. Ascus with eight ascospores. B. Ascospores in different stages of development. Only the last ascospore is mature.

collected samples indicate, particularly on *S. caprea* ssp. *coaetanea*, because only one or a few samples were collected in each locality.

My material matches very well Zogg's (1943) description of *Hysterographium elongatum*, but the ascospores are somewhat larger than specified by him. Later, Zogg (1962) synonymized *H. elongatum* with *H. fraxini* (Pers. : Fr.) de Not. In my opinion, these taxa represent two separate species. *Hysterographium fraxini* has usually rather broadly elliptical and ± smooth ascomata, obovoid ascospores with obtuse ends and mostly 7-9 transverse septa. H. Zogg (in litt.), does not agree with my opinion.

Hysterographium elongatum is in my opinion more like *H. flexuosum* (Schw.) Sacc. This species has usually longitudinally striate ascomata and ± similar ascospores, with the same pattern of septation. However, the ascospores are somewhat longer, more typically elliptical in outline, and have some additional transverse septa.

Zogg's (1962) synonymy has probably resulted in many collections of *Hysterographium elongatum* being erroneously identified as *H. fraxini*. One example is Jensson's (1978a) description of *H. fraxini* from W Norway.

Material examined: Norway: Ak: 1 coll. (O). O: 5 coll. (O). MR: 3 coll. (TRH), 1 coll. (BG). ST: 1 coll. (UPS). No: 3 coll. (O), 1 coll. (TROM). Tr: 24 coll. (TROM), see Fig. 52. Sweden: 8 coll. (C), 9 coll. (UPS). Finland: 2 coll. (UPS), 1 coll. (K).

Keissleriella cf. *cladophila* (Niessl.) Corbaz (Figs 51, 53, 57)

Phytopath. Z. 28: 410, 1957. - Basionym: *Didymosphaeria cladophila* Niessl., Öst. bot. Z. 25: 199, 1875 (n.v.). - Synonymes; see Bose (1961). Anamorph: *Dendrophoma* sp. fide Bose (1961).

Illustrations: Bose 1961: Figs 11e, 12, Sivanesan 1984: Fig. 196a-c.

Stromata clypeoid, 30-45 µm thick. Variably developed. **Pseudothecia** (200-)350-540 µm diam., ± globose, scattered to gregarious in groups, partly to completely immersed beneath the clypeus. Ostioles not prominent, but densely covered with straight or somewhat wavy, 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 consisting of larger, thin-walled, isodiametric cells. **Asci** 115-140(-155) x 9.5-12.5 µm, mean 128 x 10.7 µm, cylindrical (to slenderly clavate), short-stiped, bitunicate, thickened at the apex, 8-spored. **Pseudoparaphyses** 1.5-2 µm diam., branched, anastomosing, septate. **Ascospores** 14-18.5(-21.5) x (5.5-)6-8 µm, mean 16.5 x 6.9 µm, ± ellipsoid to obovate, two-celled, constricted at the septum, hyaline and with granular content. Uniseriate. **Conidiophores** 30-60 x 2-3 µm, branched, septate and hyaline. **Conidia** 3.5-4.5 x 1-1.5 µm, oblong-elliptical, one-celled and hyaline.

Substrate. *Salix nigricans* ssp. *borealis* (17 coll.), *S. nigricans* ssp. *nigricans* (6 coll.), *S.lapponum* (1 coll.), *S. phylicifolia* (1 coll.), *S. lanata* ssp. *lanata* x ssp. *glandulifera* (1 coll.), on wood, occasionally on bark. Previously reported on *Aesculus*, *Berberis*, *Genista*, *Kerria*, *Salix* and *Sarothamnus* (= *Cytisus*) (Sivanesan 1984).

Comments. *Keissleriella cladophila* has not been found in Norway before. It is rather common on *Salix* in Troms, and seems to prefer the *S. nigricans* group.

My material from Troms matches the description of *Keissleriella cladophila* given by Bose (1961) fairly well, except for somewhat larger asci and ascospores, and somewhat smaller conidia. The examined collections of *K. cladophila* from other herbaria also had somewhat smaller ascospores than found in my material from Troms (see also p. 22). According to L. Holm, my taxon is closely related to, but different from *Keissleriella*

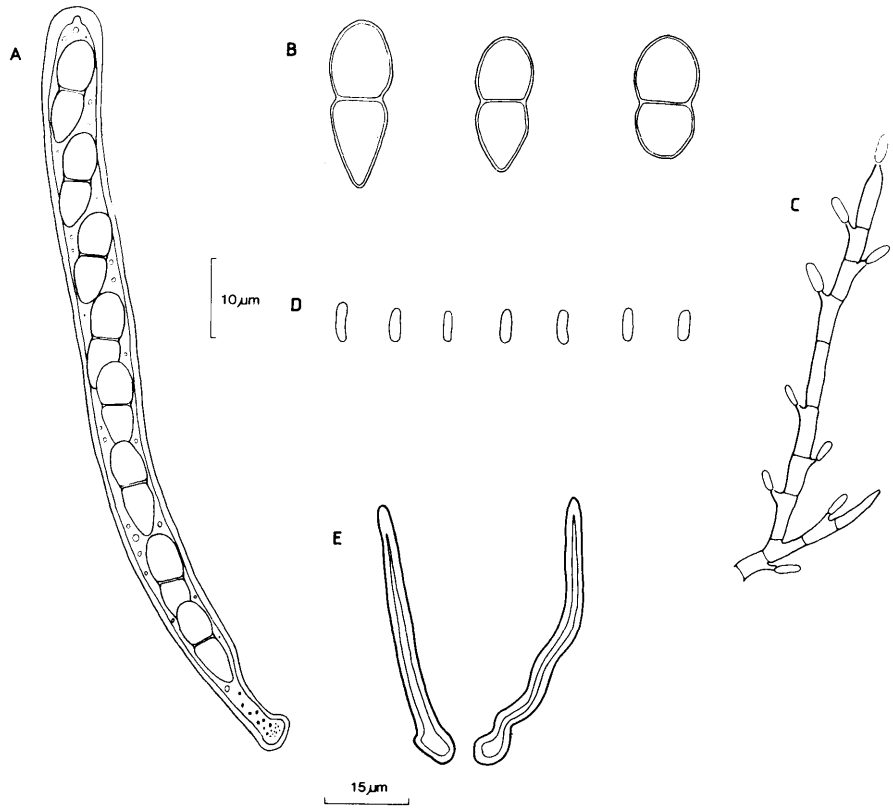


Fig. 51. *Keissleriella cladophila*. A. Ascus with eight ascospores. B. Ascospores. C. Apical part of a conidiophor. D. Conidia. E. Setae.

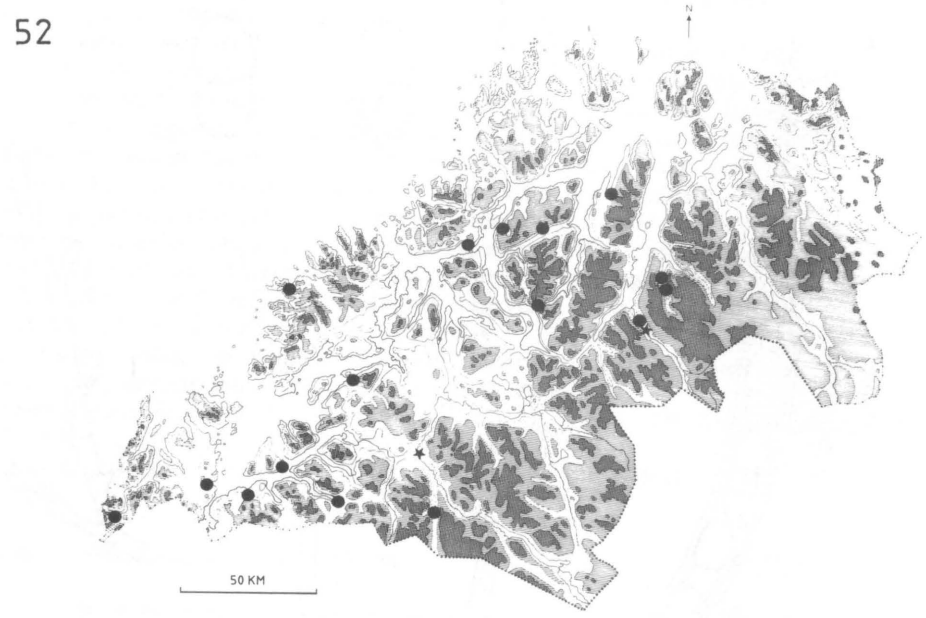
cladophila. He stresses the significance of the substrate and holds it improbable that my north-Norwegian fungus on *Salix* is the same as the middle-European species on Genista (L. Holm, in litt.). However, *Salix* is given as substrate for *K. cladophila* by both Bose (1961) and Sivanesan (1984). It is possible that the collections on *Salix* represent only a *forma specialis*.

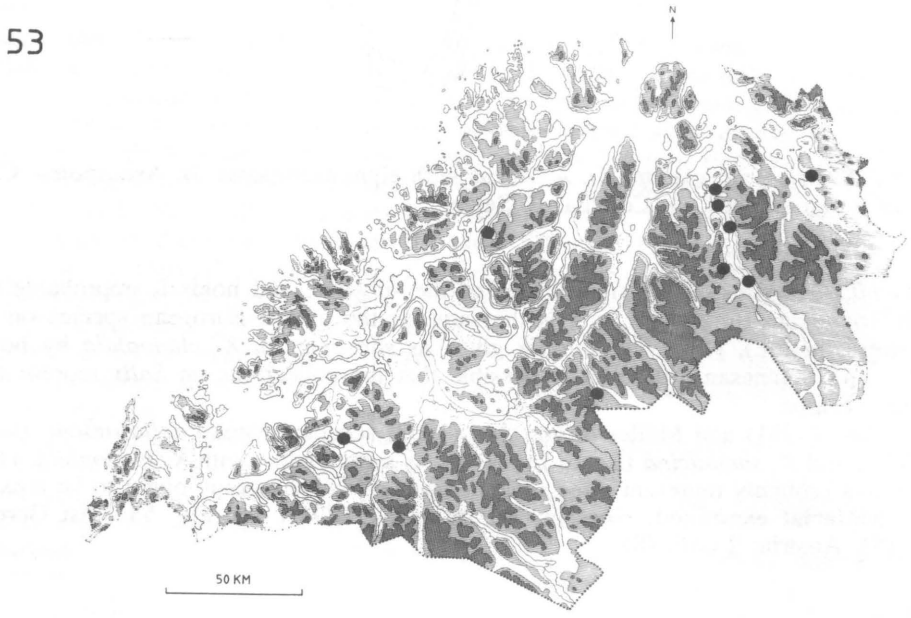
Bose (1961) and Müller & von Arx (1962) accepted *Keissleriella aesculi* (v. Höhn.) v. Höhn. and *K. sambucina* (Rehm.) v. Höhn. as synonymous with *K. cladophila*. However, these taxa probably represent three separate species, and the group ought to be reexamined.

Material examined: Norway: Tr: 26 coll. (TROM), see Fig. 53. East Germany: 1 coll. (S). Austria: 2 coll. (S).

Kirschsteiniothelia aethiops (Berk. & Curtis) D. Hawksw. (Figs 54d, 58)

Bot. J. Linn. Soc. 91: 185, 1985. - Basionym: *Sphaeria aethiops* Berk. & Curtis, Grevillea 4: 143, 1876 (n.v.). - *Amphisphaeria aethiops* (Berk. & Curtis) Sacc., Syll. fung. 1: 722, 1882. - *Astrosphaeriella applanata* s. auctt. non Fr. - *Microthelia incrustans* (Ellis & Ev-





Figs 52-53. Distribution maps. Fig. 52. *Hysterographium elongatum*. Fig. 53. *Keissleriella cladophila*. For symbols see Fig. 2.

erh.) Corlett & S. Hughes, NZ J. Bot. 16: 360, 1978 (n.v.). - Other synonyms; see Hawksworth (1985). - Anamorph: *Dendryphiopsis atra* (Corda) S. Hughes, Can. J. Bot. 31: 655, 1953.

Illustrations: Hawksworth 1985: Figs 2-15, Sivanesan 1984: Fig. 299.

Pseudothecia 400-600 µm diam., ± superficial, solitary or rather densely scattered in small groups. Hemispherical to ± conical, base often applanate, surface usually rough, black. Ostioles not prominent, sometimes short papilliform. **Asci** 90-120 x 15-18.5 µm, mean 106 x 16.3 µm, subcylindrical, short-stiped, bitunicate, thick-walled, particularly towards apex, usually 8-spored. **Pseudoparaphyses** 1.5-3.5 µm diam., branched, anastomosing and septate. **Ascospores** 24-30 x 8-10.5 µm, mean 27.2 x 9.2 µm, broadly ellipsoid or ± slipper-shaped in outline, often slightly curved, two-celled, constricted at the septum, the upper cell usually larger in size than the lower one. Verruculose, olive-brown and unibiseriate.

Substrate. *Salix nigricans* ssp. *borealis* (2 coll.), *S. nigricans* ssp. *nigricans* (2 coll.), on wood. Reported on a wide range of hosts including *Agathis*, *Alnus*, *Carpinus*, *Fagus*, *Pinus*, *Quercus*, *Salix*, *Thuja*, *Tilia*, and *Tsuga* (Hawksworth 1985).

Comments. *Kirschsteiniothelia aethiops* has not previously been recorded from Troms, but is collected in Narvik by A. Granmo, labelled *Astrosphaeriella applanata*. The only collection of this species found in S Norway (on *Quercus*) is reported by Rostrup (1904) as *Amphisphaeria applanata* (Fr.) Ces. and by Hungnes (1982) as *Microthelia applanata* (Fr.) Müller. In Troms it is found on the *Salix nigricans* group only.

With only four finds of *Kirschsteiniothelia aethiops*, it is natural to consider it as rare on *Salix* in Troms. This is not necessarily correct, as it seems to prefer old and rather decayed wood. This kind of substrate was intentionally not included in this investigation (see pp. 10, 14).

Kirschsteiniothelia aethiops has had a chequered nomenclatural history. This has previously been discussed by Hawksworth (1981a, 1981b, 1985) and Hawksworth & Sherwood (1981).

