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DISTRIBUTION AND ECOLOGY OF SOME SOUTH SCANDINAVIAN LICHENS

BY

OVE ALMBORN

DISTRIBUTÖR:
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Preface.

The present treatise has grown out of the studies on South Swedish lichen flora and lichen vegetation which I began during my first years at the University of Lund. In the course of my excursions in Skåne in the years 1934 and 1935 I met with several lichens, e.g. *Parmelia elegantula* and *laciniatula*, which I had not seen in the neighbourhood of Ronneby in Blekinge, whose lichen flora I had begun to get acquainted with as a school-boy. Some of these lichens proved to be not uncommon in the southern and western parts of Skåne, though literature and public herbaria contained few or no records of their occurrence in Sweden.

Two summers' stay in Lappland (1936—1937) turned my interest to alpine vegetation for some time, but since 1938 I have again devoted every summer to the study of South Swedish lichens. On numerous excursions in most districts of Götaland and the vicinity of Stockholm I have gathered a large material of lichens which is preserved in the Botanical Museum of Lund.

During a journey in Germany in the summer of 1938 I had an opportunity of studying North German lichen flora. The excursions of the following years showed that several German species (e.g. *Enterographa crassa*, *Pertusaria leptospora*, *slesvicensis*, and *velata*) occur also in the South of Sweden. By degrees I found that a number of lichens previously known from isolated South Swedish stations have rather wide areas in Götaland and show good parallels to the distribution of certain phanerogams and bryophytes. At first my investigation comprised lichens of an extremely South Scandinavian range, occurring S. and W. of the southern limit of wild spruce in Scandinavia, but later on I extended it so as to include a number of species with about the same Scandinavian northern limit as the beech. In order to supplement my field studies I have critically examined the statements of these species in the literature, and in public and private herbaria. Together with the exploration of the distribution of these species I have analysed the mainly epiphytic plant communities where these lichens occur and tried to establish the factors — substratum, climate, etc. — determining their habitats and distributional areas.

At the beginning of my investigation there were rather few Danish records of the species in question. After the publication of »Lichenes Daniae» by Branth and Rostrup in 1869 and »Bornholms lafflora» by Hellbom in 1890, only few papers have been published about the distribution of Danish lichens. During journeys in 1939, 1946, and 1947 (in toto 10 weeks) I have made considerable collections of Danish lichens, and besides, I have had the advantage of using the unpublished material of Danish lichenologists. A journey from

Oslo to Stavanger in June 1947 gave me the opportunity of studying some of my species at their sparse occurrences in Southern and South-Western Norway.

When finishing my work I feel the pleasant obligation of acknowledging my great debt of gratitude to Professor HERIBERT NILSSON, the head of the Institute of Systematic Botany of Lund, for the interest he has shown in my research and for the access he has given me to the facilities of the Institute. He has always been ready to discuss problems in connection with my studies and has furthered my work in all ways.

I also want to express my gratitude to Professor H. BURSTRÖM for advice and aid in several respects.

My work has been completed owing to the encouragement and assistance received from my lichenological colleagues at many quarters.

My most sincere thanks are due to Dr A. H. MAGNUSSON, Gothenburg, whose hospitality and never failing readiness to place his herbarium and library at my disposal have been of inestimable value to me.

On several occasions I have had the opportunity of working in the Institute of Plant Ecology (Växtbiologiska Institutionen) of Uppsala, to whose head Professor G. E. DU RIETZ I am much obliged for valuable suggestions and kind criticism. The same thanks I also owe Docent G. DEGELIUS, by whose rich experience in lichens I have profited in many respects. To other members of the Uppsala lichenological school, Lic. Phil. T. E. HASSELROT, Lic. Phil. S. AHLNER, Lic. Phil. R. SANTESSON, and Lic. Phil. B. PETTERSSON, I express my gratitude for several contributions to the knowledge of the distribution of my species.

I know my obligation to my Danish colleagues Dr O. GALLØE, Dr P. GELTING, and Cand. Mag. M. SKYTTE CHRISTIANSEN, as well as to Dr V. RÄSÄNEN, Kuopio, Finland, for kindly placing lichenological material at my disposal.

For valuable information of the extra-Scandinavian distribution of my lichens I am especially indebted to Dr C. TAVARES, Lisbon, and Dr R. A. MAAS GEESTERANUS, Leiden.

I hold in grateful memory my late friend Mag. Phil. B. HEDVALL, Växjö, († 1941) who introduced me in the field of lichenology, and the prominent expert on German lichens C. F. E. ERICHSEN, Hamburg († 1945), who facilitated my lichen studies in several ways.

I have been fortunate in obtaining kind advice and help on various matters dealt with in my treatise from Professor F. ENQUIST, Gothenburg (climatology), Professor E. HULTÉN, Stockholm (phanerogamous areas), Docent K. E. BERGSTEN, Lund (climatology), Dr H. PERSSON, Stockholm (bryophyte areas), and Lic. Phil. E. MOHRÉN, Lund (subfossil plants).

To my colleagues in the Botanical Museum of Lund I am much obliged for good collaboration and valuable discussions. Especially I wish to mention Docent H. WEIMARCK, First Museum Intendent, from whom I received several suggestions in connection with the publication of this paper, Docent S. WALDHEIM, Mag. Phil. OLOF ANDERSSON, and Lic. Phil. A. HÄSSLER. The latter has also been of great assistance to me in reading the proofs.

The heads and staffs of the Botanical Institutes of Stockholm (Riksmuseum), Uppsala, Gothenburg, Oslo, Bergen, Trondheim, Copenhagen, Helsingfors, and Åbo, as well as the heads of the Biological Institutes of the Secondary Schools of Karlskrona and Norrköping, have kindly facilitated my work of perusing the lichen collections there available.

Docent S. WALDHEIM and Mrs ELSA NYHOLM have determined several specimens of bryophytes from my sociological analyses.

Mr F. JÖNSSON, Amanuens H. RUNEMARK, and Mrs MARTA ALKSNIS have assisted me in preparing the maps. The latter also compiled some of the lists of stations and typed part of the manuscript.

Mag. Phil. O. FORSHEDEN has aided me with the translation. The final revising of the English text has been made by Mr F. J. TAYLOR, p. t. Uppsala.

To all these persons I tender my sincere thanks.

I also wish to express my respectful thanks to the trustees of the following societies and institutions for liberal financial support: the Royal Academy of Science, Stockholm, the University of Lund, the Royal Physiographical Society, Lund, the Botanical Society of Lund, and the State Council of Natural Science Research (Statens Naturvetenskapliga Forskningsråd), Stockholm.

I am much indebted to my colleagues at the Training School for Teachers (Folkskoleseminariet), Lund, especially Dr F. BORG, Head-master, and Lektor HILDUR LJUNGDAHL, who in many ways facilitated my work during the present school year.

Finally, my profound gratitude goes to my parents. Their sacrifices rendered possible my school studies and first years at the University, their untiring solicitude was always a support and an encouragement to me.

Abbreviations.

Collectors.

Chr.	M. Skytte Christiansen	Häv.	J. J. Havås	Me	G. O. Arn Malme
Deg.	G. Degelius	Hedv.	J. B. Hedvall	Sant.	R. Santesson
DR.	G. E. Du Rietz	Hellb.	P. J. Hellbom	Sthm	C. Stenholm
Er.	C. F. E. Erichsen	Hult.	J. Huliing	Sthr	Chr. Stenhammar
Gelt.	P. Gelting	Magn.	A. H. Magnusson	!	the present writer

Herbaria.

A	herb.	O. Almborn	L	herb.	Lund
Ar	»	S. Ahlner	M	»	A. H. Magnusson
B	»	Bergen	N	»	Läroverket, Norrköping
Ds	»	G. Degelius	O	»	Oslo
Dz	»	G. E. Du Rietz	Pn	»	B. Pettersson
G	»	Göteborg	S	»	Stockholm (Riksmuseet)
H	»	Helsingfors	T	»	Trondheim
Ht	»	T. E. Hasselrot	U	»	Uppsala
K	»	København	Vä	»	Växtbiologiska Institutionen (Inst. of Plant Ecology), Uppsala
Ka	»	Läroverket (Secondary School), Karlskrona	Å	»	Åbo

Considering the exsiccata quoted, cf. LYNGE 1915—1939.

Province Names.

(mainly in the sociological tables and in Chapter V)

Aust-Agd.	Aust-Agder	Hl.	Halland	Srm.	Södermanland
Bl.	Blekinge	Hord.	Hordaland	Upl.	Uppland
Boh.	Bohuslän	Jl.	Jylland (Jutland)	Vest-Agd.	Vest-Agder
Brnh.	Bornholm	Loll.	Lolland	Vestf.	Vestfold
Dsl.	Dalsland	Rog.	Rogaland	Vg.	Västergötland
Falst.	Falster	Sj.	Sjælland (Sealand)	Ög.	Östergötland
Gtl.	Gotland (Gothland)	Sk.	Skåne (Scania)	Öl.	Öland
		Sm.	Småland	Østf.	Østfold

Scandinavian place and province names have been spelt as is customary in the respective countries, thus Göteborg (Gothenburg), København (Copenhagen), Fyn (Funen), etc.

Chemical Reagents.

C calcium hypochlorite ($CaCl_2O_2$)
J iodine solution ($J-KJ+H_2O$)
K potassium hydroxide (KOH)

Nomenclature.

With few exceptions the plant names used are in accordance with HYLANDER 1941 (phanerogams), ARNELL 1928 and JENSEN 1939 (bryophytes), and MAGNUSSON 1937 b (lichens).

I. A Survey of the Phytogeographical Elements of the Scandinavian Lichen Flora.

Scandinavian [1] lichenology has mainly been of a descriptively taxonomic character. The lichenological works of the 18th and 19th centuries chiefly contain descriptions of species, and as a rule they give little and vague information about frequency and distribution. In accordance with the custom of the time, ACHARIUS, the founder of modern lichenology, states in his classical works (1798, 1803, 1810, 1814) the distribution of the species rather lapidarically (»habitat in saxis», »in alpibus nostris lapponicis», »in cortice Fagi»).