Kirschsteiniothelia aethiops is distinctive with the ± conical, black ascomata, the slipper-shaped, olive-brown ascospores, and the anamorph which is usually found growing together with the ascomata.

Material examined: Norway: O: 1 coll. (O). No: 1 coll. (TROM). Tr: Gratangen: Gratangsbotn XR 09-10,19 8 Jul 1981 2 coll. *Salix nigricans* ssp. *nigricans* GM 275, 280a (TROM). Bardu: Sørdalen DB 01,18 15 Jul 1981 *S. nigricans* ssp. *borealis* GM 606a (TROM). Målselv: Nordstrand DB 00,84 13 Jul 1981 *S. nigricans* ssp. *borealis* GM 541a (TROM). Sweden: 1 coll. (UPS), 1 coll. (S). Denmark: 1 coll. (C). England: 2 coll. (K). West Germany: 1 coll. (W).

Leptosphaeria hendersoniae (Fuckel) L. Holm (Figs 54A-C, 59, 62)

Symb. Bot. upsal. 14: 3: 26, 1957. - Basionym: *Cucurbitaria hendersoniae* Fuckel, Symb. mycol.: 172, 1870. - *Melanomma cinereum* (Karst.) Sacc., Syll. fung. 2: 108, 1883.

Pseudothecia 250-400(-540) µm diam., variable in shape, ± globose to hemispherical and often laterally collapsing, shiny black. Ostioles periphysate, usually not prominent. Gregarious in groups, often completely coalescent, thus resembling dothideaceous stromata in appearance, more rarely scattered or solitary. On bark, immersed, but soon becoming erumpent by splitting the bark; on wood, superficial. **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** 103-120(-

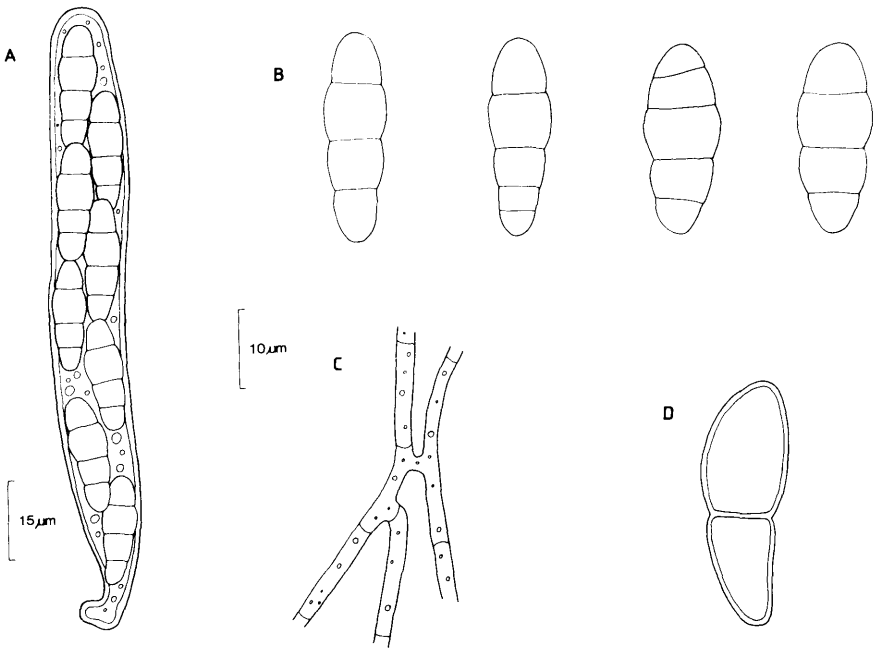


Fig. 54. A-C. *Leptosphaeria hendersoniae*. D. *Kirschsteiniothelia aethiops*. A. Ascus with eight ascospores. B. Ascospores. C. Part of pseudoparaphyses. D. Ascospore.

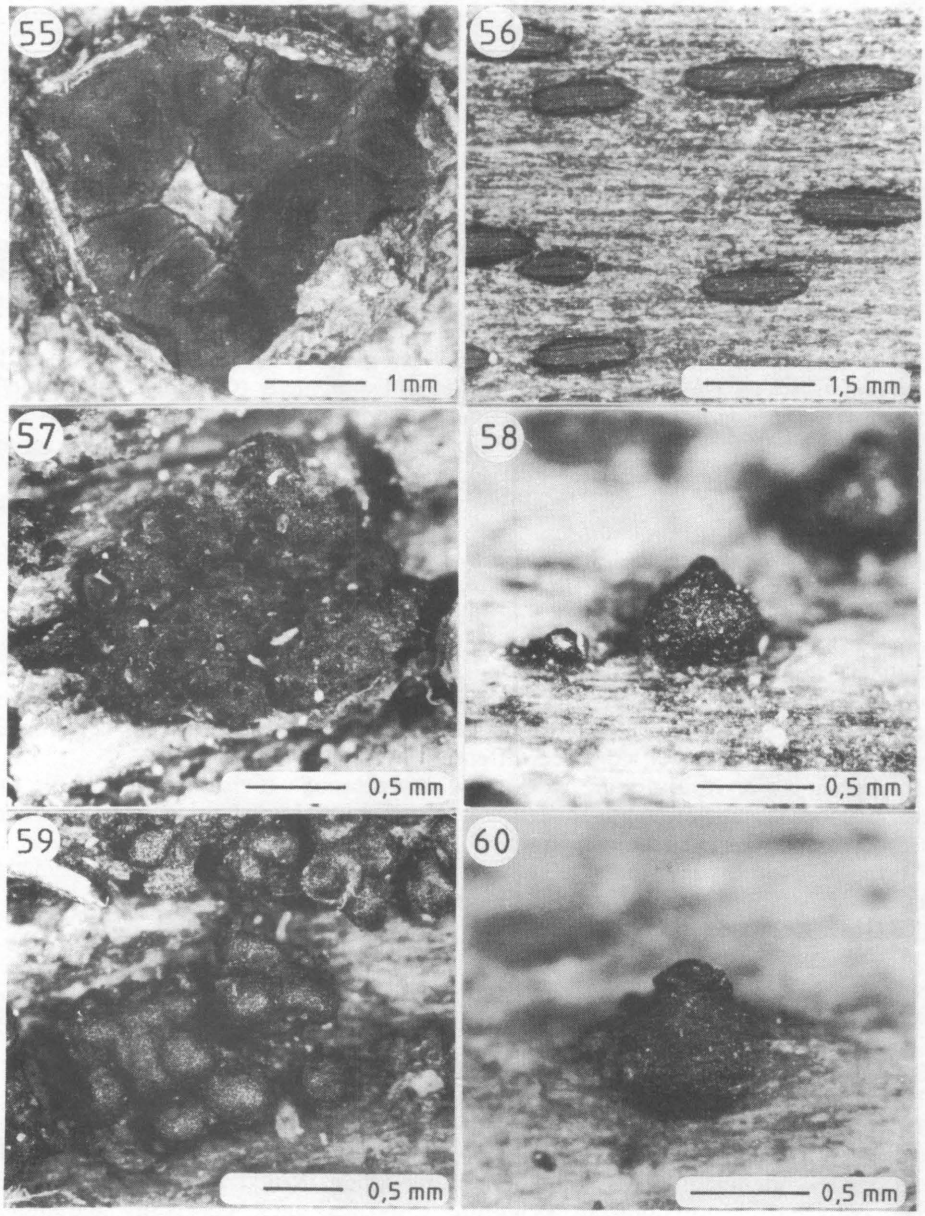
125) x 11.5-14 µm, mean 114.4 x 12.8 µm, cylindrical (-clavate), short-stiped, bitunicate, thick-walled and 8-spored. **Pseudoparaphyses** 2-4 µm diam., branched, anastomosing above asci and septate. **Ascospores** 20.5-27(-30) x 7-9.5 µm, mean 24.6 x 7.9 µm, oblong-elliptical, widest above the middle, 3(-4-5)-septate, constricted in the middle, somewhat less at the other septa. Greyish to light yellowish-brown, uni-biseriate.

Substrate. *Salix nigricans* ssp. *borealis* (11 coll.), *S. nigricans* ssp. *nigricans* (11 coll.), *S. pentandra* (3 coll.), *S. caprea* ssp. *coaetanea* (1 coll.), *S. hastata* (1 coll.), *S. lapponum* (1 coll.), *S. lanata* ssp. *lanata* x ssp. *glandulifera* (1 coll.), on wood and bark. Previously reported on *Salix* only (Holm 1957).

Comments. *Leptosphaeria hendersoniae* has not previously been recorded from Troms, but is mentioned from Norway by Rostrup (1904) as *Metasphaeria cinerea* (Fuck.) Sacc. The particular collection Rostrup refers to, was probably collected by Sommerfelt. Otherwise, three previous collections of this species from S Norway have been wrongly identified as *Melanomma pulvis-pyrius*. However, *Leptosphaeria hendersoniae* is common on *Salix* in Troms and rather evenly distributed all over the county. It seems to prefer the *S. nigricans* group.

Typical of *Leptosphaeria hendersoniae* are the shiny black, often coalescing ascomata, thus resembling dothideaceous stromata in appearance, and that it grows on *Salix* only.

Material examined: Norway: s. loc.: 1 coll. (O). He: 1 coll. (NPPI). NT: 2 coll. (NPPI). Tr: 29 coll. (TROM), see Fig. 62. Sweden: 3 coll. (S). West Germany: 1 coll. (S). Austria: 1 coll. (S). Italy: 2 coll. (S).



Figs 55-60. Photographs of ascomata. Fig. 55. *Hypoxylon mammatum*. Fig. 56. *Hysterographium elongatum*. Fig. 57. *Keissleriella cladophila*. Fig. 58. *Kirschsteiniothelia aethiops*. Fig. 59. *Leptosphaeria hendersoniae*. Fig. 60. *Lophiostoma macrostomoides*.

Lophiostoma macrostomoides (de Not.) Ces. & de Not. (Figs 60, 61C)

Comm. Soc. critt. ital. 1: 219, 1863. - Basionym: *Sphaeria macrostomoides* de Not., Micro. ital.: 111, 1842 (n.v.).

Illustration: Chesters & Bell 1970: Fig. 14.

Pseudothecia 550-850 µm diam., rather scattered, partly (1/3) to completely immersed, globose, black, with prominent laterally flattened ostioles, usually orientated in the direction of the grain. **Asci** 115-130 x 15-18(-19) µm, mean 123.4 x 16.8 µm, clavate, bitunicate, thick-walled, 8-spored. **Pseudoparaphyses** 1-1.5 µm diam., abundant, branched, anastomosing, septate. **Ascospores** (24-)27-36 x 7-9 µm, mean 31.3 x 8.1 µm, ellipsoid and often slightly curved, 5-8 septate, constricted at the primary septum, usually less at the other septa. Verrucose, golden brown, biseriate.

Substrate. *Salix pentandra* (1 coll.), *S. reticulata* (1 coll.), on wood and bark. Previously reported on *Clematis*, *Populus*, *Salix*, and *Sambucus* (Chesters & Bell 1970).

Comments. *Lophiostoma macrostomoides* has not been recorded from Troms before. Rostrup (1904) mentions it from Oslo on *Salix caprea*, but the sample is not preserved in any of the Norwegian herbaria (B, NPPI, O, TRH, TROM). It is very rare on *Salix* in Troms, hitherto only found in two localities. Of the species treated in this paper, this is the only one found on *S. reticulata*.

Lophiostoma macrostomoides is close to *L. caulium* (Fr.) Ces. & de Not. (not found by me), and belongs to the difficult *caulium* group (see Chesters & Bell 1970). *Lophiostoma caulium* is very variable, and the delimitation from *L. macrostomoides* is occasionally diffuse.

Leuchtmann (1985) studied and described the teleomorph and anamorph of seven species of *Lophiostoma* by means of single-spore cultures. The study did not solve the problems within *L. caulium*, but confirmed that this species is difficult to delimit. Using ascospore characters, he specified three different "Formen".

At present, L. & K. Holm are working with a thorough revision of the whole family Lophiostomataceae, and this might reveal new information about *Lophiostoma caulium* and the different species in the *caulium* group.

Material examined: Norway: Tr: Sørreisa: Rabbås CB 28,66 14 Jul 1981 *Salix pentandra* GM 585 (TROM). Kåfjord: Kåfjorddalen EB 02,97 7 Sep 1982 *S. reticulata* GM 531a (TROM). Denmark: 6 coll. (C).

Lophiostoma quadrinucleatum Karst. (Figs 61A-B, 63, 71)

Mycol. fenn. 2: 85, 1873. - Synonyms; see Chesters & Bell (1970).

Illustration: Chesters & Bell 1970: Fig. 9a.