A phytogeographical view of the Scandinavian flora is met with in the works of WAHLENBERG, whose extensive journeys in Sweden and Norway gave him a thorough experience of different groups of plants in their habitats. In his »Flora Lapponica» (1812) we find comparatively detailed statements of the biology and geography of the species (even with regard to cryptogams). In the introductory chapter he points out that several lichens common in the South of Sweden are not found in Lappland, several of which, however, are met with again along the coasts of the Arctic Ocean (»ex. gr. *Lichen murorum, conspersus, parietinus, ciliaris*»)[2] In »Flora Svecica» (1824—1826, 2nd ed. 1831—1833) we find again the same sense of essential features in the range of the species. The stations of rare species are often mentioned, the distribution of frequent ones are outlined with appropriate words [e.g. of *Lichen fraxineus* (=*Ramalina fr.*): ». . . Sveciae temperatioris copiose, ultra Upsaliam parum procedens»]. WAHLENBERG's dividing of Sweden into phytogeographical regions in the introductory chapter »Conspectus

[1] Like HOLMBERG (1922—1926), DEGELIUS (1935), and several other botanical authors, I mean by Scandinavia the four North European countries Denmark, Finland, Norway and Sweden (= »the North»).

[2] I.e. *Parmelia conspersa, Xanthoria parietina*, and *Anaptychia ciliaris*. »*L. murorum*» is probably identical with *Caloplaca marina* and related species of sect. *Gasparrinia*.

regni et vegetationis» is still of fundamental importance to Swedish plant geography.

»Lichenographia Europaea reformata» (1831) by ELIAS FRIES contains rather short notes on the distribution of the species, and with regard to Scandinavia they hardly give any new facts. In the chapter »Regiones lichenum» however, an attempt is made at a phytogeographical division of the European lichen flora, where a number of Scandinavian lichens are mentioned. Otherwise E. FRIES was an exclusive taxonomist and showed little of WAHLENBERG's phytogeographical interest.

With »Lichenes arctoi» (1860) by TH. FRIES and »Lichenes Scandinaviae» (1861) by W. NYLANDER, the modern epoch in Scandinavian lichenology begins. In these works they used the microscopic sporal morphology founded chiefly by NORMAN, MASSALONGO, and ANZI in the fifties for the delimitation of genera and species. NYLANDER's work is the last to treat all groups of lichens indigenous in Scandinavia. His phytogeographical statements, however, are very sparse, founded at least with respect to Sweden and Norway, on a scanty material.

»Lichenographia Scandinavica» (1871—1874) by TH. FRIES, which, though uncompleted, is still fundamental for our knowledge of Scandinavian lichens, gives rather detailed information of the distribution of foliose and fruticose lichens. The knowledge of crustaceous lichens was still rather defective and his statements often admit of no secure conclusion as to the phytogeographical position of a species, though in many cases he lists all the known stations of a species. TH. FRIES gave, as a professor at Upsala, the impulse to extensive lichenological researches. His numerous disciples (S. ALMQUIST, BERG, BLOMBERG, FALK, FORSSELL, HEDLUND, HELLBOM, HULTING, MALME, SERNANDER, THEORIN) collected a considerable material in herbaria, which partly was worked through by themselves, and partly has been used by lichenologists of the last decennia.

This lively interest in lichens has continued during the present century and has resulted in taxonomic investigations of critical groups of species and phytogeographic investigations of districts before imperfectly explored. The coordination of this material to a modern flora of Scandinavian lichens will be an urgent task for the present generation of lichenologists. Unfortunately VAINIO's »Lichenographia Fennica» (1921—1934), projected to be a complete monograph of Finnish lichens, was never finished, but the volumes published are of the greatest value to Scandinavian lichenology. As VAINIO could build on large Finnish collections his statements often give a good representation of the distri-

bution of the species, though the parts that have appeared chiefly treat of crustaceous lichens. The floras of Scandinavian foliose and fruticose lichens published during the present century (LYNGE 1910, MAGNUSSON 1929) contain notes on localities of only very rare species, whereas the distribution of the majority of species is only given in rough outlines (»common in the South of Scandinavia», »disappearing towards the North»).

As to the Swedish phanerogamic flora, the phytogeographical research of the 20th century has linked up with the tradition from WAHLENBERG. A number of treatises [above all ANDERSSON & BIRGER (1912), TH. C. E. FRIES (1913), STERNER (1922), HÅRD AV SEGERSTAD (1924), ERIK ALMQUIST (1929), and SAMUELSSON (1934)] have treated the flora with regard to different types of distribution and discussed their connection with climate, soil, and immigration. Time is, however, not yet ripe for a treatment of all our lichen flora on similar lines. The distribution of foliose and fruticose lichens is fairly well known, but with respect to crustaceous lichens, which amount to c. $^6/_7$ of Scandinavian lichens, much is still to be done. At present c. 2000 species of lichens are known from the four Scandinavian countries, but every year there are on the average some ten species described as new to the Scandinavian lichen flora. Arranging all — or even the majority — of Scandinavian lichens into phytogeographical groups is hardly yet to be done. Quite as in the case of phanerogams, we are restricted to working with species which are rather common in larger or smaller districts, or whose Scandinavian areas link up with known distributional areas outside Scandinavia. For the present a considerable number of species with distribution still uninvestigated must be left out of account.

The modern phytogeographical and phytosociological treatment of the Scandinavian lichen flora grew out from the investigations carried out in the institute of plant ecology at Uppsala under the ægis of SERNANDER (1908—1931). Especially in the lichenological works of DU RIETZ much stress was laid upon geographical and ecological aspects. LYNGE (1921 a, b) arranged a number of Norwegian lichens (mostly foliose and fruticose ones) under different distributional types and published maps showing the areas of some species. In his survey of Scandinavian vegetation DU RIETZ (1925) also recorded lichens as examples under the different regions. A regional grouping of Swedish lichens — in analogy with a similar classification of Scandinavian bryophytes by ARNELL & JENSEN (1910 p. 238) — has been made by DEGELIUS who, in his studies on the lichen floras of Ångermanland (1931 p. 14), Åsele

Lappmark (1932 p. 18), and Skaftö in Bohuslän (1939 p. 92), arranged a large number of species in six groups, viz. ubiquitous, alpine, northern, eastern, western, and southern species. This grouping founded on climatical and historical factors can be applied to the Scandinavian lichen flora in general, with the above reservation with regard to several rare species. In some cases species with special edaphic demands (e.g. calcareous and marine [1] species) can also be arranged according to this ground of division but, in my opinion, they should form their own groups not directly comparable to those previously mentioned.

The ubiquitous species (e.g. *Cladonia rangiferina*, *Parmelia physodes*) have a rather uniform distribution over the whole area. To this group belong c. 200 species of lichens.

The alpine group comprises at least a hundred species, preferably restricted to alpine regions (e.g. *Parmelia alpicola*, *Buellia pulchella*). Several of the typical alpine lichens, however, occur also in the subalpine region and in the conifer region, and some are even found in Central and Southern Sweden (MALME 1918 p. 288). Such isolated outposts are the Bohuslän Skärgård (e.g. *Buellia atrata*), the shores of Lake Vetter (e.g. *Caloplaca elegans*), and besides, several alpine species also occur on Öland and Gotland (e.g. *Thamnolia vermicularis*). In the phanerogamic flora similar areas are known.

The northern species, probably counting at least 200 sure representatives among the lichens, have their main distribution in the North Scandinavian conifer region, without being predominantly restricted to alpine regions. The group comprises various types of distribution with separate southern limits owing to climate and immigration. Several species have the same southern limit as the North Scandinavian conifer region (e.g. *Cetraria Delisei*, *Pertusaria protuberans*). Others are more or less common down to Halland, N. Skåne, and N. Blekinge (e.g. *Parmelia centrifuga*, *Umbilicaria hyperborea*). With few exceptions these species are lacking in Denmark. The limit between this group and the preceding is not always distinct. The distribution of a number of alpine and northern species, chiefly foliose and fruticose lichens, has been treated by HASSELROT (1941 and a treatise in preparation).

The eastern species (e.g. *Cornicularia odontella*, map ap. DU RIETZ 1926 p. 38) have their chief Scandinavian distribution in Finland and in the eastern coast provinces of Sweden. They are lacking in

[1] DEGELIUS (1939 p. 92) later also distinguished the marine species as a separate group.

Denmark and have only few stations in Norway. Their distribution will principally be explained by their immigration history. Of the lichens rather few species belong to this group. A special position is held by the north-eastern species (e.g. *Evernia divaricata, Usnea longissima*), which are, on the whole, epiphytes on spruce. They have immigrated together with the spruce and have often ranges coincident with that of this tree. The distribution of some lichens of this group will be treated in a forthcoming work by AHLNER.

The w e s t e r n element comprises species restricted to the oceanic climate. Their centres of distribution are situated in the high precipitation areas in Western Norway, Southern Västergötland, and Western Småland (e.g. *Nephroma lusitanicum, Parmeliella plumbea*). Their distribution falls mainly to the west of the *Erica-Ledum* limit indicated by GRANLUND (1925 p. 81), a limit which divides South Sweden into the flora provinces subatlanticum and middle-balticum named by ENGLER (1924 p. 375). DEGELIUS (1935) has published a thorough-going study of the distribution and ecology of a number of these species. Some crustaceous lichens, though chiefly restricted to special habitats on the West-Swedish rocks, come close to this group (MAGNUSSON 1935 p. 1). In all the group will probably comprise at the most some 50 Scandinavian lichens.[1]

The s o u t h e r n species have northern limits (as a rule caused by temperature factors) across Scandinavia. To this group belong c. 300 species of lichens. In this treatise an attempt will be made to differentiate this group into a number of subordinate groups.

[1] The majority of oceanic species are also southern, and their distribution seems to be dependent on high precipitation and comparatively high winter temperature in combination.

II. The Southern Element.

A. The *Umbilicaria pustulata* Group.

Northern limits in Norway: mostly across Nordtröndelag or Nordland, in some cases reaching Finnmark; in Sweden: across Jämtland-Ångermanland, in many cases in the coastland of Västerbotten and Norrbotten, too, sometimes also in S. Lappland (exceptionally even to the North of the Arctic circle); in Finland: as a rule across Österbotten, in isolated cases reaching Kuusamo and Finnish Lappland.

This group is rather heterogenous. Future research will probably constitute a separate group containing species whose northern limits fall between the limits of *Picea Abies* and *Betula verrucosa*. Here belong i.a. *Evernia prunastri* and *Xanthoria parietina*. Yet the occurrences of *Xanthoria* in N. Sweden (northernmost at Muddus in Lule Lappmark, sec. P. GELTING) and N. Norway (along the whole Norwegian arctic coast) are not actually comparable, as in the inland the species grows on bark (mainly *Populus tremula*), in N. Norway, however, on marine rocks. The majority of species within this group (e.g. *Ramalina fraxinea*, fig. 1, and *Umbilicaria pustulata*, fig. 2) have their northern limits in Central Norrland. In Norway several species approach the Lofoten district, while others show a perceivably decreased frequency on the Norwegian western coast or are quite lacking there (like *Ramalina fraxinea*; cf. further Chapter VI B).