Pseudothecia 400-600(-700) µm diam., scattered, more often gregarious in groups, partly (1/3) to completely immersed, globose, black, with prominent laterally flattened ostioles, usually orientated in the direction of the grain. Wood surface often somewhat blackened between the pseudothecia. **Peridium** 30-60 µm thick, consisting of rather thin-walled, somewhat elongated brown cells, mostly textura angularis. Tissue in and around the ostiolum of very thick-walled, dark brown cells, ± textura epidermoidea. **Asci** (105-)115-140(-150) x (13-)14.5-17.5 µm, mean 126.5 x 15.7 µm, clavate, with tapering stipe and ± foot-like base, bitunicate, thick-walled, 8-spored. **Pseudoparaphyses** 1.5-2.5 µm diam., abundant, branched, anastomosing, septate. **Ascospores** 20-27(-31) x (6.5-)7.5-9.5(-10.5) µm, mean 24.5 x 8.1 µm, broadly ellipsoid, with rounded ends, often somewhat curved, 3(-4-5)-septate, constricted at septa. Verruculose, light ochre brown to dark brown, usually with

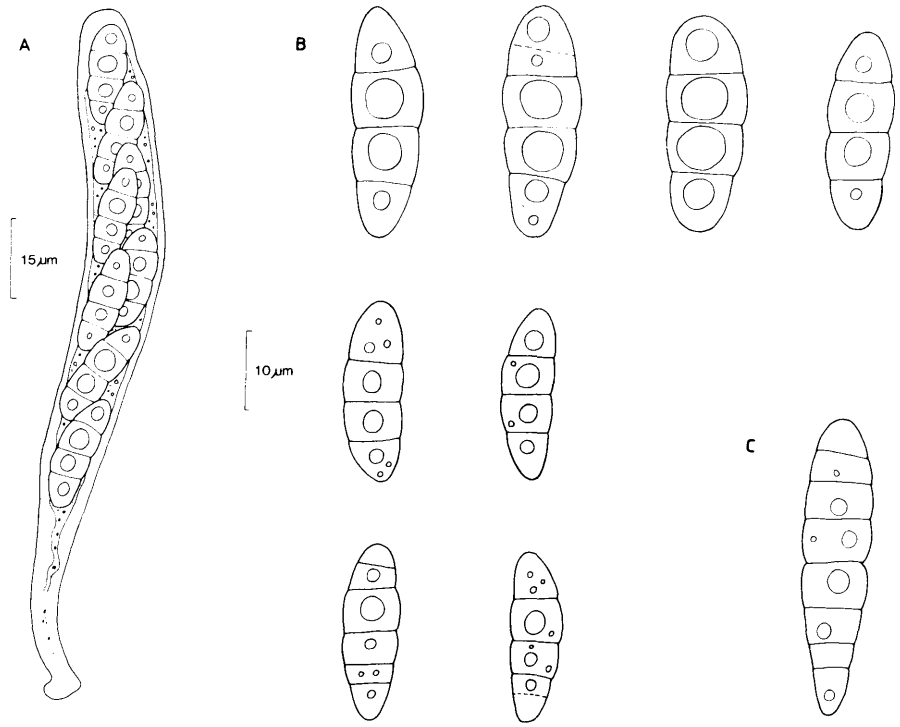


Fig. 61. A-B. *Lophiostoma quadrinucleatum*. C. *Lophiostoma macrostomoides*. A. Ascus with eight ascospores. B. Ascospores. C. Ascospore.

one large guttula in each cell, mostly biseriate.

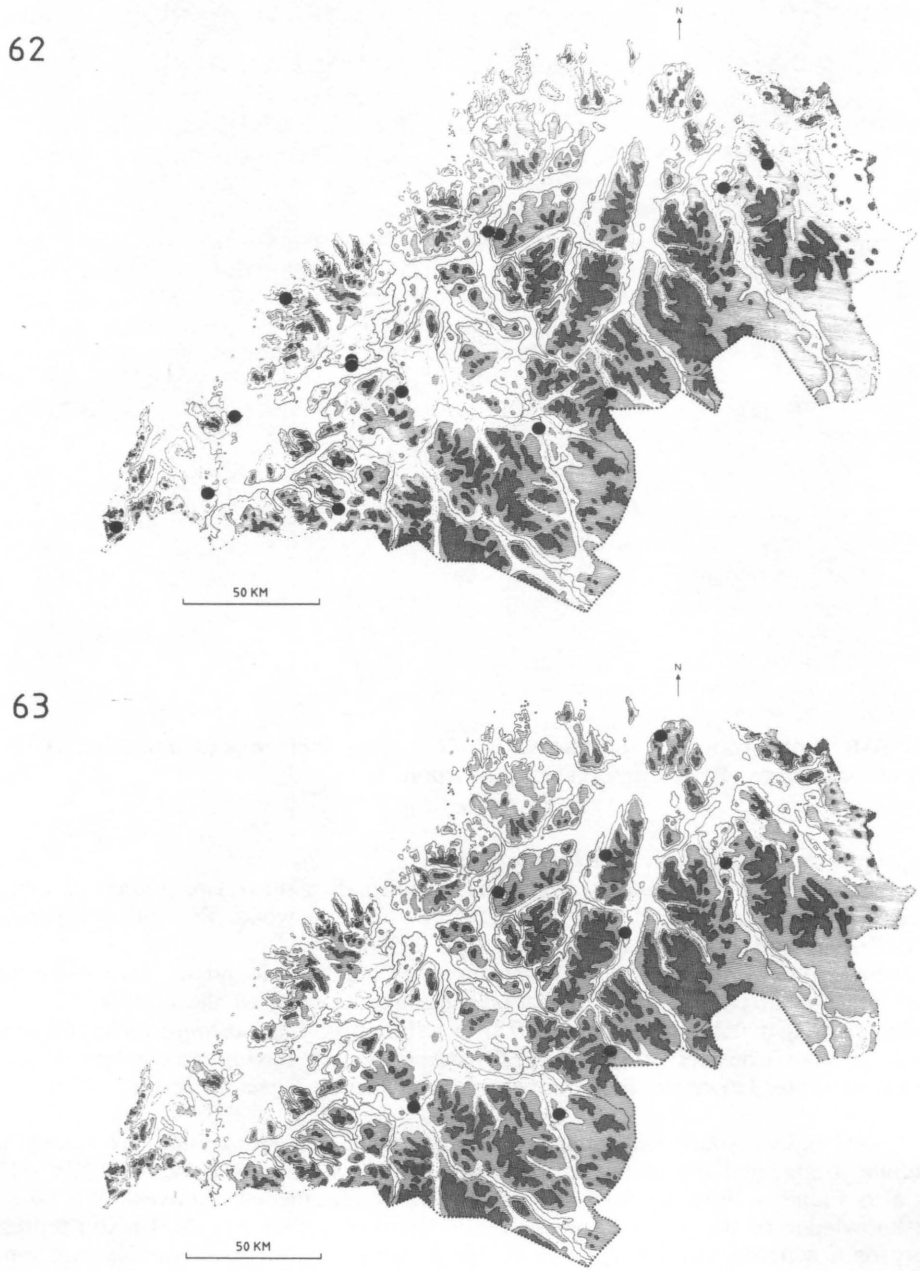
Substrate. *Salix nigricans* ssp. *borealis* (5 coll.), *S. glauca* ssp. *glauca* (2 coll.), *S. nigricans* ssp. *nigricans* (2 coll.), *S. pentandra* (1 coll.), on wood. Previously reported on *Populus*, *Prunus* and *Rhamnus* (Chesters & Bell 1970).

Comments. *Lophiostoma quadrinucleatum* has not been found in Norway before. It is rather rare on *Salix* in Troms, but scattered throughout most of the county.

My material matches Karsten's (1873) description of *Lophiostoma quadrinucleatum*, but deviates from Chesters & Bell's (1970) description in having ascospores which are constricted at septa. However, the spore-character given by Chesters & Bell (1970) is not correct.

I regard both *Lophiostoma quadrinucleatum* and *L. macrostomoides* as belonging to the *caulium* group, and the distinction between these two species is occasionally diffuse. I have also found a third taxon which is somewhat intermediate between the two. My present knowledge of the genus is too sparse to decide whether this third taxon represents a variety or a separate species. L. and K. Holm are likely to treat *Lophiostoma macrostomoides* as a variety of the polymorph *L. caulium* (L. Holm, in litt.), which might also be the case for *L. quadrinucleatum*.

Material examined: Norway: Tr: 10 coll. (TROM), see Fig. 63. Finland: 2 coll. (H).



Figs 62-63. Distribution maps. Fig. 62. *Leptosphaeria hendersoniae*. Fig. 63. *Lophiostoma quadrinucleatum*. For symbols see Fig. 2.

Lophiotrema boreale G. Mathiassen, sp. nov. (Figs 64, 66, 72-73)

Pseudothecia 140-240 µm diam., in lignum plus minusve nigrescens partim (1/3) vel omnino immersa, sparsa vel gregulata, globularia, nigra. Papilla a lateribus compressa, humilis, parum manifesta. Peridium 25-40 µm crassum, textura plus minusve epidermoide, parietibus cellularum crassis, fuscis. Asci 70-90(-95) x 5.5-7 µm magni, cylindrici, breviter stipitati, 8-spori; pseudoparaphyses numerosae, e filamentis 0.5-1.5 µm crassis constitutae. Sporae 13-16(-17) x 3-5 µm magnae, ellipsoides vel fusiformes, saepe paulum curvae, in seriem unicam oblique dispositae apicibus sese tegentes, diu bicellulares, ad septa constrictae, hyalinae, demum quadricellulares, fuscidulae, quaque cellula plerumque guttam unicam fovente.

Holotypus: Norway: Tr: Harstad: Sørvik-Sørvikfjellet WS 60-61,19-20 7 Jul 1981 ad lignum *Salix nigricans* ssp. *nigricans* GM 218 (TROM).

Pseudothecia 140-240 µm diam., scattered to gregarious in groups, partly (1/3) to completely immersed, globose, black, with low and often indistinct laterally flattened ostioles, orientated in several directions, but mostly in the direction of the grain. Wood surface often blackened between the pseudothecia. **Peridium** 25-40 µm thick, somewhat brittle, consisting of very thick-walled, dark brown cells, ± textura epidermoidea. A thin hyaline layer of rather large thin-walled cells, ± textura angularis, is often observed innermost. **Asci** 70-90(-95) x 5.5-7 µm, mean 80.6 x 6.1 µm, cylindrical, short-stiped, with ± foot-like base, bitunicate, rather thick-walled, 8-spored. **Pseudoparaphyses** 0.5-1.5 µm diam., abundant, branched, anastomosing, septate. **Ascospores** 13-16(-17) x 3-5 µm, mean 14.7 x 4.0 µm, ellipsoid to fusiform, with acute ends, often slightly curved. For a long time 2-celled, constricted at the primary septum, hyaline, later on 4-celled, light brownish and usually with one guttula in each cell, obliquely uniseriate.

Substrate. *Salix nigricans* ssp. *borealis* (3 coll.), *S. nigricans* ssp. *nigricans* (3 coll.), on wood, occasionally on bark. Reported on *Betula* (L. Holm, in litt.).

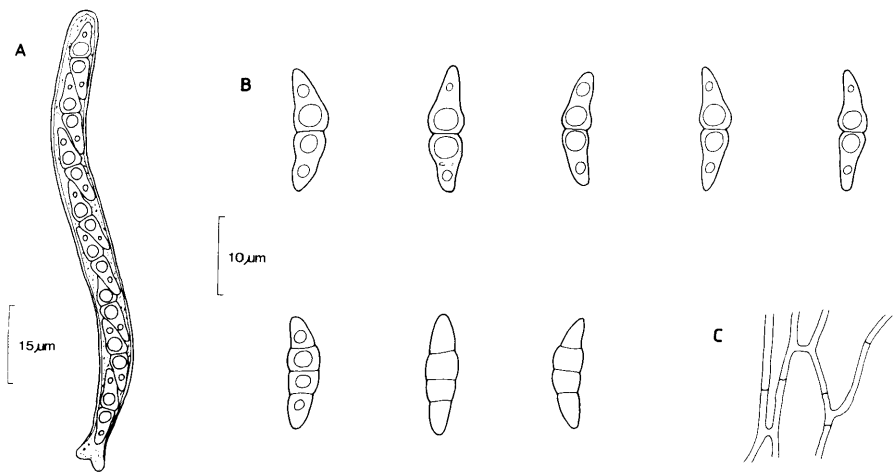


Fig. 64. *Lophiotrema boreale*. A. Ascus with eight ascospores. B. Ascospores. C. Part of pseudoparaphyses.

Comments. *Lophiotrema boreale* is rather close to *L. nucula* (Fr.) Sacc., but is smaller in all respects (see Fig. 66). The ascospores of *L. boreale* are very similar to those of *Lophiostoma fuckelii* Sacc., both in shape and size. However, the latter has spores with hyaline appendages and clavate asci, thus belonging in *Lophiostoma*. A characteristic feature of *L. boreale* is the rather small, black ascomata with the low and often indistinct laterally flattened ostioles. The ostioles are occasionally lacking.

Lophiotrema boreale is found on old, rotten stems and twigs only. This kind of substrate was intentionally not examined by me (see pp. 10, 14), and the species is probably more common on *Salix* in Troms than indicated by my six finds. Previously found in Alta by N.G. Moe (O), and in Abisko (2 collections, UPS) (L. Holm, in litt.).

Material examined: Norway: Tr: Harstad: Sørvik-Sørvikfjellet WS 60-61,19-20 7 Jul 1981 2 coll. *Salix nigricans* ssp. *nigricans* GM 207, 218 (holotype) (TROM). Bardu: Sørdalen DB 01,18 15 Jul 1981 *S. nigricans* ssp. *borealis* GM 614 (TROM). Målselv: Dividalen DB 37,54 16 Jul 1981 *S. nigricans* ssp. *nigricans* GM 685a (TROM). Nordreisa: Josdalen EC 09,15-16 6 Sep 1982 *S. nigricans* ssp. *borealis* GM 1941b (TROM). Kvænangen: Burfjorddal EC 41,57 19 Jul 1981 *S. nigricans* ssp. *borealis* GM 817b (TROM). Fi: 1 coll. (O).

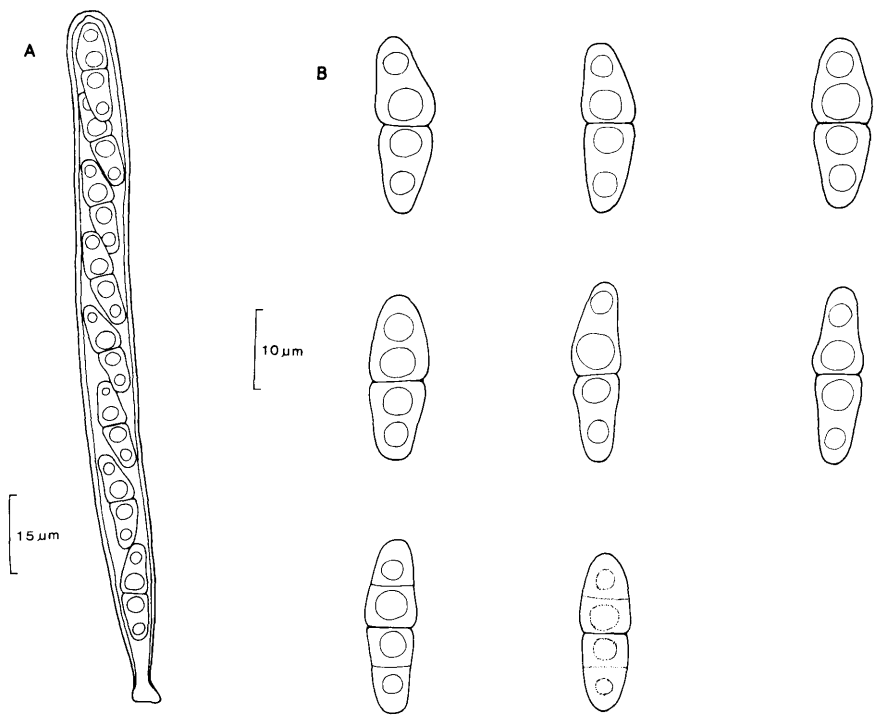


Fig. 65. *Lophiotrema nucula*. A. Ascus with eight ascospores. B. Ascospores.