These more southern species of the group can be compared with several of ANDERSSON & BIRGER's »South-Scandinavian species» or, with the more exact terminology of ERIK ALMQUIST, the »South-Swedish—South-Norrlandic group». Cf. the Swedish northern limit of *Ramalina fraxinea* with those of e.g. *Impatiens Noli-tangere* (A. & B. p. 369) or *Viburnum Opulus* (l.c. p. 389), both of which, however, reach S. Nordland in Norway, or the area of *Umbilicaria pustulata* with that of *Anemone Hepatica* (A. & B. p. 333), though the latter plant is more common in the Storsjö district of Jämtland. To this group belong several mosses

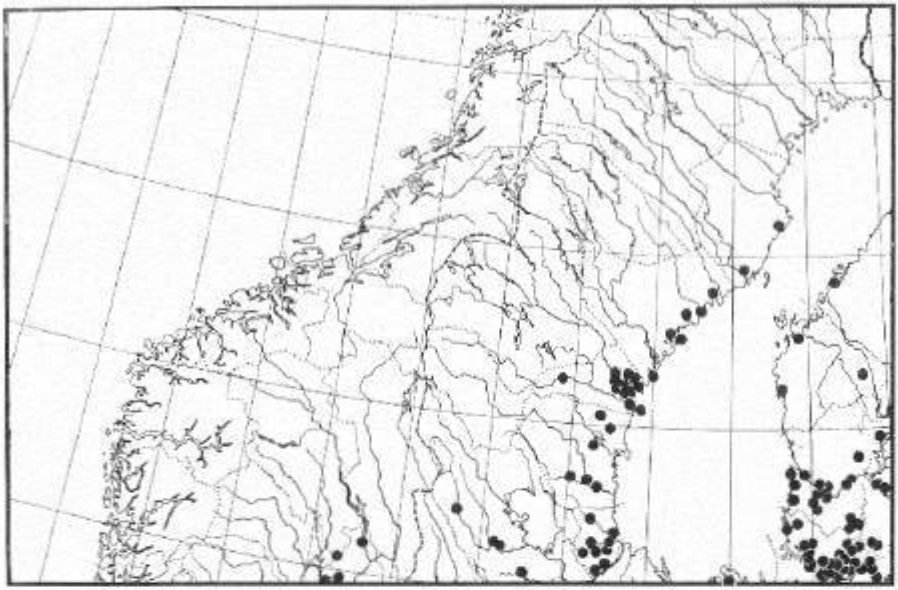


Fig. 1. The northernmost Scandinavian occurrences of *Ramalina fraxinea*. Finnish stations from LINKOLA 1938.

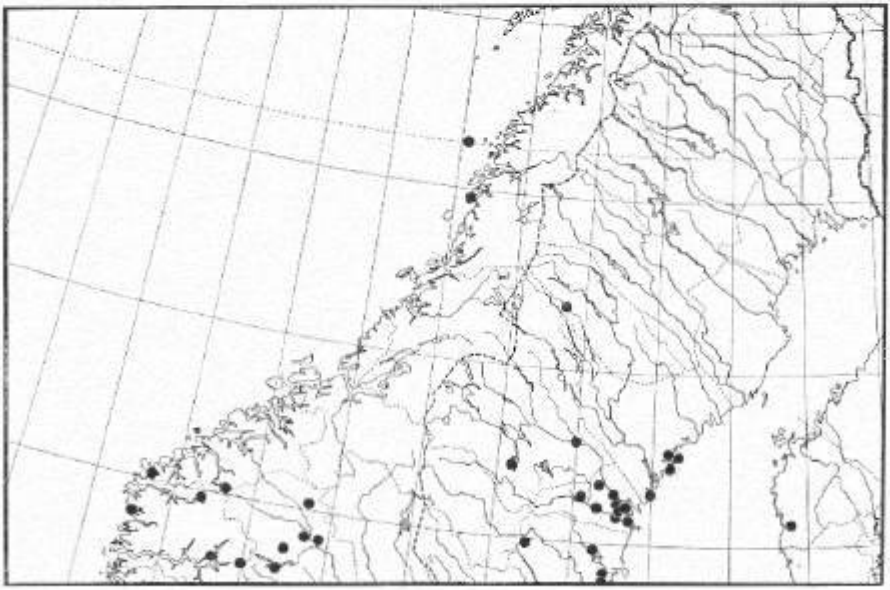


Fig. 2. The northernmost Scandinavian occurrences of *Umbilicaria pustulata*

(cf. ARNELL & JENSEN 1910 p. 238 and KRUSENSTJERNA 1945 p. 119 with a map of *Brachythecium Mildeanum*).

A more exhaustive knowledge of North Scandinavian lichen flora will probably facilitate a better differentiation within this group. Especially from Nordtröndelag and Nordland in Norway, as well as from Hälsingland and Västerbotten in Sweden, there are comparatively few statements available. The southerly exposed mountain precipices (Swedish: »sydberg») in Norrland have a rich flora of southern phanerogams (cf. ANDERSSON & BIRGER) but they are little known as to their cryptogamic flora (cf. DEGELIUS 1945 b p. 390). For that reason the following list — which builds on records from the literature and herbaria and on personal information from several lichenologists — is only preliminary and needs to be emended by means of further research.

At present I count the following species to this group:

Acarospora fuscata
Alectoria implexa
Allarthonia apatetica
Anaptychia ciliaris
Arthonia cinereopruinosa
— *didyma*
— *excipienda*
— *lurida*
— *punctiformis*
— *radiata*
Arthopyrenia cerasi
— *stenospora*
Bacidia chlorococca
— *ligniaria*
— *Naegelii*
— *subacerina*
— *vermifera*
Buellia alboatra
— *badia*
— *betulina*
Caliciella corynella
Caloplaca aurantiaca
— *citrina*
— *ferruginea*
— *festiva*
— *murorum*
Candelaria concolor
Catillaria Ehrhartiana
— *Griffithii*
— *lenticularis*
Catillaria micrococca
— *prasina*
Cetraria chlorophylla
Chaenotheca aeruginosa
— *chlorella*
Cladonia Floerkeana
— *macilenta*
— *papillaria*
— *rangiformis*
— *scabriuscula*
— *squamosa*
Evernia prunastri
Graphis scripta
Gyalecta ulmi
Haematomma coccineum
— *leiphaemum*
Lecanactis abietina
Lecania cyrtella
— *dimera*
— *syringea*
Lecanora allophana
— *atriseda*
— *caesiocinerea*
— *carpinea*
— *cupreogrisea*
— *distans*
— *grumosa*
— *intumescens*
— *leptyrodes*
— *pallida*
Lecanora pinastri
— *rugosella*
— *rupicola*
— *sambuci*
— *subcarnea*
— *subfuscata*
— *subrugosa*
— *varia*
Lecidea coarctata
— *cyathoides*
— *deustata*
— *efflorescens*
— *erratica*
— *flexuosa*
— *fuscoatra*
— *fuscocinerea*
— *goniophila*
— *lucida*
— *misella*
— *Nylanderi*
— *sopinea*
— *sulphurea*
— *symmictella*
Lepraria aeruginosa
Microglaena modesta
Ochrolechia parella
Opegrapha herpetica
— *vulgata*
— *zonata*
Parmelia Bitteriana

Parmelia conspersa
— *exasperata*
— *exasperatula*
— *fuliginosa*
— *furfuracea*
— *pulla*
— *stenophylla*
— *subaurifera*
— *tubulosa*
Peltigera horizontalis
— *praetextata*
Pertusaria amara
— *corallina*
— *discoidea*
— *leioplaca*
— *leucostoma*
Phacotiella microcephala
Phlyctis argena
Physcia ascendens
— *grisea*
— *nigricans*
— *orbicularis*
— *pulverulenta*
— *tenella*
Porina chlorotica
— *lectissima*
Pyrenopsis impolita
Pyrenula corgli
— *farrea*
Ramalina farinacea
— *fastigiata*
— *fraxinea*
Rhizocarpon distinctum
— *obscuratum*
— *Oederi*
— *plicatile*
Rinodina exigua
— *pyrina*
— *sophodes*
Schismatomma pericleum
Stereocaulon coralloides
— *microscopicum*
— *pileatum*
Umbilicaria polyrrhiza
— *pustulata*
Usnea barbata
— *comosa*
— *dasypoga*
— *hirta*
Xanthoria fallax
— *parietina*
— *polycarpa*

B. The *Parmelia acetabulum* Group.

Northern limits in Norway along the South and West coasts, in some cases reaching Nordland; in Sweden across Värmland—S. Dalarna—Uppland (—Gästrikland); in Finland along the South coast, sometimes reaching Satakunta, Tavastland and Savolaks.

Broadly speaking, the northern limits of the species belonging to this type coincide with the northern limit of the oak (fig. 3), which, since WAHLENBERG's time (»Regio Quercus») has been regarded as one of the most important limit zones of our floral district. Here also fall the northern limits of a large number of »South Scandinavian» phanerogams (the »*Quercus* group», Swedish: »ekväxtgruppen», sec. ERIK ALMQUIST: »mittelschwedische Gruppe», sec. SAMUELSSON 1934 with maps of *Potamageton crispus* and *Ranunculus circinatus*). To this type belong several »continental species» sec. STERNER 1922 (cf. his maps of i.a. *Avena pratensis, Crepis praemorsa,* and *Chimaphila umbellata*). With regard to mosses which should be placed in this group, I refer to KRUSENSTJERNA 1945 p. 167 with a map of *Thuidium tamariscinum*.

To this group I refer, partly with the same reservations as in group A, the following lichens:

Acarospora oligospora
Arthonia dispersa
— *leucopellaea*
Arthopyrenia gemmata
— *pluriseptata*
— *sphaeroides*
Bacidia arceutina
— *fuscorubella*
— *incompta*

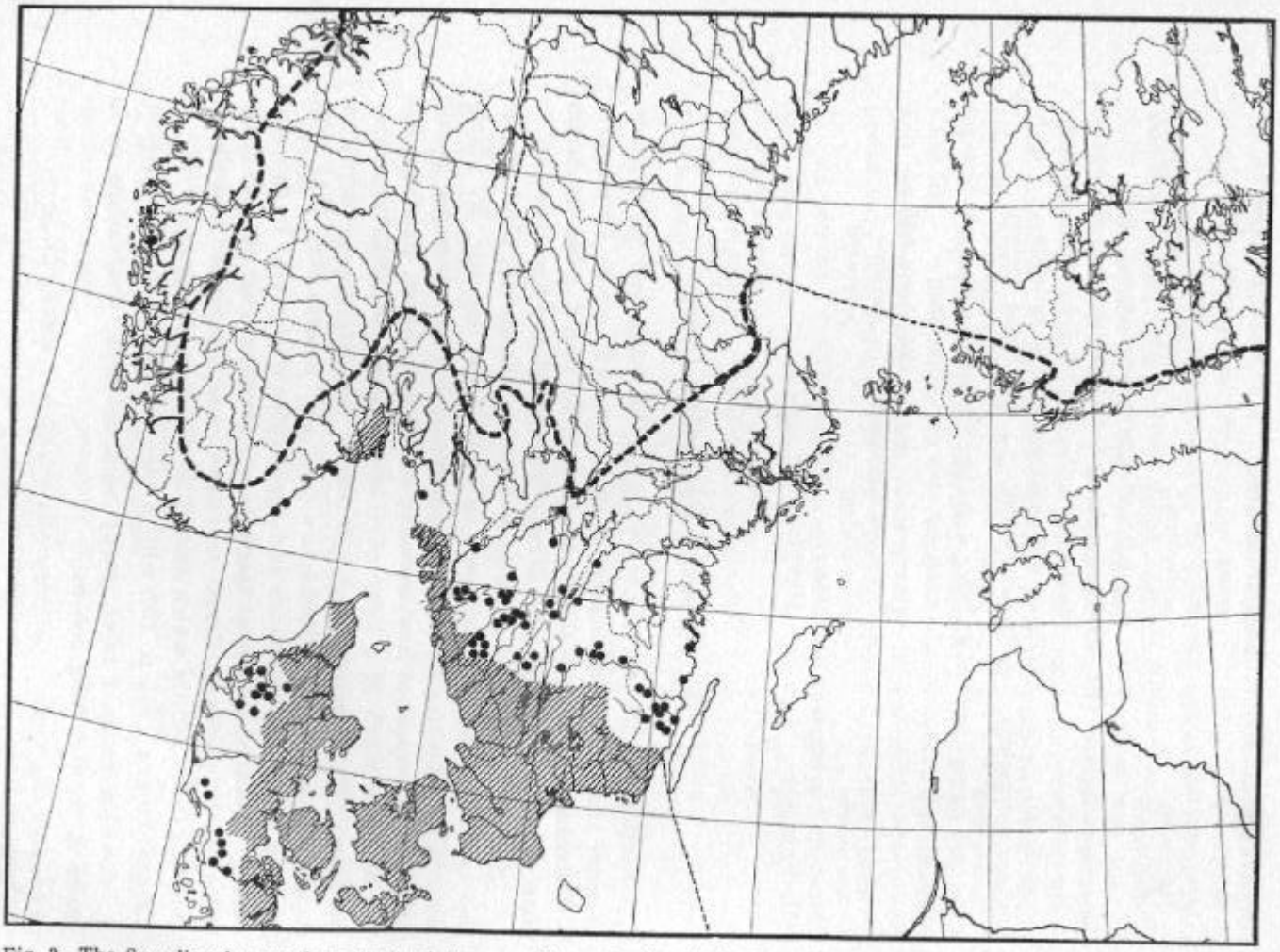


Fig. 3. The Scandinavian northern limit of *Quercus Robur* (broken line). From Du Rietz 1925. The Scandinavian area of *Fagus silvatica* (shaded by diagonal lines); black disks indicate isolated stations of wild beech. After Lindquist 1931 and Hjelmqvist 1940.

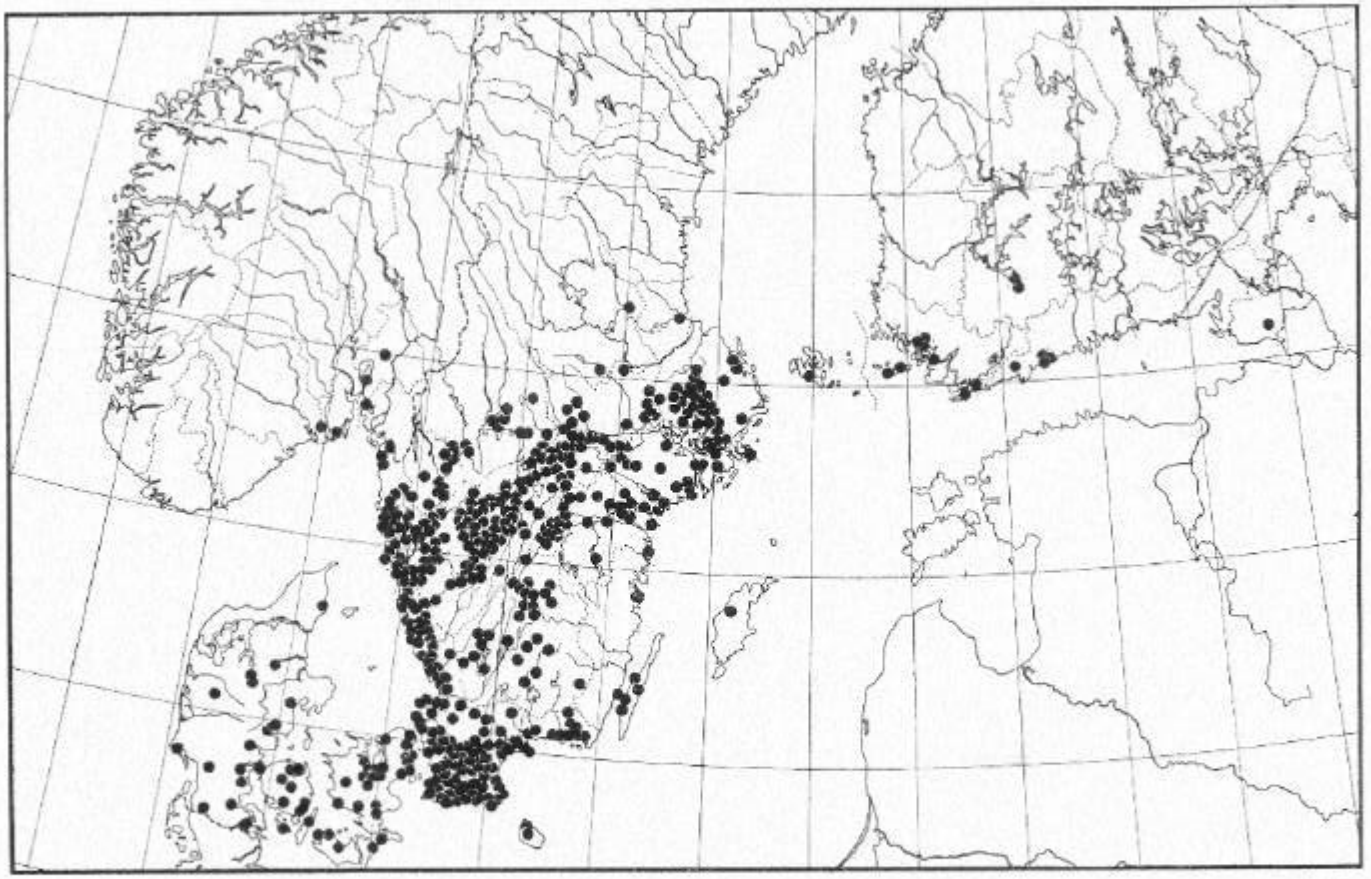


Fig. 4. *Parmelia acetabulum* in Scandinavia. After GRETA SERNANDER 1923, LINKOLA 1938, DU RIETZ 1945 b with the addition of several records. Denmark is somewhat underrepresented compared to Sweden.

Bacidia intermissa
— *luteola*
— *Nitschkeana*
Buellia aethalea
— *ambigua*
Calicium adspersum
— *praecedens*
— *quercinum*
Caloplaca atroflava
— *cerinella*
— *decipiens*
— *obscurella*
— *phlogina*
— *scotoplaca*
Catillaria Bouteillei
Catinaria leucoplaca
Cladonia flabelliformis
— *glauca*
— *pityrea*
Collema cheileum
— *glaucescens*
Coniocybe nivea
Cyphelium Notarisii
Dermatina quercus
Dermatocarpon deminuens
Gyalecta truncigena
Lecanora cartilaginea
— *chlorotera*
— *conizaea*
— *crassula*
— *epiglypta*
— *expallens*
— *gibbosula*
— *macrocyclos*
— *pityrea*
Lecidea fuliginosa
— *intumescens*
— *praeruptorum*
— *scabra*
— *viridescens*
Leptogium tenuissimum
Leptorrhaphis quercus
Opegrapha lithyrga
Parmelia acetabulum (fig. 4)
— *glomellifera*
— *isidiotyla*
Parmelia Mougeotii
— *tiliacea*
Pertusaria coccodes
— *globulifera*
— *leprarioides*
— *leucosora*
— *lutescens*
— *maculata*
— *pertusa*
Phlyctis agelaea
Physcia leptalea
Porina carpinea
Ramalina calicaris
Rhizocarpon viridiatrum
Rinodina arenaria
— *colobina*
Roesleria hyalinella
Sphinctrina gelasinata
Tomasellia gelatinosa
Umbilicaria murina
Xanthoria lobulata

C. The *Pyrenula nitida* Group.

Main distribution within the Scandinavian beech area (fig. 3). These species are either epiphytes on wild beech or their distribution is determined by much the same temperature factors as that of the beech. Northern limits in Norway on the South coast (in some cases reaching the Vestland); in Sweden from Bohuslän across S. Västergötland, W. Småland, and Blekinge to Öland and Gotland, further with isolated occurrences near the Central Swedish lakes, and in the »Skärgårds» of E. Götaland and Södermanland; in Finland, with few exceptions, they are lacking.

D. The *Parmelia laciniatula* Group.

Northern limits mainly within the beech area. In Norway isolated stations on the South and South-West coasts; in Sweden northernmost in the neighbourhood of Gothenburg, W. Småland and Blekinge, (lacking on the East coast), some species reaching Öland and Gotland; lacking in Finland.

E. The *Buellia canescens* Group.

Northern limits across Denmark (lacking in N. Jylland) and the oceanic-maritime districts of S. Sweden (mainly W. Skåne, in some case reaching the coast of Blekinge or Gotland), lacking in Norway (with some exceptions) and Finland.

F. The *Parmelia trichotera* Group.

Stations in the *Ilex* region in Denmark and S.W. Norway, lacking in Sweden and Finland.

G. The *Graphis elegans* Group.

In Scandinavia wholly restricted to Denmark (lacking in N. Jylland).