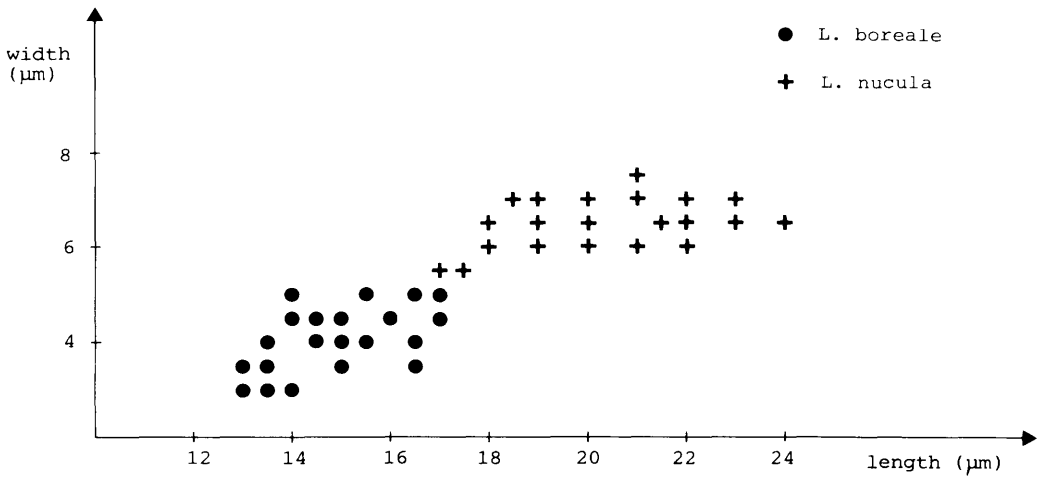


Fig. 66. Scatter diagram illustrating the variation in ascospore length and ascospore width in *Lophiotrema boreale* and *L. nucula*.

Lophiotrema nucula (Fr.) Sacc. (Figs 65-66, 69, 74)

Michelia 1: 338, 1878 (n.v.). - Basionym: *Sphaeria nucula* Fr., Syst. mycol. 2: 466, 1823. - *Lophiostoma nucula* (Fr.) de Not., Schem. di Class.: 46, 1863.

Illustration: Chesters & Bell 1970: Fig. 6a.

Pseudothecia (210-)300-450 µm diam., scattered to gregarious in groups, often completely immersed, ± globose or somewhat elongated, black, protruding with laterally flattened ostioles, on wood usually orientated in the direction of the grain, on bark in several directions. Wood surface usually blackened between the pseudothecia. **Asci** 100-132(-140) x 9-10.5 µm, mean 117.3 x 9.9 µm, cylindrical, short-stiped, bitunicate, 8-spored. **Pseudoparaphyses** 0.5-1.5 µm diam., abundant, branched, anastomosing, septate. **Ascospores** (17-)18.5-24 x 5.5-7.5 µm, mean 20.9 x 6.4 µm, broadly ellipsoid to oblong-elliptical, with rounded ends, for a long time 2-celled, constricted at the primary septum, hyaline, later on 4-celled and light brownish, obliquely uniseriate.

Substrate. *Salix nigricans* ssp. *borealis* (19 coll.), *S. nigricans* ssp. *nigricans* (2 coll.), *S. caprea* ssp. *coaetanea* (1 coll.), *S. pentandra* (1 coll.), *S. nigricans* ssp. *nigricans* x *phylicifolia* (2 coll.), on wood, occasionally on bark. Previously reported on *Acer*, *Populus*, *Quercus*, *Salix*, and *Ulmus* (Chesters & Bell 1970).

Comments. *Lophiotrema nucula* has not been found in Norway before. However, it is quite common on *Salix* in Troms and evenly distributed all over the county, mainly found on the *S. nigricans* group.

Lophiotrema nucula is rather close to *L. boreale*, but is larger in both macro- and microscopical characters (see Fig. 66).

Material examined: Norway: Tr: 25 coll. (TROM), see Fig. 69. Finland: 2 coll. (H). Denmark: 1 coll. (C).

Melanomma fuscidulum Sacc. (Figs 67, 75)

Michelia 1: 450, 1878. - Anamorph: *Aposphaeria fuscidula* (Sacc.) Sacc. fide Sivanesan (1984).

Illustrations: Hilber & Hilber 1978: Fig. 14a-c, Sivanesan 1984: Fig. 198a-d.

Pseudothecia 300-510 µm diam., scattered or densely crowded in groups, partly (1/3) to completely immersed, globose and black. Ostioles periphysate and ± cylindrical, 150-500 x 100-150 µm. Porus circular. **Peridium** 40-55 µm thick. Outermost, the cells are very thick-walled, flattened and dark brown, gradually becoming thinner-walled, larger and paler inwards. **Asci** (55-)65-80 x 10-12 µm, mean 71.5 x 11.3 µm, clavate to cylindrical-clavate, short-stiped, with a ± foot-like base, bitunicate, thickened at apex, 8-spored and numerous. **Pseudoparaphyses** 0.5-2 µm diam., branched, anastomosing and septate. Often wider towards base, numerous. **Ascospores** 14.5-17.5(-19) x 5-6 µm, mean 16,0 x 5,6 µm, ± ellipsoid, slightly curved, 3-septate, broadest above the middle and somewhat constricted at septa. Olivaceous brown to brown and usually with one large guttula in each cell.

Substrate. *Salix nigricans* ssp. *borealis* (2 coll.), *S. nigricans* ssp. *nigricans* (1 coll.), *S. pentandra* (1 coll.), on wood, occasionally on bark. Previously reported on *Acer*, *Bambusa*, *Fagus*, *Fraxinus*, *Hedera*, *Lonicera*, *Quercus*, *Rhamnus*, *Salix*, *Sambucus*, *Ulex*, and *Ulmus* (Sivanesan 1984). Also seen on *Phylica* and *Populus* in the examined material.

Comments. *Melanomma fuscidulum* has not been reported from Norway before. It is very rare on *Salix* in Troms, hitherto only found in one locality.

My material from Troms matches well the description of *Melanomma fuscidulum* given by Holm (1957), but deviates a little from Saccardo's (1883) description in having somewhat larger ascospores. The examined collections of *M. fuscidulum* from other regions had, on average, somewhat smaller ascospores than found in my material from Troms (see p. 22).

Melanomma fuscidulum is characteristic with its rather long ostioles, the brown 3-septate and slightly curved ascospores. However, old and ill-preserved collections, without the long ostioles, may be confusingly like small-spored collections of Lophiostoma quadri-

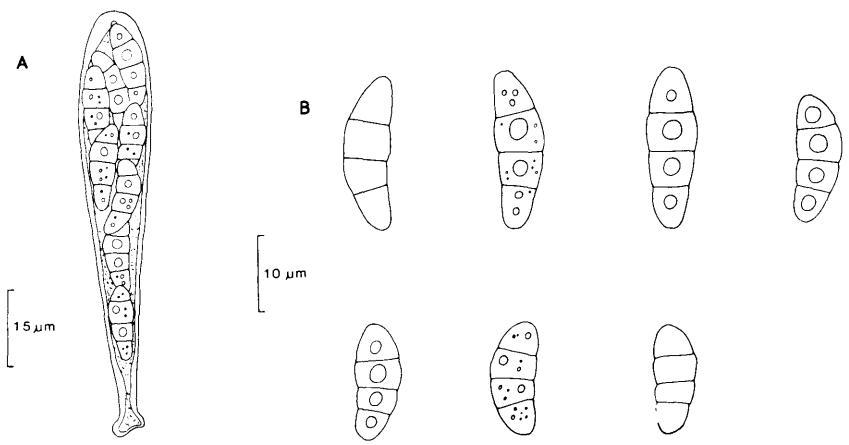


Fig. 67. *Melanomma fuscidulum*. A. Ascus with eight ascospores. B. Ascospores.

nucleatum. They are however easily distinguishable by other characters (e.g. the peridium).

Material examined: Norway: Ho: 1 coll. (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 (TROM), *S. pentandra* GM 2117a (TROM). West Germany: 1 coll. (K). Italy: 1 coll. (K). Tristan da Cunha?: 1 coll. (K).

Melanomma pulvis-pyrius (Pers. : Fr.) Fuckel (Figs 68, 70, 76)

Symb. mycol.: 160, 1870. - Basionym: *Sphaeria pulvis-pyrius* Pers. : Fr., Syst. mycol. 2: 458, 1823. - Synonymes; see Sivanesan (1984). - Anamorph: *Aposphaeria agminalis* (Sacc.) Sacc. fide Sivanesan (1984).

Illustration: Sivanesan 1984: Fig. 199a-c.

Pseudothecia 270-450 µm diam., densely gregarious, generally in rather large groups, superficial, ± globose, black, dull or somewhat shiny, usually non-papillate and sulcate. **Peridium** carbonaceous and 30-60 µm thick. **Asci** (90-)105-135 x 8-10 µm, mean 116.7 x 8.8 µm, cylindrical, short-stiped, with a hoof-like base, bitunicate, rather thin-walled, 8-spored and numerous. **Pseudoparaphyses** 1-2 µm diam., numerous, branched, anastomosing and septate. **Ascospores** (14-)16-20(-22) x 6-7(-8) µm, mean 17.9 x 6.6 µm, ellipsoid to broadly fusiform, with rounded ends, 3-septate, constricted at the middle, somewhat less at the other septa, widest above the middle. Olivaceous grey to rather pale brown, often with granular content and one large or several small guttulae in each cell. Uniseriate.