In the present work I will discuss only the last five of these groups (C.—G.) which are on the whole restricted to S. Norway, S. Sweden (Götaland), and Denmark. 27 species belonging to these groups will get a detailed treatment, and several other species, whose phytogeographical position is still dubious but which may prove to belong here, will be also mentioned in Chapter IV.

III. Some Representatives of South Scandinavian Lichens.

C. The *Pyrenula nitida* Group.

1. *Bacidia rosella* (Pers.) De Not.

Syn. *Lecidea rosella* Ach. — Cf. further ZAHLBRUCKNER Cat. Lich. IV (1927) p. 235, VIII (1932) p. 408, X (1940) p. 365, TH. FRIES Lich. Scand. II (1874) p. 343, and GALLÖE Nat. Hist. of Danish Lichens II (1929) p. 69, plates 81—84.

History. — This lichen was described by PERSOON in 1794 from Germany. In 1798 ACHARIUS published it from S w e d e n (»Habitat ad caudices *Fagi sylvaticae*»). The first exact locality recorded from this country is Femsjö in Småland (E. FRIES 1825—26), the locus classicus of several Swedish lichens. In Lichenographia Europaea reformata (1831) FRIES emphasized its character of a beech epiphyte (»Ad cortices arborum, praecipue *Fagi* et hujus limitibus definite circumscripta, ut postquam cum ista arbore in Suecia evanuit, cum *Fago* inopinato in Omberg redeat»). In the literature there have been published records of about 30 Swedish stations. As far as I know, the lichen has hitherto been collected at about 90 localities in this country.

In N o r w a y the lichen was first collected in the Larvik district by J. M. NORMAN in 1880 (no record in the literature). There are in all 5 Norwegian localities known.

The first record from D e n m a r k (as *Lichen rosellus*) was in Flora Danica, fasc. XXI, tab. 1243 (1799), where a coloured picture was published with the note »haud rarus in *Fago sylvatico*». HORNEMANN (1836) recorded it as »here and there on the bark of *Fagus*» (translated from Danish), and BRANTH & ROSTRUP (1869) stated it to be common. As is often the case with »common» plants, only few exact stations have been published. At present I know this lichen from 22 stations in Denmark.

There is no record from F i n l a n d.

Scandinavian Distribution (substratum *Fagus* unless otherwise stated).

Sweden.

Skåne. »Ad fagi truncos abunde«. E. FRIES 1835 p. 273. — Bjäresjö: Bergsjöholm. 1944! (L, S). — Brunnby: Kullen, very rare on *Quercus*. 1900 B. Nilson (L) B. NILSON 1903 p. 475; near Ahlahamn, scarce on *Ulmus*. 1911 Er. ERICHSEN 1913 p. 50. — Böringe: N. of point 65, on *Quercus*. 1944! (L, S). — Dalby: D. Söderskog, on *Ulmus*. 1890, 91 Berg (G, L); ibm, scarce on *Fagus* and *Ulmus*. 1934 Me (S) MALME 1934 p. 9. — Degeberga. 1890 Me (S). — Fjälkestad: Knutstorp. 1944! (L). — Genarp: Häckeberga. 1946! (L, S). — Halmstad: Bullstofta. 1894 Alvthin (B, L, N, S, U) ALVTHIN 1904 p. 17; Duveke. 1903 Alvthin (L). — Hjärsås: Gyvik. 1890 Me (L, S, MALME exs. 86); Skarvik, not on *Fagus*. 1932 Sthm (G, M, T). — Hyby: Bökeberg. 1890 Me (S); 1943! (L). — Ivetofta: Håkanryd. 1942! (L, S); Årup, on *Acer* in an avenue. 1942! (L). — Kågeröd: Skaftarp. Alvthin. ALVTHIN 1912 p. 14. — Linderöd: near the road to Äsphult. 1945! (L). — S. Mellby: Kiviks Äsperöd, on *Fraxinus* and *Ulmus*. 1890, 91, 1916 Me (Dz, L, S) MALME 1935 p. 12. — Oppmanna. 1890 Me (S); Arkelstorp, on *Quercus* and *Fagus*. 1916 Me (B, Dz, L, M, S); Bokenäset. 1916 Vrang (Dz, M, S, T, U); ibm. 1943! (L, S, U); E. of Bokenäset, on *Acer* in an avenue. 1943! (L, S). — Ottarp: Bälteberga, on *Ulmus*. Alvthin. ALVTHIN 1904 p. 17. — Röstånga: Duveskog, on *Quercus*. Alvthin. ALVTHIN 1912 p. 14. — Sireköpinge. 1890 Alvthin (G). — Stehag: Räröd. 1888 Berg (G, L); »pr. Ringsjön«. 1889 Berg (L). — Ö. Sönnarslöv: Maltesholm, on *Fagus* and *Quercus*. 1890 Me (G, S, U); ibm. 1900 Alvthin (H, L); ibm, on *Populus canadensis*. 1947! (L). — Sövde: Sövdeborg, on *Ulmus* in the park. 1939 Deg. (Ds); Snogeholm, on *Fraxinus* in the avenue. 1939 Deg. (Ds). — Sövestad: Krageholm. 1889 Berg (L, U). — Torekov: Hallands Väderö, on *Quercus* and *Fraxinus*. 1884 Hellb. (G, S) HELLBOM 1887 p. 55. — N. Vram: Vrams Gunnarstorp. Alvthin. ALVTHIN 1912 p. 14. — V. Vram. 1891 Me (L, S). — Örkelljunga: N. of Ö. Spång. 1943! (L, S). — Österslöv: Gårrö. 1916 Me (S). — Öved. 1850 Hardin (L).

Blekinge. »Common on beech« (transl. fr. Swed.). HULTING 1872 p. 17. FALK 1874 p. 14. Asarum: on *Populus* and *Quercus*. 1871 Hult. HULTING l.c. — Augerum: the churchyard, on *Acer*. 1945! (L). — Elleholm: on *Quercus*. 1871 Hult. (G). — Förkärla: N. of p. 20,29. 1945! (L) — Gammalstorp?: Ryssberget. 1871 Hult. (L). — Hjortsberga: N. end of Lake Sännen. 1944! (L). — Jämshög: Holje, on *Quercus*. 1871 Hult. HULTING l.c. — Karlskrona: Gullberna. 1872 H. G. Lübeck (Ka); Hästö. 1871 W. Molér (S, O); ibm, on *Pyrus malus*. Falk. FALK l.c.; Verkö. 1871 W. Molér (Ds, S, U); Vämö. 1871 Svanlund (Ka, L, Vä); ibm. 1872, 73 Falk (H, L, N). — Kristianopel. 1873 Falk (S, U). — Kyrkhult: Levershult, on *Juniperus*. 1871 Hult. HULTING l.c. — Mörrum: Hästaryd, on *Fraxinus*. 1871 Hult. (S, U) HULTING l.c. — Nättraby: Mariclund. 1945! (L, S); Skärva. 1943! (L, S, U). — Ronneby. 1873 Falk (L); Brunnsskogen. 1942! (L). — Sölvesborg: Sissebäck. 1931 Sthm (G); Valje. 1871 Hult. (G). — Sineloco. ASPEGREN 1823 p. 85.

Öland. — Böda: between Melby and St. Mossen, on *Sorbus aucuparia*. 1940 Deg. (Ds). — Högsrum: Ekerum (S, U) and Rälla, on *Quercus*. 1853 M. Floderus and W. Stenhammar (S, U) FLODERUS 1854 p. 163; Rälla 1863 Hellb. (G); between

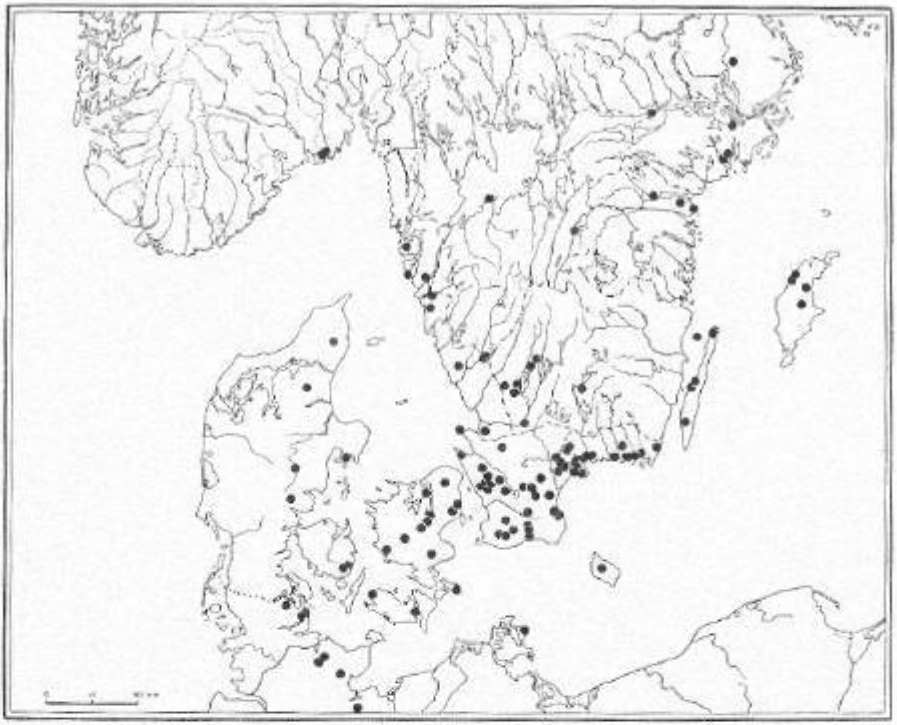


Fig. 5. *Bacidia rosella* in Scandinavia.

Halltorp and Ekerum, on *Ulmus*. 1914 DR. (Ds, Dz, G, M, S, U). — K a s t l ö s a: St. Dalby, on *Fraxinus*. 1943! (L). — R e p p l i n g e: Lasarettsskogen (pr. Borgholm), on Ulmus. 1913 DR. (Dz).

Gotland. B o g e: W. of Västers, on *Quercus*. 1943 Deg. (Ds, *S*) DEGELIUS 1944 p. 46. — L u m m e l u n d a: »Prästängen», on deciduous tree. 1863 Hellb. (G) DEGELIUS 1936 p. 71. — V ä n g e: on deciduous tree. K. J. Lönnroth (U). — V ä s t k i n d e. 1917 Me (S) DEGELIUS 1936 p. 71. — S i n e l o c o. 1855 Sthr. STENHAMMAR 1858 p. 122; 1857 Hellb. (H, L).