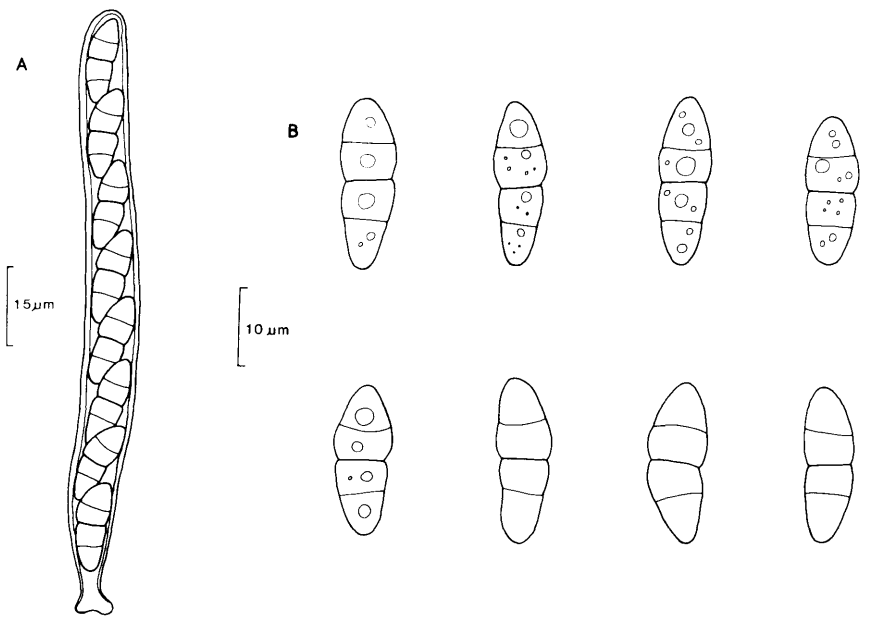
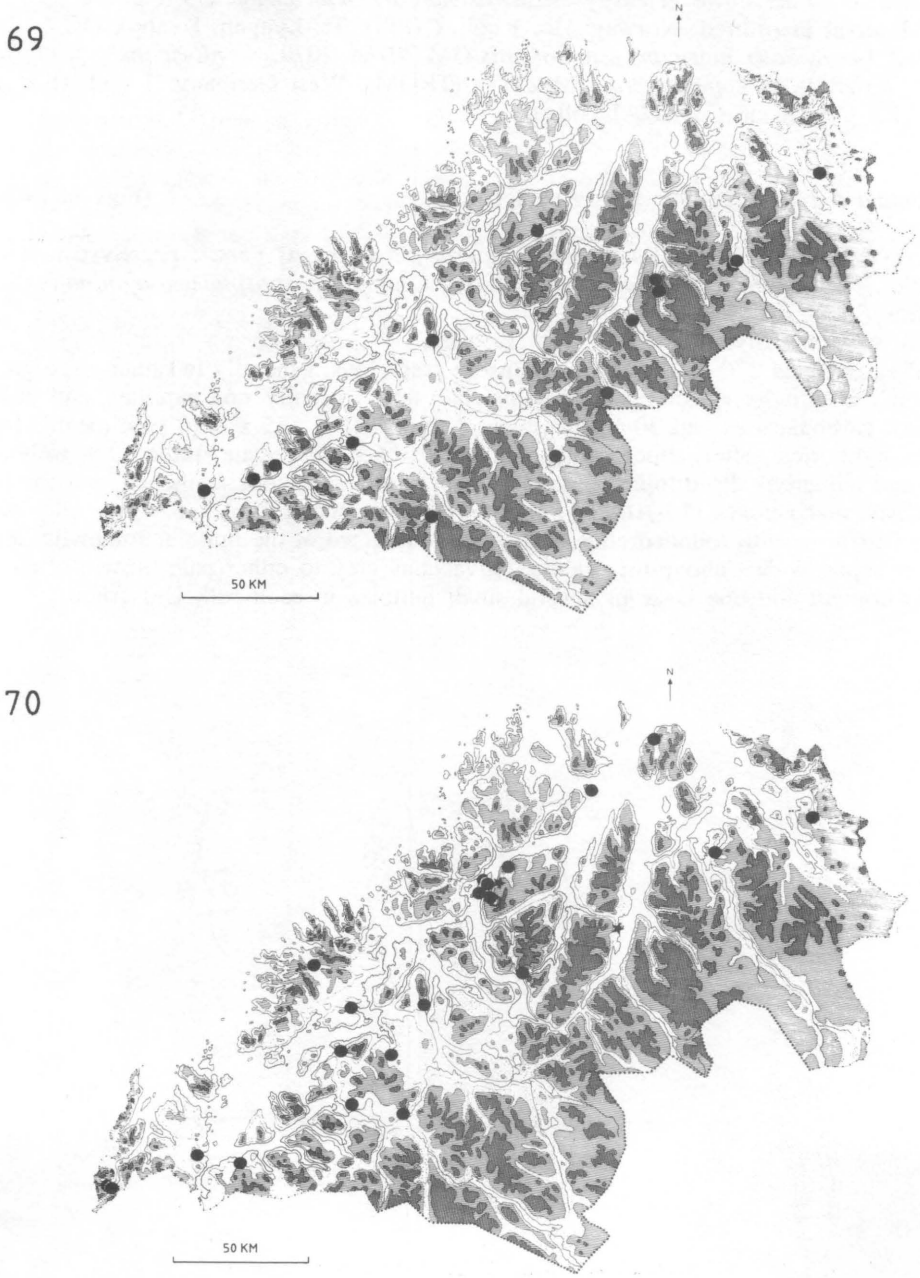
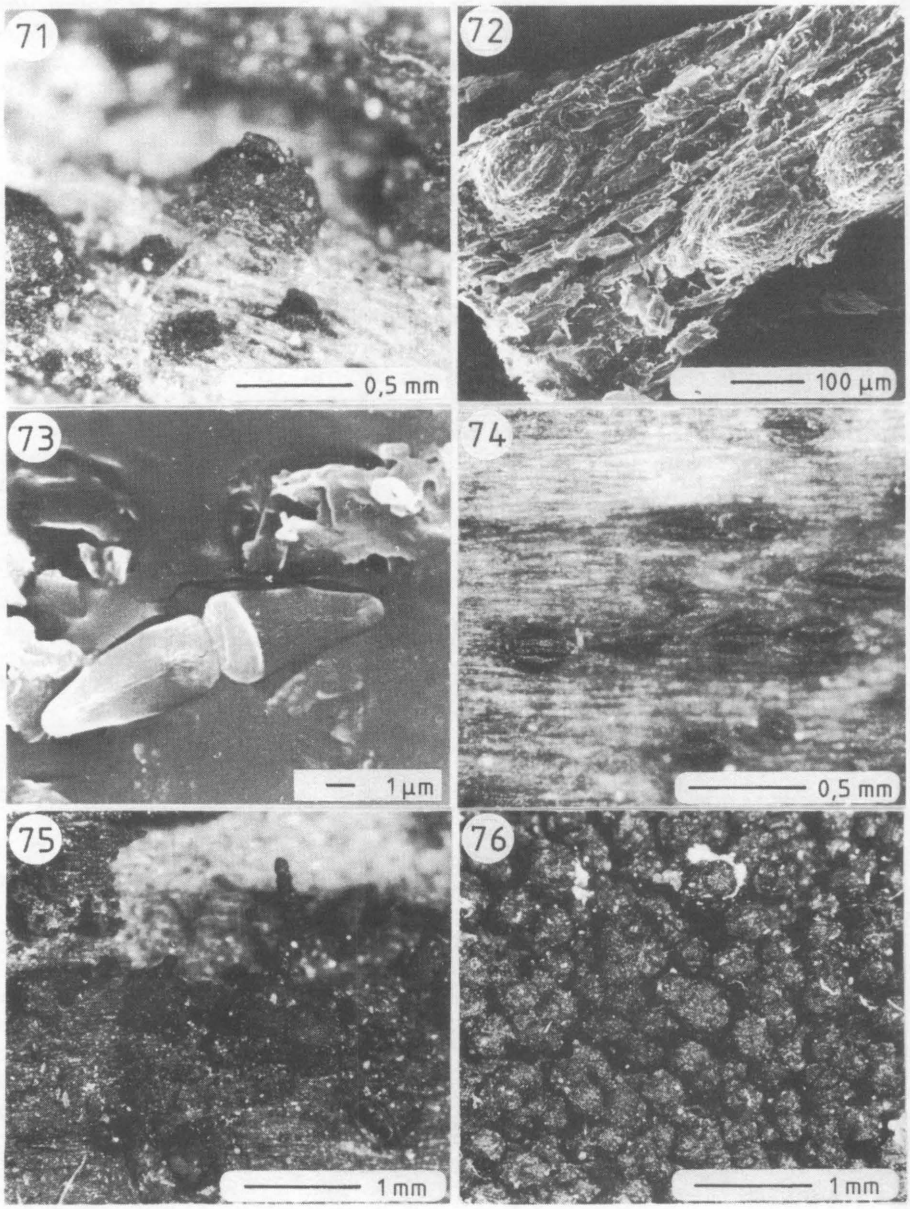


Fig. 68. *Melanomma pulvis-pyrius*. A. Ascus with eight ascospores. B. Ascospores.



Figs 69-70. Distribution maps. Fig. 69. *Lophiotrema nucula*. Fig. 70. *Melanomma pulvis-pyrius*. For symbols see fig. 2.



Figs 71-76. Photographs of ascomata and ascospore. Fig. 71. *Lophiostoma quadrinucleatum*. Figs 72-73. *Lophiotrema boreale* (SEM). Fig. 74. *L. nucula*. Fig. 75. *Melanomma fuscidulum*. Fig. 76. *M. pulvis-pyrius*.

Substrate. *Salix nigricans* ssp. *borealis* (34 coll.), *S. nigricans* ssp. *nigricans* (22 coll.), *S. lapponum* (5 coll.), *S. caprea* ssp. *coaetanea* (2 coll.), *S. glauca* ssp. *glauca* (2 coll.), *S. pentandra* (1 coll.), *S. phylicifolia* (1 coll.), *S. nigricans* ssp. *borealis* x *lanata* ssp. *glandulifera* (1 coll.), on wood and bark. Previously reported on *Acer*, *Betula*, *Corylus*, *Carpinus*, *Fagus*, *Fraxinus*, *Ilex*, *Populus*, *Pyrus*, *Rhamnus*, *Salix*, *Tilia*, *Ulex*, and *Ulmus* (Chesters 1938). Also seen on other substrates in the examined material.

Comments. *Melanomma pulvis-pyrius* is previously mentioned from Troms only by Schröter (1886, 1888). Sommerfelt (1826, 1827) mentions it from Nordland, Rostrup (1904) from Oslo to Alta, Hungnes (1982) particularly from S Norway, and Jensson (1978a) from W Norway. It is very common on *Salix* in Troms, but not found in the continental parts of the county.

Melanomma pulvis-pyrius has a wide range of hosts, also coniferous trees (Munk 1957). Jensson (1978b) reported that this species seems to prefer dry conditions, because he, as a rule, found it growing on dry, dead branches. In Troms, I found it growing as often on humid as on dry substrate.

Melanomma pulvis-pyrius is a rather easily recognizable species. Distinctive are the ± sulcate, black ascomata and the 3-septated, olivaceous grey to pale brown ascospores. The densely crowded ascomata often cover large areas on the substrate. Of the species treated in this paper, *M. pulvis-pyrius* may be mistaken for *Leptosphaeria hendersoniae*, but this species has somewhat larger ascospores and rather smooth, shiny, black ascomata.

Material examined: Norway: Øf: 3 coll. (O). Ak: 1 coll. (BG), 5 coll. (NPPI), 1 coll. (O). O: 22 coll. (O), 1 coll. (TRH). He: 1 coll. (O). Op: 6 coll. (O), 1 coll. (TRH). Bu: 1 coll. (O). Vf: 1 coll. (O). Te: 2 coll. (O). VA: 1 coll. (O). Ho: 10 coll. (BG), 1 coll. (NPPI). SF: 4 coll. (BG), 2 coll. (O). MR: 1 coll. (BG). ST: 1 coll. (BG). NT: 1 coll. (BG), 3 coll. (NPPI). No: 1 coll. (BG), 3 coll. (O), 1 coll. (TROM). Tr: 1 coll. (TRH), 68 coll. (TROM), see Fig. 70. Denmark: 1 coll. (O).

Platystomum compressum (Pers. : Fr.) Trev. (Figs 77, 79, 86)

Bull. Soc. r. Bot. Belg. 16: 16, 1877. - Basionym: *Sphaeria compressa* Pers. : Fr., Syst. mycol. 2: 470, 1823. - *Lophidium compressum* (Pers.) Sacc., Michelia 1: 340, 1878. - Other synonymes; see Chesters & Bell (1970).

Illustration: O. Eriksson 1981: Figs 178, 179.

Pseudothecia 550-800(-1050) µm diam., scattered to gregarious in small groups, partly (1/4) to completely immersed, globose, black, with laterally flattened ostioles, on wood usually orientated in the direction of the grain, on bark orientated in several directions. **Asci** 115-145 x 13-17 µm, mean 127.8 x 14.7 µm, cylindrical-clavate, short-stiped, bitunicate, rather thick-walled, 8-spored. **Pseudoparaphyses** 1.5-2 µm diam., branched, anastomosing, septate. **Ascospores** (19-)21.5-30 x 8-12 µm, mean 24.7 x 9.9 µm, ± broadly ellipsoid, with rounded ends, with 3-5(-8) transverse septa and (0-)1-3(-5) segments with 1(-2) longitudinal septa, constricted at septa, ochre brown to brown, obliquely uniseriate (-biseriate).

Substrate. *Salix glauca* ssp. *glauca* (20 coll.), *S. lanata* ssp. *lanata* (19 coll.), *S. lapponum* (5 coll.), *S. glauca* ssp. *stipulifera* (4 coll.), *S. nigricans* ssp. *borealis* (4 coll.), *S. hastata* (3 coll.), *S. myrsinites* (1 coll.), *S. phylicifolia* (1 coll.), *S. nigricans* ssp. *nigricans* x *phylicifolia* (3 coll.), *S. lanata* ssp. *lanata* x *hastata* (1 coll.), on wood and bark. Previously reported on a wide range of hosts, among others *Cornus*, *Populus*, *Prunus*, *Pyrus*, *Quercus*, and *Salix* (Chesters & Bell 1970). Also seen on other substrates in the examined material.

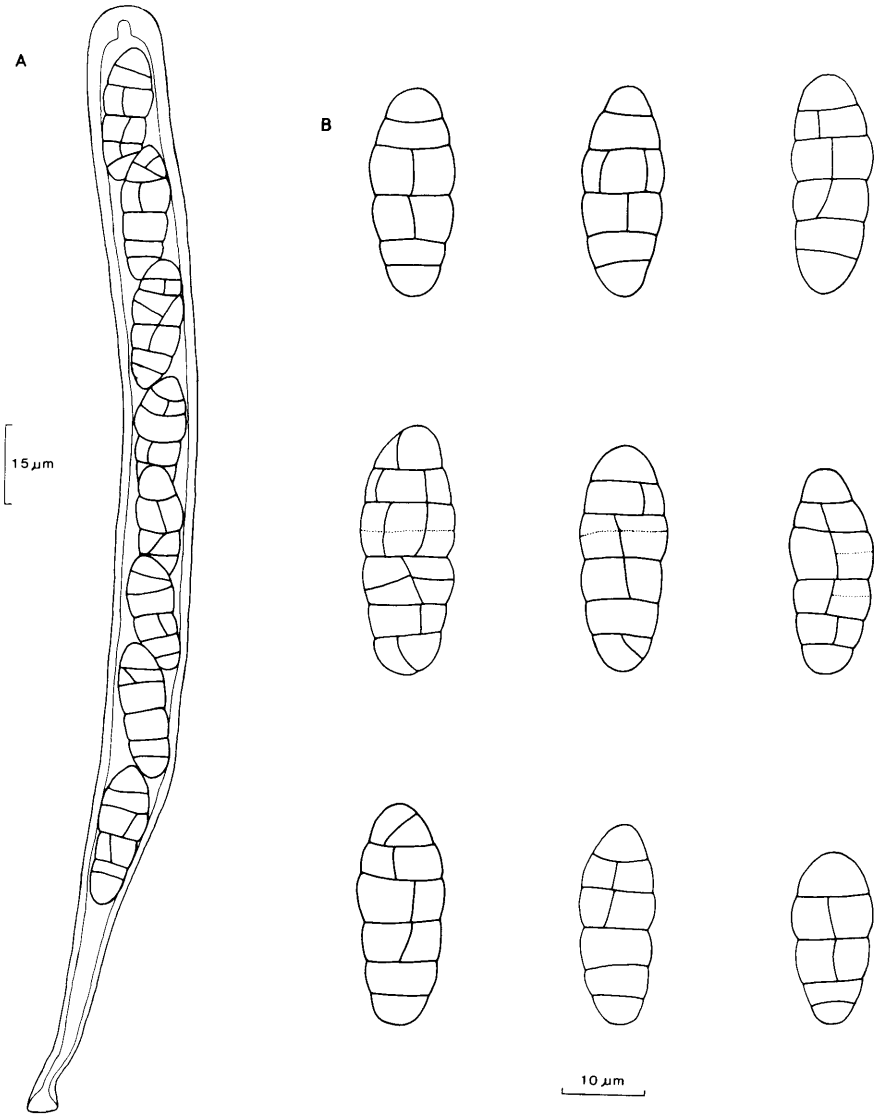


Fig. 77. *Platystomum compressum*. A. Ascus with eight ascospores. B. Ascospores.

Comments. *Platystomum compressum* has not previously been recorded from Troms, but is mentioned from S Norway by Rostrup (1904) as *Lophidium compressum* (Pers.) Sacc. and by Hungnes (1982). It is restricted to a few localities in Troms, but very frequent on *Salix* within these.

Platystomum compressum can both macro- and microscopically be confused with the variety *P. compressum* var. *pseudomacrostomum* (Sacc.) Chesters & Bell. However, in the

variety, the asci are usually more typically clavate, and a majority of the ascospores are often without longitudinal septa. The variety is also found on *Salix* in Troms, but is not treated in this paper.

Material examined: Norway: s. loc.: 1 coll. (O). Ak: 1 coll. (O). O: 2 coll. (O). No: 2 coll. (O). Tr: 61 coll. (TROM), see Fig. 79.

Platystomum curtum (Fr.) G. Mathiassen comb. nov. (Figs 78, 80, 87)

Basionym: *Sphaeria curta* Fr., Syst. mycol. 2: 470, 1822. - *Lophidium curtum* (Fr.) Sacc., Michelia 1: 340, 1878. - *Lophidium subcompressum* (Karst.) Sacc., Syll. fung. 2: 712, 1883. - *Lophidium deflectens* (Karst.) Sacc., Syll. fung. 2: 712, 1883.

Pseudothecia 300-450(-600) µm diam., usually gregarious in groups, partly (1/4) to completely immersed, globose, black, with prominent laterally flattened ostioles, on wood usually orientated in the direction of the grain, on bark orientated in several directions. Wood surface usually blackened between the pseudothecia. **Peridium** 40-60 µm thick, consisting of rather thin-walled brown cells, textura angularis. Tissue in and around the ostiolum of very thick-walled, dark brown cells, ± textura epidermoidea. **Asci** 110-130(-

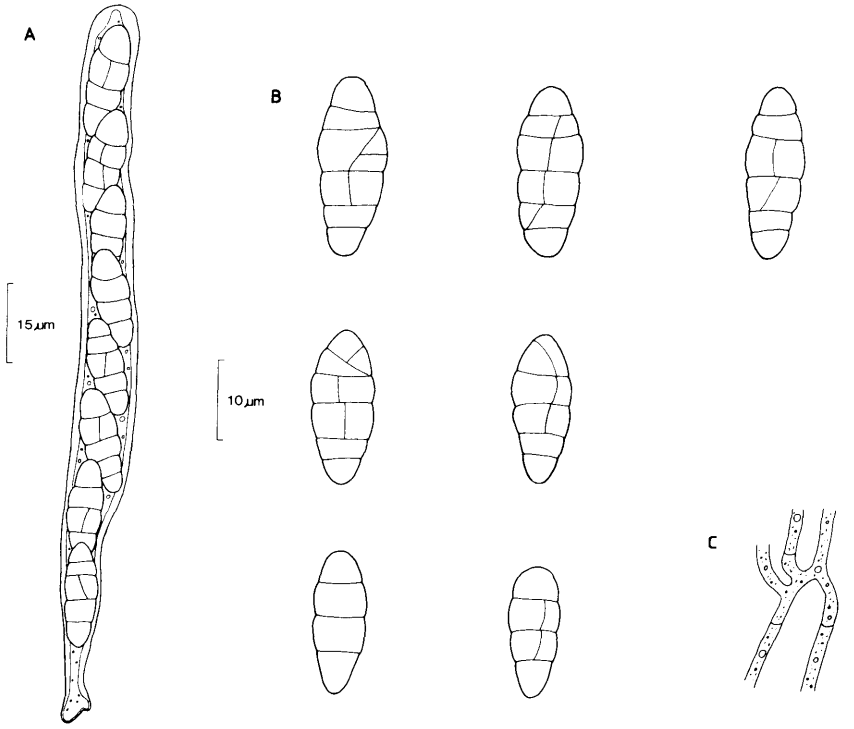
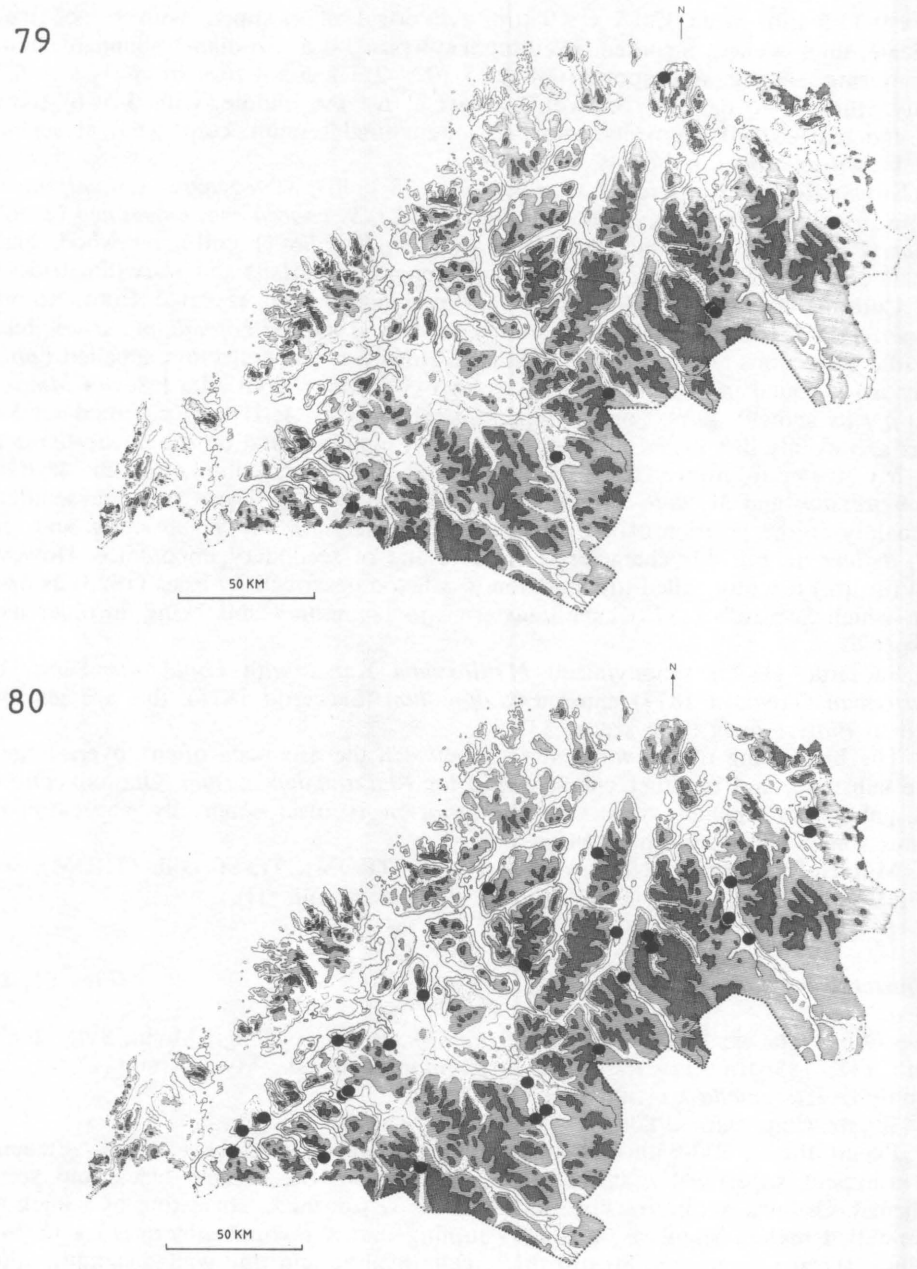


Fig. 78. *Platystomum curtum*. A. Ascus with eight ascospores. B. Ascospores. C. Part of pseudoparaphyses.



Figs 79-80. Distribution maps. Fig. 79. *Platystomum compressum*. Fig. 80. *P. curtum*. For symbols see Fig. 2.

140) x 9-11.5 µm, mean 120.5 x 9.9 µm, cylindrical, short-stiped, with ± foot-like base, bitunicate, thick-walled, 8-spored. **Pseudoparaphyses** 1-1.5 µm diam., abundant, branched, anastomosing, septate. **Ascospores** (14-)15.5-19.5(-21) x 5.5-8 µm, mean 17.9 x 6.7 µm, broadly ellipsoid to narrowly obovoid, widest above the middle, with 3-5(-6) transverse septa and (0-)1-2 (-4) segments with one longitudinal septum, constricted at septa, light ochre brown to brown, obliquely uniseriate.

Substrate. *Salix nigricans* ssp. *borealis* (58 coll.), *S. nigricans* ssp. *nigricans* (25 coll.), *S. lapponum* (2 coll.), *S. phylicifolia* (2 coll.), *S. caprea* ssp. *coaetanea* (1 coll.), *S. hastata* (1 coll.), *S. nigricans* ssp. *nigricans* x *phylicifolia* (1 coll.), on wood, bark and stromata of *Hypoxylon mammatum*. Previously reported on *Alnus* and *Salix* (Saccardo 1883).

Comments. *Platystomum curtum* has previously been reported from Norway by Sommerfelt (1826) as *Sphaeria curta* and by Rostrup (1904) as *Lophidium curtum*, but these particular collections are incorrectly identified. However, one collection, labelled *Lophidium deflectens*, is found in Narvik. In addition, two collections from Alta labelled *Melanomma pulvis-pyrius* actually turned out to represent this species. It is very common on *Salix* in Troms and evenly distributed all over the county, mainly found on the *S. nigricans* group.

My material from Troms matches well the description of both *Mytilostoma subcompressum* and *M. deflectens* given by Karsten (1879). These taxa are separated by him mainly on the position of the ascomata, "gregaria" in *M. subcompressum* and "sparsa" in *M. deflectens*, but this character is variable and of secondary importance. However, L. Holm (in litt.) recently called my attention to a taxon described by Fries (1823) as *Sphaeria curta*, which Saccardo (1878) later transferred to *Lophidium*, this being an older name of this species.

Saccardo (1883) synonymized *Mytilostoma* Karst. with *Lophidium* Sacc., but as *Platystomum* (Trevisan 1877) antedates *Lophidium* (Saccardo 1878), this species must be placed in *Platystomum* (also see p. 23).

The blackening of the wood surface between the ascomata often covers large areas of the substrate, and is rather characteristic for *Platystomum curtum*. One collection from Rana, labelled *P. compressum* var. *microsporum* is macroscopically very similar, but deviates somewhat in ascospore shape.

Material examined: Norway: No: 1 coll. (TROM). Tr: 90 coll. (TROM), see Fig. 80. Fi: 2 coll. (O). Sweden: 1 coll. (UPS). Finland: 6 coll. (H).

Rebentischia massalongii (Mont.) Sacc. (Figs 81, 84, 88)

Nouvo G. bot. ital. 8: 12, 1876. - Basionym: *Sphaeria massalongii* Mont., Syll. Gen. Spec. Crypt.: 237, 1856 (n.v.). - *Rebentischia pomiformis* Karst., Mycol. fenn. 2: 97, 1873. - Anamorph: *Asteromella* sp. fide Barr (1980).

Illustration: Barr 1980: Figs 1, 2.

Pseudothecia 200-350(-400) µm diam., globose to subglobose, often collabent with age, erumpent superficially at maturity, mostly scattered, surface black and somewhat roughened. Ostioles not prominent. **Peridium** 20-32 µm thick, consisting of a thick-walled, brown-celled textura angularis, gradually turning into ± textura epidermoidea towards the ostiolum. Basal tissue up to 80 µm thick, cells hyaline and thin-walled, textura angularis. **Asci** 100-130(-140) x (16-)17-21 µm, mean 124.2 x 19.0 µm, clavate (-cylindrical), short-stiped, bitunicate, thick-walled, particularly at apex, 8-spored. **Pseudoparaphyses** 1.5-2.5 µm diam., numerous, branched, anastomosing, septate. **Ascospores** (18-)21-26.5(-28) x 7.5-10 µm, mean 23.4 x 8.4 µm, narrowly obovoid and often slightly curved main body, 4 (-5)-septate, slightly constricted at septa, with olive-brown to light brown cells in the middle

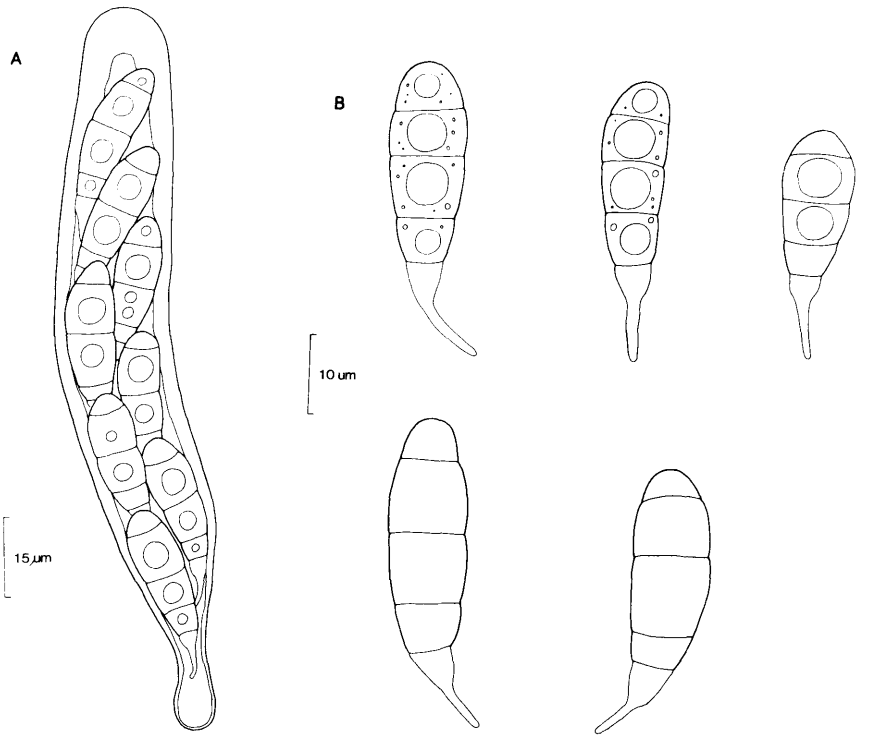


Fig. 81. *Rebentischia massalongii*. A. Ascus with eight ascospores. B. Ascospores.

parts, and hyaline to subhyaline end cells. Contents multiguttulate in young, hyaline ascospores, with one large guttula in each cell at maturity. Basal cell remaining hyaline, becoming elongate and setiform 7-13 µm long, cell 4-5 µm wide, tapering to a width of 1-1.5 µm.

Substrate. *Salix nigricans* ssp. *borealis* (11 coll.), *S. nigricans* ssp. *nigricans* (11 coll.), *S. glauca* ssp. *glauca* (4 coll.), *S. lanata* ssp. *lanata* (2 coll.), *S. glauca* ssp. *stipulifera* (1 coll.), *S. lapponum* (1 coll.), *S. nigricans* ssp. *nigricans* x *phylicifolia* (1 coll.), on bark. Previously reported on *Abies*, *Acer*, *Ilex*, *Robinia*, *Salix*, and *Ulmus* (Barr 1980).