Småland. D a n n ä s. 1864 P. G. Theorin (L). — F e m s j ö: E. Fries (S); »p(assim)» E. FRIES 1825—26 p. 36; 1851 Th. Fries (S); Älmås. 1851 Th. Fries (U); Valshult. 1852 Th. Fries (U) TH. FRIES 1852 p. 35. — K ä r d a: Åminne. 1945! (L). — L i d h u l t: Kolhult. 1851 Th. Fries. TH. FRIES l.c. — M a r k a r y d: Timsfors. 1943, 47! (L). — M i s t e r h u l t: Jungfrun, on *Quercus*. 1914 DR. (Dz). — O d e n s j ö. Fr. Rydeman (U). — V ä x j ö. 1879, 80, 85 E. Köhler (B, Ds, Dz, G, L, N, S, U, Vä); Bokhultet (between N. and S. Bergundasjön). 1937, 38 Hedv. (Ds, L, U); ibm. 1945! (L, S).

Halland. G u n n a r p: Tallsjö, near Lake Fegen. 1923 Sthm (G). — Ö. K a r u p: on *Ulmus*. 1918 Vrang (S). — S i b b a r p: S. of Angryd. 1945! (L).

Bohuslän. Marstrand: Klöverön, on *Quercus*. 1922 Magn. (M). — Morlanda: between Sörbo and Glimsås, on *Fraxinus*. 1884 Hellb. (G) Hellbom 1887 p. 55. — Ytterby: Guddehjälm. 1924 Sthm (G).

Västergötland. Askim: Billdal, on *Ulmus*. 1915 Magn. (M); ibm, on *Ulmus*. 1925 Sthm (G). — Otterstad: Läckö, Djurgården, on *Quercus*. 1860 Graewe (L, U) Th. Fries 1874 p. 344. — Partille: Bokedalen. 1946! (L); Jonsered, on *Pyrus malus*. 1923 R. Ohlsén (S).

Östergötland. Häradshammar. Sthr (S). — Jonsberg: Aspön, scarce on *Quercus*. 1878 Hult. (G) Hulting 1897 p. 216, 1925 p. 39. — Kvillinge: Torsklint, on *Quercus*. Hj. Mosén (S) Hulting 1925 p. 39. — V. Tollstad: Omberg. J. Bohman. Bohman 1829 p. 45, 1840 p. 166, E. Fries 1831 p. 260; ibm. 1870 R. Indebetou (G, N, S, U, Vä); ibm, on *Fagus* (not common), on *Quercus* near V. Djurledet. 1871, 74 Theorin (G, L, S, U) Theorin 1874 p. 9, 1875 p. 151; ibm, »common on *Fagus*, also on *Ulmus* and *Picea*» (transl. fr. Swed.), 1888, 90, 1908, 11, 14, 21 Me (L, M, S, Malme exs. 412) Malme 1909 p. (81); ibm, on *Fagus*, *Picea*, and *Quercus*. 1911 DR. (Dz, N, U); ibm. 1915 Vrang (G, Dz, M, S, U); Höje. 1908 Hult. (G) Hulting 1912 p. 431.

Södermanland. Hölö: Tullgarn, on deciduous tree. E. Köhler. Th. Fries 1874 p. 344. — Kungsör: on *Quercus*. 1879, 81, 83, 90 Blomb. (B, G, L, S, T, U) Blomberg 1895 p. 97. — Salem: Viksberg, Korpberget, on *Quercus*. 1937 Deg. (Ds). — Västerljung: scarce on *Quercus*. 1893 Blomb. (L) Blomberg l.c.

Uppland. Funbo: Halmbyhoda, on deciduous tree. 1850 Th. Fries (U) Th. Fries 1874 p. 344. Malme 1909 p. (81).

[Jämtland. Nyhem: Gimdalen, on *Populus tremula*. 1875 Hellb. (G, U) Hellbom 1884 p. 79. Refers to *B. sphaeroides*.]

Norway.

Vestfold. Brunlanes: Jordfalden. 1880 Norman (O); Fritzöparken (Jordfalddalen). 1922 Höeg (T); pr. Gröterö. 1922 Höeg (T); Tildremyren. 1922 Höeg (T). — Hedrum: Farriseidet. 1922 Höeg (T).

Denmark.

Sjælland. Allerslev: Lejre, »Ollrup Skov». 1888 J. P. Pedersen (K). — Boeslunde: Troldehoved (»Trollehave»). 1865 J. Lange (K). — Haslev: Bregentved. Branth (K). — København (?): »pr Hafniam». Ex herb. Liebmann (K). — Nöddebo: Grib Skov. 1870 Leg.? (K); ibm. 1943 Chr. (K, L); W. of Ottevejs Hs. 1938 Deg. (Ds, U). — S:t Jörgensbjærg: Boserup. 1870 Leg.? (K). — Sorö. 1848 J. Lange (K). — Taarbæk: Dyrehaven. 1873 Hellb. (G) Hellbom 1890 p. 77. — Valsölille: St. Höedskov, on *Fraxinus*. 1946! (L). — Værlöse: Jonstrup Vang. 1887 W. Taussing (B, S). — Sine loco. »In cortice *Fagi, Ulmi, Pini Strobus*». Ex herb. Liebmann (K) Gallöe 1929 p. 69.

Mön. Magleby: Möns Klint. 1873 Hellb. Hellbom l.c.

Lolland. Sandby: Sten(s)gaard. E. Rostrup (K). — Toreby: Storskov. 1946! (L).

Fyn. Skaarup: Klingstrup, on *Fagus* and *Fraxinus*. 1865, 66 Rostrup (K). — Vejstrup: Vejstrupgaard, 1865 Rostrup (K).

Jylland. N. Jylland, »common on beech» (transl. fr. Dan.). BRANTH 1867 p. 84. — Agri: Mols Bjærge. 1943 Chr. (K); Strandkær, scarce on *Fagus* and *Alnus*. 1943 Chr. CHRISTIANSEN 1946 p. 77. — Ovsted: Sneptrup. 1884 Branth (K); ibm. on *Quercus*. 1888 Hellb. (G) HELLBOM l.c. — Rold: Rold Skov. 1947! — Gl Rye: Rye Skov. 1887 J. P. Pedersen (K). — Vraa: Ormholt. Branth (U).

Bornholm. Aaker: Almindingen, near the woodward's house, on *Larix*. 1884 Hellb. (G) HELLBOM l.c.

Bacidia rosella is spread over wide parts of Denmark, especially in the beech woods, but it is by no means so »common» as indicated by BRANTH & ROSTRUP. Its chief area in Sweden is about congruent with the beech district. It is rather common in Skåne and Blekinge and also spread in the beech occurrences in S.W. Småland. Further there are also scattered localities on other deciduous trees in the coastal districts of Götaland and near the central Swedish lakes, northernmost near Upsala. The few Norwegian occurrences known are situated in the beech district near Larvik.

Extra-Scandinavian Distribution. — Our species has a wide, though somewhat irregular distribution, mainly in the beech districts of Europe.

In Germany LINDAU (1923) stated it to be »auf glatter Rinde von Laubbäumen, bes. *Fagus* im Gebiete zerstreut, nicht in den Alpen» (cf. below). According to ERICHSEN (manuscr.) it is »sehr zerstreut im östlichen Schleswig-Holstein, aus Nordwestdeutschland nicht bekannt». In Silesia STEIN (1879) recorded it to be distributed »an glatten Laubholzrinden besonders der Buchen in der Hügelregion und Bergregion hin und wieder». In Saxony it is »an Buchen nicht häufig» (RABENHORST 1870). LAHM (1885) reported several stations from Westphalia. It is rare in S. Germany (some stations from Baden sec. BAUSCH 1869 and specimens seen from Eichstätt in Bavaria, leg. Arnold, herb. S). From Austria I have seen it from Kierling near Vienna, leg. Welwisch, herb. S. From Switzerland STITZENBERGER (1882) recorded several stations on *Fagus*. It is known from Czechoslovakia (Bohemia sec. ANDERS 1922, HILITZER 1924, Moravia sec. SUZA 1925 and Slovakia sec. ZAHLBRUCKNER 1894, SUZA 1930) and Hungary (specimens seen from the Bukk Mountains, leg. F. Foriss, herb. S).

Stations are known from Holland (sec. herb. Leyden) and Belgium (DE WILDEMAN & DURAND 1898—1907). Its distribution in France is somewhat irregular. It is recorded from the departments of Manche, Ille et Vilaine, Finistère and Deux Sèvres (OLIVIER 1897) but seems to be lacking in several districts of this country. From the British Isles A. L. SMITH (1926) reported it as growing »on the trunks of trees in maritime and upland districts. Very local and scarce in S. and N. England and S.W. Ireland.»

From the Iberian Peninsula it is known from one station in Portugal (sec. TAVARES in litt.). In Italy it is recorded as growing »ad truncos varios

in Longobardia, Pedimentio, Aprutio, Gargano et prope Neapolim» (JATTA 1909—11). No statements from the Balkans are known by me.

In E. Europe it is not known from Russia proper, but it is reported from Balticum (leg. Mereschkovskij, sec. TOMIN 1939).

Its extra-European distribution is very imperfectly known.

In Africa it is reported from Morocco (several stations on *Olea* and *Quercus*, sec. GATTEFOSSÉ & WERNER 1931).

Old statements from the Azores (RUSSEL 1862) and New Zealand (sec. HELLBOM 1896) are perhaps doubtful.

In N. America stations are reported from the states of Maine and Vermont in the U.S. (FINK 1935).

Habitat Ecology. — *Bacidia rosella* is mainly a beech epiphyte, but is sometimes also found on other deciduous trees, mainly on oak, exceptionally on coniferous trees.

The species has a rather wide ecological amplitude. As a rule, especially when growing on beech trunks, it is met with in rather photophobous communities, where the macrolichens (*Evernia, Parmeliae*) are present in very small quantities. It is often found in a constellation of »beech lichens» (mainly *Lecanora glabrata, Opegrapha viridis, Pertusaria Wulfenii,* and *Pyrenula nitida*) which are index species [1] of a union playing an essential rôle in the epiphytic vegetation of not too young beech trunks, where the amount of light is relatively low. I call this union *Pyrenuletum nitidae* (cf. further under *Lecanora glabrata* and *Pyrenula nitida*). Together with the *Opegraphetum herpeticae* (cf. under *Opegrapha atra, Arthothelium ruanideum,* and *Arthonia cinnabarina*), which is still more photophobus and restricted to the thin, smooth bark of mainly young ashtrees, it is subordinate to the federation *Graphidion* (cf. OCHSNER 1928) containing photophobus and coniophobous epiphytic communities on smooth bark, where *Graphis scripta* is an index species.