Comments. *Rebentischia massalongii* has not been found in Norway before. In the field it is very difficult to find, but with 31 finds I regard it as common on *Salix* in Troms.

My material from Troms matches well Karsten's (1873) description of *Rebentischia pomiformis*, and Müller's (1950) description of *R. massalongii*. Von Arx & Müller (1975) synonymized *R. pomiformis* with *R. massalongii*, and this was later accepted by Barr (1980), but her (Barr 1980) description of *R. massalongii* deviates from my material in having larger ascospores. The ascomata in the examined collection labelled *R. pomiformis* (H) were often collabent as in my material, the ascospores were similar in shape and septation, but slightly smaller. The collection of *R. massalongii* (PAD) deviated somewhat from Karsten's collection of *R. pomiformis* (H) in having mostly subglobose ascomata and somewhat larger ascospores. The ascospore sizes in both collections fell within the size ranges found in my material from Troms; *R. pomiformis* (H) below, and *R. massalongii*

(PAD) above the mean ascospore size in my material. Examination of additional collections is needed to confirm whether one or two taxa occur. The material examined so far, seems to form a sequence from *R. pomiformis* (H), via my material, to *R. massalongii* (PAD).

Rebentischia unicaudata (Berk. & Br.) Sacc. is quite similar to *R. massalongii*, but differs in habitat and size ranges.

Material examined: Norway: Tr: 31 coll. (TROM), see Fig. 84. Finland: 1 coll (H). ? Italy: 1 coll. (PAD).

Rhynchostoma minutum Karst. (Figs 82, 89-90)

Mycol. fenn. 2: 58, 1873. - *Rhynchostoma rubrocinctum* Karst., Hedwigia 29: 178, 1890. - Anamorph: ?*Acremonium* sp.

Perithecia 150-300 µm diam., scattered, slightly immersed, globose and black. Ostioles 660-900 x 60-110 µm, cylindrical, often somewhat curved, periphysiate. Apex bulbous and red in colour. **Peridium** up to 65 µm thick, consisting of a 10-30 µm thick unstructured, hyaline outer layer, a 25-35 µm thick inner layer with thick-walled, brown cells, ± textura angularis, turning into textura porrecta in the ostiolum, and a 10-15 µm thick innermost layer with thin-walled, hyaline cells, textura prismatica. **Asci** 26-33 x (5-)6-8 µm, mean 30.1 x 6.9 µm, clavate, short-stiped, unitunicate, non-amyloid and 8-spored. Numerous, thin-walled and easily dissolving. **Paraphyses** 80-90 x 1-2 µm, filiform

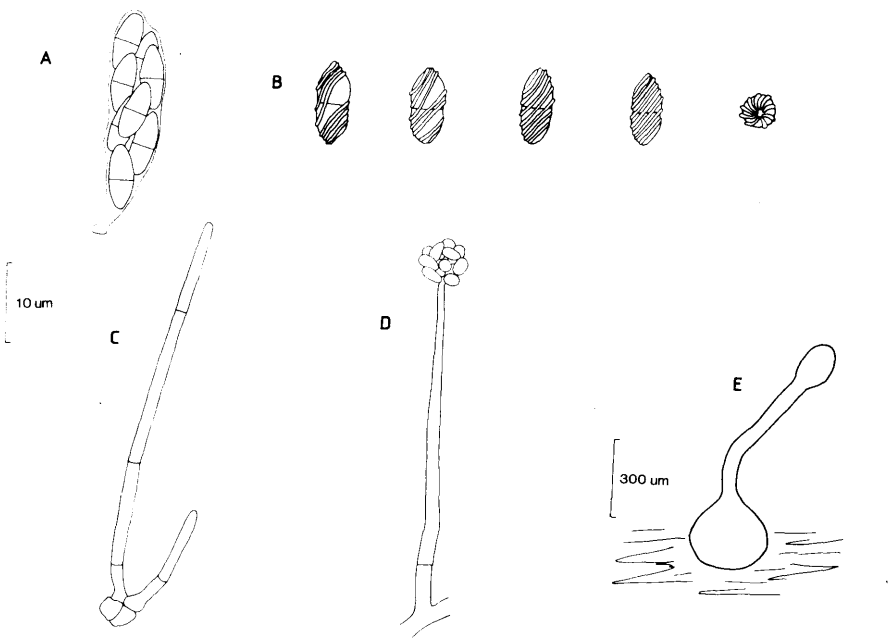


Fig. 82. *Rhynchostoma minutum*. A. Young ascus with eight immature ascospores. B. Ascospores. C. Paraphyses. D. Conidiophore with conidia in apex. E. Habit sketch of one ascoma.

and septate. Asci and paraphyses abundant, springing from almost the whole inside of the perithecium. **Periphyses** approx. 20 x 1-1.5 µm, numerous, hyaline, often with one septum. **Ascospores** 8-10.5 x (3-)3.5-4.5 µm, mean 9.0 x 4.0 µm, broadly ellipsoid, often with somewhat pointed ends, two-celled, light brown to brown and adorned with parallel, diagonally orientated ornaments. Biseriate or crowded. **Conidiophores** 25-50 µm in length, approx. 2.5 µm wide at base, gradually tapering towards apex, simple and hyaline. **Conidia** approx. 3.5 x 2 µm, oblong-e.lliptical to ± oval, one-celled and hyaline. Develop and aggregate in slime in the apex of the conidiophore to form a globose, white mass.

Substrate. *Salix nigricans* ssp. *borealis* (1 coll.), on wood. Previously reported on *Betula* and *Juniperus* (Müller & von Arx 1962). Also seen on *Populus* in the examined material.

Comments. *Rhynchostoma minutum* has not been found in Norway before. It is obviously very rare on *Salix* in Troms, so far only found in one locality in the north of the county.

The type collection of *Rhynchostoma minutum* (!) had ascospores measuring 7-10 x 3-4.5 µm, while Karsten (1873) stated 6-8 x 3-4 µm. However, the measurements of the asci fall well within the range given by Karsten. I have not seen the type collection of *Rhynchostoma rubrocinctum*, but the examined collections of this species (from other herbaria) had ascospores measuring 7-10 x 3-4.5 µm, while Karsten (1890) stated 8-10 x 3-5 µm.

Because I have not found differences in other characters, I consider *Rhynchostoma rubrocinctum* to be synonymous with *R. minutum*, as suggested by Müller & von Arx (1962). However, these authors did not describe the characteristic spore ornamentation (easily seen with 400x magnification).

Hyaline conidiophores develop and grow on the surface of the host near the ascomata, or even on the ascomata themselves. This seems to be a species of *Acremonium* Link, and it may be the anamorph of *Rhynchostoma minutum*. Cultural studies could probably settle this matter.

Typical of *Rhynchostoma minutum* are the long, often curved ostiolum with the red, bulbous apex, and the rather small, two-celled, characteristically ornamented ascospores. *Rhynchostoma minutum* has a counterpart in North America, described as *Sphaeria rubefaciens* Peck (M. Barr, in litt.). The ascospores in the American species are ornamented as in *Rhynchostoma minutum*, but are smaller, 5-6.5 x 2.5-3 µm, and have no median septum.

Material examined: Norway: Tr: Kvænangen: Burfjorddal EC 41,57 19 Jul 1981 *Salix nigricans* ssp. *nigricans* GM 836 (TROM). Sweden: 2 coll. (UPS). Finland: 1 coll. (H), 1 coll. (UPS).

Saccardoella transsylvanica (Rehm) Berl. (Figs 83, 85, 91)

Icon. fung. 1: 102, 1894. - Basionym: *Zignoella transsylvanica* Rehm, Ascom. Loik. 46: 47, 1883 (n.v.).

Illustration: Berlese 1894: Tab. XCVIII, Fig. 2.

Stromata clypeoid, but poorly developed. **Pseudothecia** 540-900 µm diam., globose, usually scattered and completely immersed, only with the ± conical, black ostioles visible. Ostioles periphysate, porus circular. **Peridium** (15-)20-35 µm thick, thicker around the ostiolum. Consisting of large, rather thin-walled, often slightly elongated, brown cells (± textura angularis), which gradually become more thick-walled towards the ostiolum and turn into ± textura epidermoidea in the clypeus. **Asci** 260-310 x 10.5-14 µm, mean 301.4 x

11.9 µm, cylindrical, short-stiped, bitunicate, rather thick-walled, 8-spored. **Pseudoparaphyses** 1-2 µm diam., numerous, long, somewhat branched above the asci, septate. **Ascospores** (35-)40-55(-58) x 8-10.5 µm, mean 48.7 x 9.1 µm, ellipsoid to broadly fusiform, slightly curved, 11-18 septate, constricted at the middle septum, not at the other septa, hyaline and obliquely uniseriate.

Substrate. *Salix glauca* ssp. *stipulifera* (3 coll.), *S. lanata* ssp. *lanata* (2 coll.), *S. nigricans* ssp. *borealis* (2 coll.), *S. arbuscula* (1 coll.), *S. glauca* ssp. *glauca* (1 coll.), *S. hastata* (1 coll.), on wood, occasionally on bark. Previously reported on *Lonicera* and *Syringa* (Saccardo 1883, Bose & Müller 1967).

Comments. *Saccardoella transsylvanica* has not been found in Norway before. In the field it is difficult to find, and is probably more common on *Salix* in Troms than the 10 collected samples suggest.

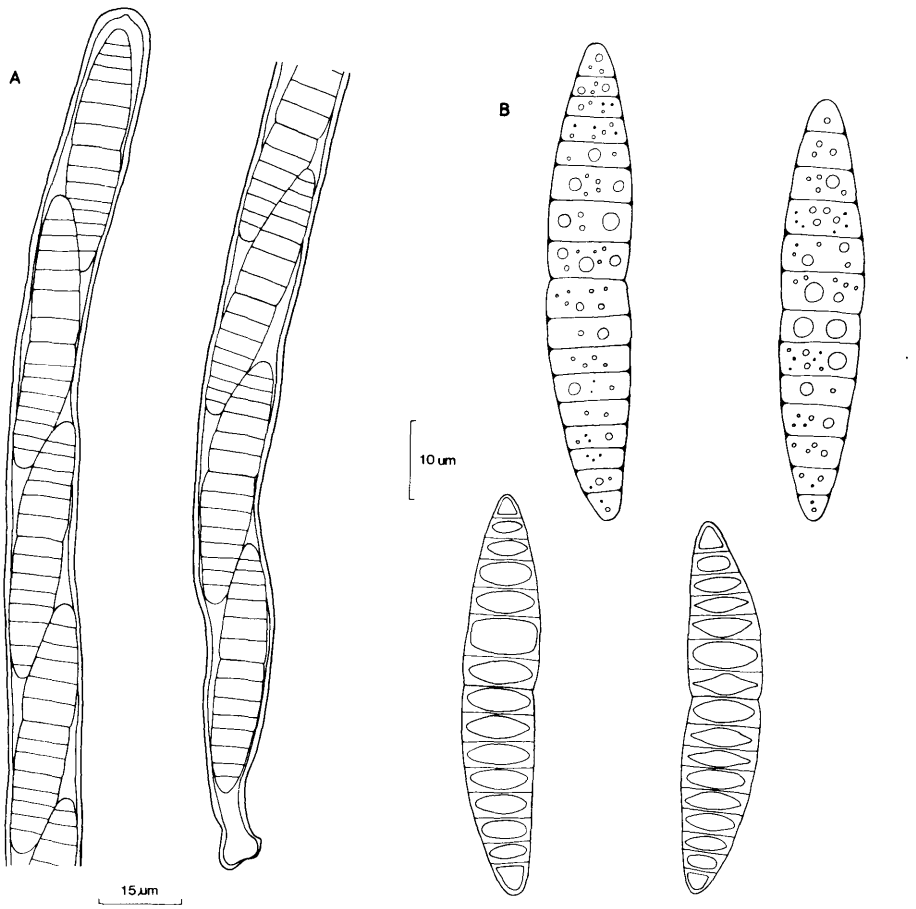
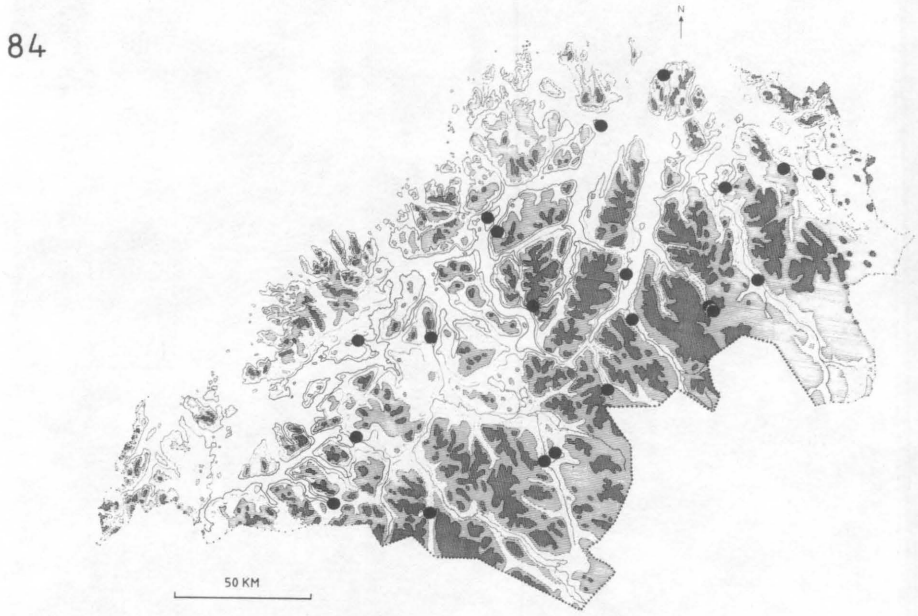
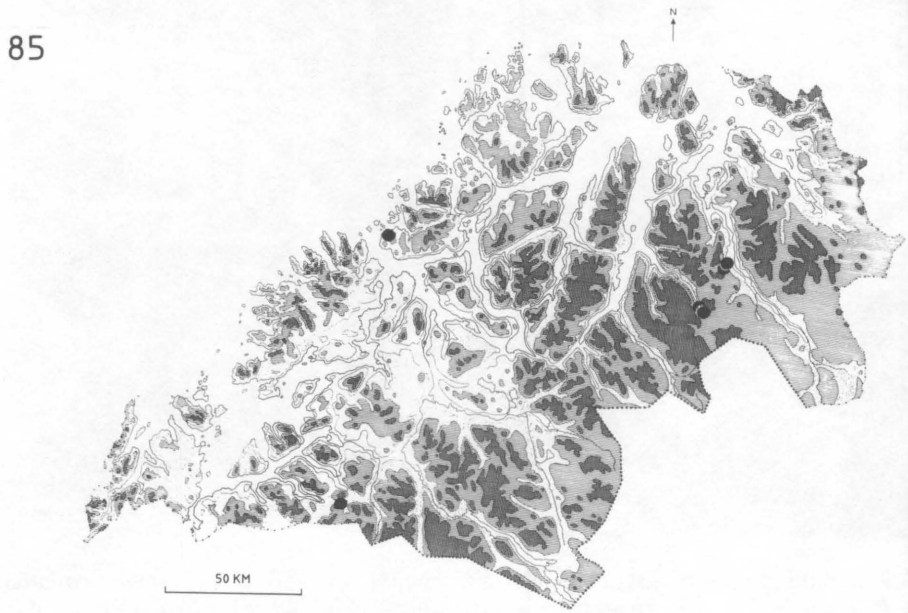
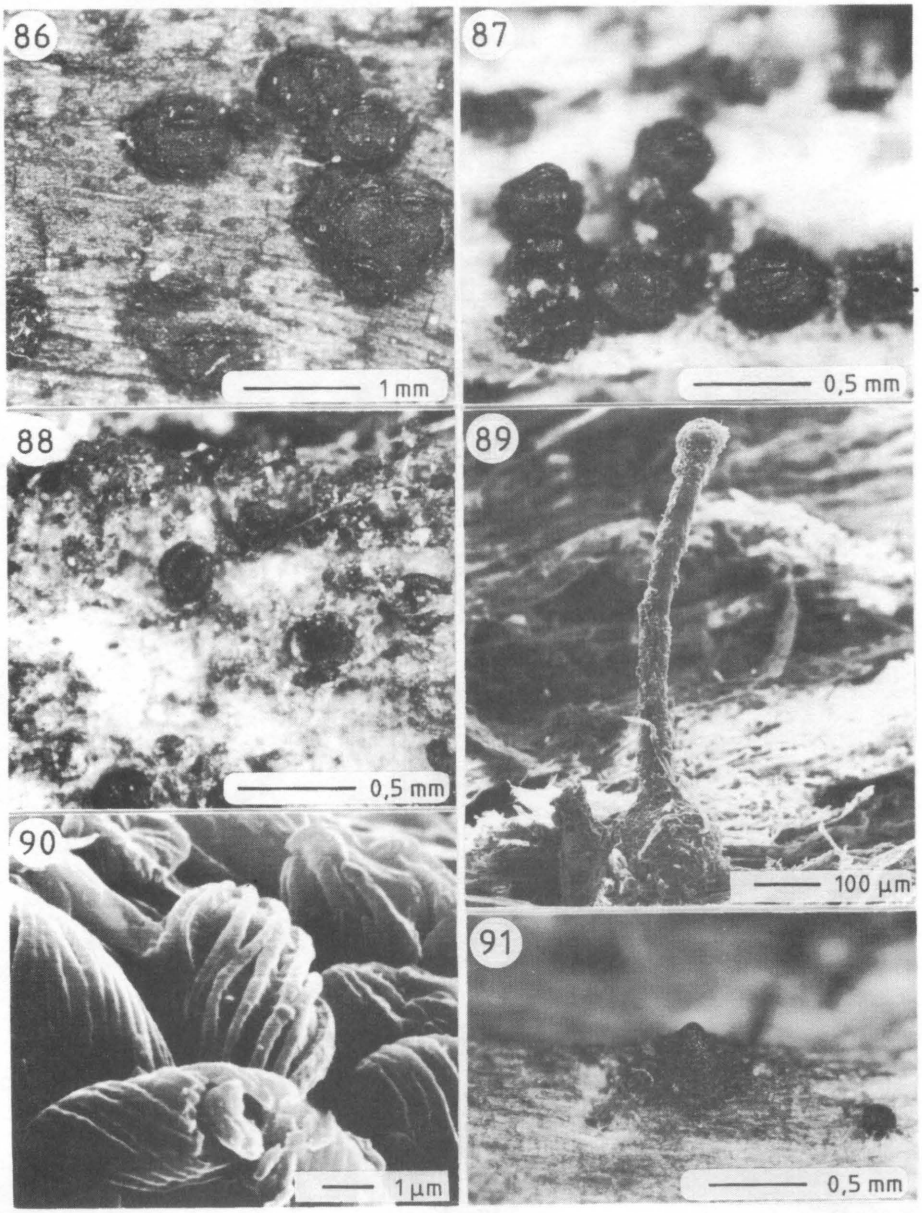