Otherwise it can also grow on solitary trees in far more illuminated stations (cf. especially the Maltesholm station — tab. I: 2 — with a large amount of the photophilous *Evernia prunastri*). Though mainly a coniophobous lichen (cf. Chapter VI A) it can also endure a certain impregnation of the bark with dust. So the Skärva station (I: 4—6) showed several coniophilous lichens (*Candelariella vitellina* and *xanthostigma, Physcia leptalea,* and *Xanthoria parietina*).

[1] As to the phytosociological terms index species (»Charakterart», Swedish »ledart»), differential species (Swedish »skiljeart»), federation, union, society, constant, and dominant, I refer to DU RIETZ 1936, WALDHEIM 1944, 1947, and KRUSENSTJERNA 1945.

Tab. I. Bacidia rosella - communities.

1 and 3—10 on the trunks of old *Fagus*, 2 on an old *Populus canadensis* (with very rough bark). — 1. **Sk.** Oppmanna: Bokenäset, W. exposure. — 2. Ö. Sönnarslöv: Maltesholm, at the highroad, N. E. exp. — 3. **Bl.** Nättraby: Skärva, S. exp. — 4. Ibm, S. W. exp. — 5. Ibm, N. exp. — 6. **Sm.** Kärda: Åminne, S. exp. — 7. Markaryd: Timsfors, S. exp. — 8. Växjö: Bokhultet, S. E. exp. — 9. Ibm, W. exp. — 10. Ibm, S. exp.

	1	2	3	4	5	6	7	8	9	10
Bacidia luteola	—	—	—	—	—	—	—	—	1	—
— rosella	3	3	3	4	3	3	3	4	3	3
Buellia betulina	—	—	—	—	—	1	—	—	—	—
Calicium salicinum	—	—	1	—	—	—	—	—	—	—
Candelariella vitellina	—	—	—	—	1	—	—	—	—	—
— xanthostigma	—	—	1	—	1	—	—	—	—	—
Evernia prunastri	—	3	1	1	1	—	—	—	—	1
Graphis scripta	—	—	—	—	—	—	1	—	—	—
Haematomma coccineum	—	—	2	1	1	—	—	3	1	—
Lecanora expallens	—	—	2	—	—	—	—	—	—	1
— glabrata	—	—	—	—	—	—	3	—	—	—
— intumescens	—	—	—	—	—	1	—	—	—	—
— subfusca (coll.)	1	3	2	1	1	1	2	1	1	3
Lecidea olivacea	—	2	1	—	—	1	1	—	—	—
— quernea	—	—	—	—	—	—	—	—	—	1
Lepraria aeruginosa	—	2	—	2	3	2	1	1	1	1
Opegrapha herpetica	—	—	—	—	—	—	—	—	—	1
— subsiderella	—	1	—	—	—	—	—	—	—	—
— varia	—	3	—	—	—	—	—	—	1	—
— viridis	1	—	2	1	1	—	1	—	1	—
Parmelia fuliginosa var. laetevirens	—	—	—	2	—	1	—	—	—	1
— subaurifera	1	1	—	—	—	—	—	—	—	—
— sulcata	—	—	—	—	—	—	—	1	1	2
Pertusaria amara	—	—	1	—	—	3	—	3	1	—
— coronata	—	—	—	—	—	1	—	—	—	—
— globulifera	—	—	2	—	—	—	—	—	1	—
— hemisphaerica	—	—	—	1	—	—	—	—	—	—
— lutescens	—	—	—	—	—	2	1	—	—	1
— pertusa	1	—	—	—	1	2	1	1	1	1
— Wulfenii	2	—	—	—	1	—	2	—	—	2
Phlyctis argena	2	4	1	4	3	3	3	2	2	2
Physcia leptalea	—	—	—	1	—	—	—	—	—	—
Pyrenula nitida	—	—	—	—	—	2	2	1	3	1
Ramalina farinacea	—	—	—	—	—	—	—	1	1	2
— pollinaria	—	1	—	—	—	—	—	—	—	—
Sphinctrina gelasinata	—	—	—	—	—	—	—	—	—	1
Thelotrema lepadinum	—	—	—	—	—	—	1	—	—	—
Xanthoria parietina	—	—	—	—	1	—	—	—	—	—
Dichaena faginea	3	—	—	—	—	—	—	—	2	—
Coccoid Chlorophyceae [1]	—	+	—	—	+	—	—	—	—	+
Antitrichia curtipendula	—	—	—	—	—	—	—	—	1	—

Tab. I. Continued.

	1	2	3	4	5	6	7	8	9	10
Homalothecium sericeum	—	—	—	—	—	—	—	—	—	1
Hypnum cupressiforme	4	—	—	1	—	2	—	—	—	—
Leucodon sciuroides	—	—	—	—	—	—	—	2	1	1
Neckera pumila	—	—	—	—	—	—	1	1	—	—
Orthotrichum Lyellii	—	—	—	—	—	—	—	1	—	—
— stramineum	—	—	—	—	—	—	—	—	—	1
— striatum	2	—	—	—	—	—	1	—	—	—
Frullania dilatata	—	—	—	3	—	1	3	—	—	1
Metzgeria furcata	1	—	—	1	—	—	—	—	—	—
Radula complanata	—	—	—	—	—	—	—	—	—	1

[1] A thorough determination of the *Chlorophyceae* (e.g. *Apatococcus lobatus*, *Desmococcus vulgaris*, *Trentepohlia umbrina*) which often play a certain rôle in epiphytic communities, would need a microscopic investigation of the whole analysed sheet, also in many cases, culture experiences. Hence I have noted only the macroscopically perceivable presence or absence of green algae and omitted the taxation of their frequency. A microscopic investigation would probably have shown at least traces of free algae within every dm^2.

For analyses of corticolous plant communities I have in most cases used a rectangular frame of paper fixed at the lower part of the trunk, as a rule about 0.5 m above the ground. The interior surface of the rectangle was 8×2 dm, thus containing 16 small squares of 1 dm^2. The degree of density has been rated for every species occurring within the frame according to the scale of HULT-SERNANDER-DU RIETZ (DU RIETZ 1921 p. 225):

5 = the species covering at least $^1/_2$ of the rectangle
4 = » » » $^1/_4$—$^1/_2$ » » »
3 = » » » $^1/_8$—$^1/_4$ » » »
2 = » » » $^1/_{16}$—$^1/_8$ » » »
1 = » » » less than $^1/_{16}$ » » »
1 — indicates a very small fragment of a specimen.

Independent of the degree of density, figures printed in heavier type have been used to indicate a maximal dispersion of a species within the analysed community, i.e. it is found in all the 16 squares.

The size of the rectangle, 0.16 m^2, has been chosen for practical reasons (the easiness of reckoning with sixteenths according to the above scheme). Earlier analyses of epiphytic lichen communities have generally used still larger squares. OCHSNER (l.c.) used squares of varying sizes, between 0.25 and 2.5 m^2. DEGELIUS (1939) used a frame of 10×2 dm = 0.2 m^2. KRUSENSTJERNA (l.c.) investigated »the whole cylindrical sheet (up to a height of c. 2 m.), supposed as unrolled to a plane» (translated from Swedish). A restriction to one side of a trunk,

however, has seemed to me to be of value, especially with regard to forming an opinion of the dependence of a species on the light conditions of the habitat. The squares analysed have been chosen to give a representation of the occurrence of the species under optimal circumstances. As a rule the communities treated are societies with the species in question as a dominant. As my sociological treatment is wholly an autecological one, I have sometimes, however, especially when dealing with rare species with a low power of competition, listed communities where the species plays a quantitatively subordinate part (cf. e.g. under *Catinaria Laureri*). In some cases a rating of the constants of the community has been made, when it has seemed possible to me.

The outlines of the sociology of epiphytic plants, according to modern principles, have been drawn by OCHSNER (l.c.), who has treated both moss and lichen communities in Switzerland. DEGELIUS (l.c.) has analysed a few epiphytic communities on Skaftö in Bohuslän. In WALDHEIM's (1944) and KRUSENSTJERNA's (1945) thorough descriptions of epiphytic moss communities from Dalby in Skåne and the vicinity of Upsala, lichens, too, have got a casual treatment, chiefly building on the terminology of DU RIETZ (cf. DU RIETZ 1945 p. 147). The analyses given in the present treatise, as well as the delimitation of societies, unions and federations, are only to be regarded as preliminary work to a study of the South Swedish epiphytic vegetation.

Measurements of pH [1] from 2 communities with *Bacidia rosella* on relatively dust-free beech bark (Sk. Oppmanna: Bokenäset and Sm. Markaryd: Timsfors, each 10 samples) gave values in both cases varying between 5.1 and 5.7, mean 5.4 (cf. under *Lecanora glabrata* and other members of the *Pyrenuletum nitidae*). The Skärva station (5 samples) gave values between 5.9 and 6.2, mean 6.0.

Affinity and Variation. — *B. rosella* is well characterized by its flesh-coloured, pruinose apothecia. Exceptionally it has been confused in Scandinavian herbaria with *B. luteola* (Schrad.) Mudd, which has yellowish-brown—reddish, naked apothecia, and with *B. sphaeroides* (Dicks.) Zahlbr. which belongs to sect. *Bilimbia* and has 4-celled, far shorter spores (15—20 μ; in *rosella* 12—16-celled, 60—100 μ).

The Scandinavian material contains no material for describing taxonomical units of a lower rank.

[1] The pH-values have been obtained electrometrically (with a »Radiometer»; glass electrode) in the Botanical Museum at Lund. The bark samples (small pieces of the periderm with lichens) were shaken (1 : 4) with distilled water (free from carbonic acid) for one hour and the pH determined after the samples had stood 24 hours in the cold.

2. *Lecanactis amylacea* (Ehrh.) Arn.

Syn. *Lecidea farinosa* (Ach.) Nyl. — *Pyrenothea farrea* Fr. — *Opegrapha amylacea* Chev. — *Lecanactis illecebrosa* (Duf.) Fr. — Cf. further ZAHLBRUCKNER Cat. Lich. II (1924) p. 531, LETTAU Monogr. Bearb. einig. Flechtenfam. (1932) p. 35, and GALLÖE Nat. Hist. of Danish Lichens III (1930) p. 12, plates 5—7.

History. — This lichen was described (as *Lichen amylaceus*) from Germany in 1793 by FR. EHRHART. There is no record of it from Sweden in the works of ACHARIUS. The lichen was introduced into Swedish lichenology in 1826 by G. C. LJUNGSTEDT (as *Pyrenothea farrea*) in the schedulae of E. FRIES Lich. Suec. exs., fasc. VII, No. 193, where the species was distributed, probably from Skåne. There was no exact locality stated (»ad cort. vet. quercus frequenter»), but in Flora Scanica (1835) FRIES recorded the lichen as collected by LJUNGSTEDT at Krageholm in S.E. Skåne. Towards the end of the 19th century several Swedish lichenologists confused *L. amylacea* with *Arthonia impolita*, so that some of the 9 records of our species in Swedish literature refer to the latter species. At present I know the lichen from 23 Swedish stations.