Fig. 83. *Saccardoella transsylvanica*. A. Ascus with eight ascospores. B. Ascospores. The two lowest ascospores are stained with cotton blue in lactophenol.





Figs 84-85. Distribution maps. Fig. 84. *Rebentischia massalongii*. Fig. 85. *Saccardoella transsylvanica*. For symbols see Fig. 2.



Figs 86-91. Photographs of ascomata and ascospores. Fig. 86. *Platystomum compressum*. Fig. 87. *P. curtum*. Fig. 88. *Rebentischia massalongii*. Figs 89-90. *Rhynchostoma minutum* (SEM). (91) *Saccardoella transsylvanica*.

My material from Troms matches well the description and illustrations given by Berlese (1894). The only difference is that he reports more septa in the ascospores (13-22) than found in my material (11-18 septa). The examined collections from other herbaria were similar macroscopically, but microscopically they could be divided into two groups on spore characters; one group with ascospores identical to my material, another with ascospores similar to Berlese's (1894) illustrations. Bose & Müller (1967) reported *Saccardoella transsylvanica* from Himalaya, but their description differs from the above-mentioned groups in several characters. The asci are cylindrical-clavate, shorter and broader, the ascospores are crowded in the ascus and have fewer (8-13) septa.

Petrak (1962) mentioned *Saccardoella*, but as far as I know, the genus has not been thoroughly treated in literature. Therefore, little is known about the natural variation within the different species described. *Saccardoella transsylvanica* seems to be variable, particularly with regard to the septation of the ascospores.

The systematic position of the species is in need of clarification. It has previously been regarded as a unitunicate pyrenomycete. Hawksworth et al. (1983) include it in Sphaeriales, M. Barr (in litt.) in Amphisphaeriaceae and O. Eriksson (1984) among the Unitunicate Ascomycetes, *inc. sed.* However, these do not agree with my observations; the asci are morphologically bitunicate, but I do not know whether they function like real bitunicate asci ("Jack in the Box").

When the ascomata of *Saccardoella transsylvanica* are completely immersed, only with the ± conical, black ostioles visible, it is macroscopically confusingly similar to *Amphisphaerella xylostei* and *Anthostomella melanotes*, but easily distinguished microscopically.

Material examined: Norway: Tr: 10 coll. (TROM), see Fig. 85. Switzerland: 1 coll. (S). Austria: 1 coll. (S). Romania: 1 coll. (S).

COMMENTS ON OTHER GENERA REPRESENTED ON *SALIX* IN TROMS

Eutypa Tul. & C. Tul.

Sel. Fung. carp. 2: 52, 1863.

The genus *Eutypa* is very difficult taxonomically, and there are too few teleomorphic characters available to separate the different species. One exception is *E. flavovirens* (Pers. : Fr.) Tul., which is easily distinguished by its greenish entostroma. Much of the information published on the genus seems to be incorrect.

Progress in the taxonomy of this genus will, according to D. Glawe (in litt.), depend on cultural studies, as well as pathogenity studies on the hosts. Both D. Glawe and F. Rappaz are working with *Eutypa*, and their investigations will probably result in a reduction of the number of species. Saccardo (1882) mentions 54 species in Eutypa.

Rosellinia Ces. & de Not.

G. bot. ital. 1: 334, 1844.

A comprehensive systematic treatment of *Rosellinia* is lacking, but L. Petrini and S. Francis are now working on a monograph of the genus. The most common, but also the most widely abused names in the genus are *R. aquila* (Fr.) de Not. and *R. mammiformis*

(Pers. : Fr.) Ces. & de Not. The concept of *R. mammiformis* is not clear at all. According to L. Petrini (in. litt.), three different taxa are so named, depending whether one applies the British, European or Scandinavian concepts.

Two different taxa were found by me on *Salix* in Troms, but I have not found any descriptions matching these taxa. They are also found in the Alps (L. Petrini, in litt.), and are quite different from the collections labelled *R. aquila* and *R. mammiformis* preserved in the Copenhagen (C) herbarium. Schröter (1886) mentions *R. mammiformis* from Tromsø, but most probably this is the collection he later refers to as *R. aquila* (Schröter 1888). I have not seen Schröter's collection, but it probably represents one of the taxa found by me.

I have decided not to treat these taxa in this paper as the whole genus is at present under thorough review.

Teichospora Fuckel

Symb. mycol.: 160, 1870.

The genus *Teichospora* is very common and represented by many species on *Salix* in Troms. A comprehensive systematic treatment is lacking, and the genus could justifiably be described as "terra incognita" for most mycologists. Few bitunicate genera are in greater need of a thorough review.

According to O. Eriksson (in litt.), there are about 30 different species in Sweden. Many of the *Teichospora* collections preserved in the different Scandinavian herbaria seem to be incorrectly determined.

The genus *Teichospora* is a great challenge, and a review of the whole genus ought to be given high priority in the near future.

Valsa Fr.

Summ. veg. scand.: 410, 1849.

The genus *Valsa* has been commented upon by several mycologists, e.g. Défago (1935), Kern (1955) and Hubbes (1960), but important nomenclatural and taxonomical problems still remain to be solved. Hubbes (1960) synonymized *Valsa germanica* Nits., *V. salicina* (Pers. : Fr.) Fr. and *V. sordida* Nits. with *V. ambiens* (Pers. : Fr.) Fr., while Kobayashi (1970) regarded them all as separate species. L. Spielman (in litt.) suspects that at least some of these taxa may be distinct at the species level, although the differences may be masked by overlapping ascospore sizes.

My present knowledge of the genus is not sufficient to treat the species found on *Salix*. A profound study of Spielman's (1985) *Valsa* monograph is needed.

Many of the examined *Valsa* collections preserved in the Norwegian herbaria are incorrectly determined, some of them to wrong genera.

SYSTEMATIC SURVEY OF THE INVESTIGATED TAXA

The systematic classification follows Eriksson & Hawksworth (1986), except for *Saccardoella* Speg. The genera and the species are listed in alphabetical order within each family.

AMPHISPHAERIALES D. Hawksw. & O. Eriksson, Systema ascom. 5: 177, 1986.
AMPHISPHAERIACEAE Winter, Rabenh. Krypt.-Fl. 1: 2: 191, 1885.
Amphispaerella (Sacc.) Kirschst. emend. Munk, Dansk bot. Ark. 15: 2: 88, 1953.
Amphisphaerella xylostei (Pers. : Fr.) Munk, Dansk bot. Ark. 15: 2: 89, 1953.

BITUNICATE ASCOMYCETES *inc. sed.*
Saccardoella Speg., Michelia 1: 461, 1878.
Saccardoella transsylvanica (Rehm) Berl., Icon. fung. 1: 102, 1894.

CALOSPHAERIALES Barr, Mycologia 75: 11, 1983.
CALOSPHAERIACEAE 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., Annls mycol. 19: 118, 1921.
Cryptodiaporthe salicella (Fr.) Petr., Annls mycol. 19: 180, 1921.

DIATRYPALES Chadef. 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. PflFam. 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.
Berlesiella Sacc., Rev. mycol. 10: 7, 1888.
Berlesiella nigerrima Bloxam ex. Curr., Trans. Linn. Soc. Lond. 22: 272, 1852.

Herpotrichiella Petrak, Annls mycol. 12: 472, 1914.
Herpotrichiella collapsa G. Mathiassen sp. nov.

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.

LOPHIACEAE Zogg ex v. Arx & Müller, CBS mykol. Stud., Baarn 9: 60, 1975.
Glyphium Nits. ex Lehm., Nova Acta Acad. Caes. Leop.-Carol. germ. nat. curios. 50: 139, 1886.

Glyphium schizosporum (Maire) Zogg, Beitr. KryptogFlora Schweiz 11: 3: 101, 1962.

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

Lophiostoma (Fr.) Ces. & de Not. emend. Holm in litt.

"Species with hyalo- and phaeophragme ascospores, usually provided with terminal appendages. Asci clavate."

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. Holm in litt.

"Species with hyalo- and phaeophragme ascospores, usually lacking terminal appendages. Asci cylindrical."

Lophiotrema boreale G. Mathiassen sp. nov.

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

Platystomum Trev., Bull. Soc. r. Bot. Belg. 16: 16, 1877.

Platystomum compressum (Pers. : Fr.) Trev., Bull. Soc. r. Bot. Belg. 16: 16, 1877.

Platystomum curtum (Fr.) G. Mathiassen comb. nov.

MASSARINACEAE Munk, Friesia 5: 305, 1956.

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

Keissleriella cladophila (Niessl) Corbaz, Phytopath. Z. 28: 410, 1957.

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.

PHAEOSPHAERIACEAE Barr, Mycologia 71: 948, 1979.

Leptosphaeria Ces. & de Not., Comm. Soc. critt. ital. 1: 234, 1863.

Leptosphaeria hendersoniae (Fuckel) L. Holm, Symb. bot. upsal. 14: 3: 26, 1957.

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., Nuovo G. bot. ital. 8: 12, 1876.

SORDARIALES Chadef. 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.
Chaetosphaeria Tul. & C. Tul., Sel. fung. carp. 2: 252, 1863.
Chaetosphaeria pomiformis (Pers. : Fr.) Müller, Beitr. KryptogFlora Schweiz 11(2): 588, 1962.

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.
XYLARIACEAE Tul. & C. Tul., Sel. fung. carp. 2: 3, 1863.
Anthostomella Sacc., Nuovo G. bot. ital. 8: 12, 1878.
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 (preprint 1866).
Hypoxylon mammatum (Wahl.) Karst., Not. Sällsk. F. Fl. fenn. Förh. 8: 212, 1882 (preprint 1866).

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