The lichen was recorded from Denmark in 1869 by BRANTH & ROSTRUP. The following list contains 4 Danish stations.

The species is unknown from Norway and Finland.

Scandinavian Distribution (substratum *Quercus*).

Sweden.

Skåne. Bosjökloster: the mansion park. 1947! (L). — Genarp: Häckeberga (sterile). 1945! (L, S). — Kiaby: Plageboda (together with *Arthonia impolita*). 1943 Deg. (L). — Kvidinge: Prästemarken. 1933 Sture Nilsson (M). — Söve-stad: Krageholm. Ljungstedt (U) E. FRIES 1835 p. 281, S. ALMQUIST 1869 p. 14. — [Torekov: Hallands Väderö. 1884 Hellb. (G, L, S, U) HELLBOM 1887 p. 66. Specimens belong to *Arth. imp.* and *Lepraria decolorans*.] — Tosterup: Tosterupsskogen. 1945! (L, S). — Sine loco. E. Fr. exs. 193. (cf. above).

Blekinge. »Here and there on the N. side of old oaks near the sea» (transl. fr. Swed.). FALK 1874 p. 20 (chiefly referring to *Arth. imp.*) — Bräkne-Hoby: Hoby. 1935 Sthm (G, M, O, T). — Ellehölm. 1871 Hult. (G, L, S, T) HULTING 1872 p. 21. — Förkärla: the churchyard. 1943! (L, S); Tromtö. 1946! (L, O, S, U). — Karlskrona: Vämö. 1873 Svanlund (L, with *Arth. imp.*) FALK l.c. — [Listerby. Falk (Ka) FALK l.c. Belongs to *Arth. imp.* — Lösen: Lyckeby. FALK l.c. No specimen.] — Mörrum: Stensnäs. 1942, 46! (L, S). — Nättraby: Skärva, the mansion park. 1947! (L, S). — [Rödeby. FALK l.c. No specimen.] — Sölvesborg: Valje. 1871 Hult. (U) HULTING l.c.; ibm. 1931 Sthm (G, M, O).

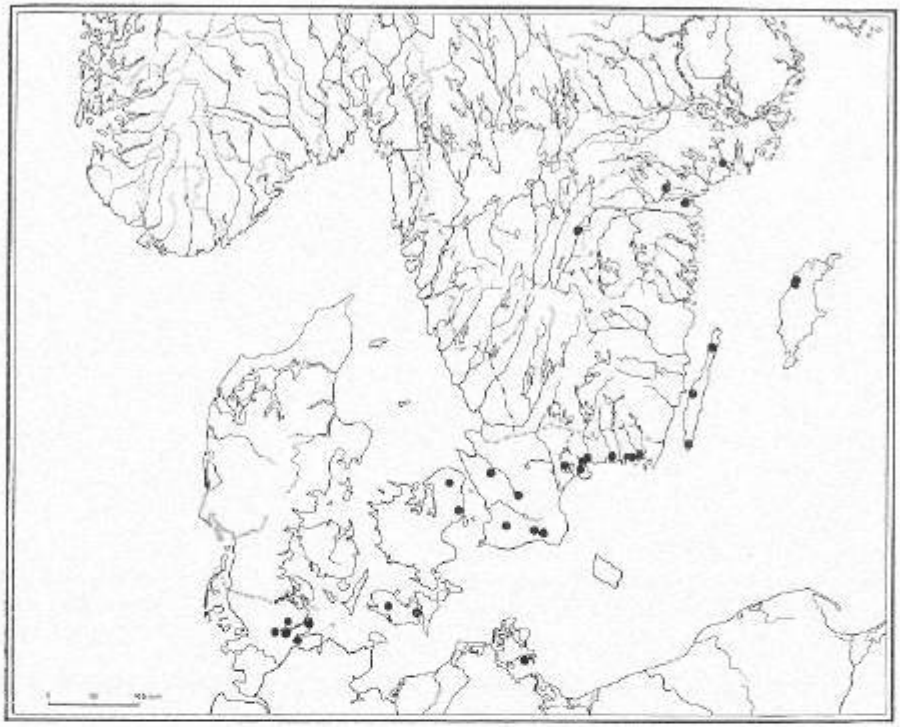


Fig. 6. *Lecanactis amylacea* in Scandinavia.

Öland. H ö g b y. 1853 M. M. Floderus (L). — H ö g s r u m: Ekerum. 1857 Sthr (L, O, S, U). — Å s: Ottenby. 1853 Floderus and W. Stenhammar (Dz, S); ibm. 1857 Sthr (U); ibm. 1867 J. E. Zetterstedt (L, O, S, U) S. ALMQUIST l.c.

Gotland. L u m m e l u n d a. 1871 W. Molér (L); Kams. 1857 Sthr (S); Kinners. 1863 Hellb. (S); near Kams. 1887 Hellb. (O). — M a r t e b o. Sthr (S) S. ALMQUIST l.c.

Östergötland. K r o k e k: Uttersberg. Hult. HULTING 1925 p. 14. — H ä r a d s h a m m a r: Yxnö. Sthr (S) S. ALMQUIST l.c. — V. T o l l s t a d: Omberg. 1944 Deg. (Ds) DEGELIUS 1944 b p. 17.

Södermanland. H ö l ö: Tullgarn. 1893 Blomb. (L as *Arthonia byssacea*). Cf. BLOMBERG 1895 p. 104.

S i n e l o c o. »Ad corticem *Quercus* in Gotlandia et Oelandia.» STHR exs. 115.

Denmark.

»The sterile thallus probably not rare» (transl. fr. Dan.). BRANTH & ROSTRUP 1869 p. 231.

Sjælland. E s b ö n d e r u p: W. of Esrum (sterile). 1946! (L). — G e n t o f t e: Charlottenlund. 1867 Rostrup (K) GALLÖE l.c.

Lolland. Skörringe: Christianssæde, 1870 Rostrup (K). — Toreby: Fuglsang Storskov. 1943 Chr. (K).

The Scandinavian area of *L. amylacea* might suggest a species with a south-eastern tendency. As is the case with *Arthonia impolita* this is only apparent. Both species are restricted to trunks of old oaks, and as such trees are nowadays rather rare in Denmark and Skåne, the number of suitable localities is limited. The total absence of this species (as well as of *A. impolita*) on the Swedish west coast is, however, noticeable. On the whole, it is a southern species with its northern limit drawn far more to the south than that of the oak.

Extra-Scandinavian Distribution. — The lichen has a wide distribution, chiefly on *Quercus*, in Central, Western, and Southern Europe.

In Germany, Austria, and Switzerland it is »im Hügellande hier und da häufiger, meist aber zerstreut bis ziemlich selten, im Alpengebiet und in der Ebene meist selten» (LETTAU 1932). In the Alps it does not ascend to more than 1000 m. (LETTAU l.c.). It is recorded from Czecho-Slovakia (some stations in Moravia, sec. LETTAU l.c., and Slovakia, sec. SZATALA 1930). — It is found in several parts of France, especially in the northern and western districts (cf. e.g. OLIVIER 1900). In England it is probably rare (only 5 stations recorded by A. L. SMITH 1926). — The species is unknown from Spain and Portugal. In Italy it is only recorded from Treviso in Venetia (sec. JATTA 1909—11). There are some records from Yugo-Slavia (Kroatia and the Island of Pomo in the Adriatic, sec. LETTAU l.c.). — The lichen is not known from E. Europe.

Records from Japan and N. America (as var. *megaspora* Merrill) deserve a critical revision.

Habitat Ecology. — *L. amylacea* is met with on the rough bark of old oaks. It is mainly a photophobous species, often growing on the northern sides of the trunks. It often grows together with *Arthonia impolita*, forming a photophobous union which can be called *Arthonietum impolitae*. This union is poor in species and is characterized by the presence of mainly crustaceous lichens (except *A. impolita* and *L. amylacea*, mainly *Chaenotheca trichialis* and *Lepraria*e) and coccoid green algae (often *Desmococcus vulgaris*), and the absence or rareness of photophilous macrolichens (small quantities of *Evernia*, *Parmeliae*, and *Ramalinae* can be present; *R. obtusata* and *pollinaria* in somewhat larger amounts). Together with some other unions on rough bark (of the communities treated in the present work, only *Opegraphetum fuscellae*), it is subordinate to a federation of photophobous and hydrophilous communities, which I call *Leprarion*. It is characterized by the presence, mainly in the crevices, of large amounts (as a rule dominance) of

Tab. II. Lecanactis amylacea - communities.

On the trunks of old *Quercus*. — 1. **Sk.** Genarp: Häckeberga, E. exposure. — 2—3. Bosjökloster, N. exp. — 4. Kiaby: Plageboda, N. exp. — 5. **Bl.** Mörrum: Stensnäs, N. E. exp. — 6. Ibm. N. exp. — 7. Förkärla: Tromtö, N. exp. — 8—9. Nättraby: Skärva, W. exp. — 10. **Sj.** Esbönderup: Esrum, E. exp.

	1	2	3	4	5	6	7	8	9	10
Arthonia impolita ...	**4**	**4**	**3**	**3**	—	—	**5**	—	—	2
Calicium viride	—	—	—	—	2	—	—	—	—	—
Caloplaca phlogina ..	—	—	—	—	—	—	**1**	—	—	—
Catillaria Griffithii ..	—	—	—	—	1	—	—	—	—	—
Chaenotheca trichialis	1	1	—	—	—	2	1	1	—	—
Evernia prunastri ...	—	—	—	—	1	—	—	—	2	—
Haematomma leiphaemum	—	—	—	—	—	—	—	—	—	1
Lecanactis amylacea	**2**	**2**	**3**	**2**	**3**	**3**	**3**	**4**	**3**	**2**
Lecanora expallens ..	—	—	—	—	—	—	—	—	—	1
— subfusca (coll.) ..	—	—	—	—	1	—	—	—	—	—
Lepraria aeruginosa ..	**2**	**3**	**3**	**3**	**4**	3	**2**	**4**	**4**	**3**
— candelaris	1	4	2	—	**3**	**4**	—	3	**3**	**3**
— decolorans	1	3	1	**4**	**3**	1	—	4	**4**	**3**
Parmelia fuliginosa var. laetevirens ..	—	—	—	—	—	—	—	—	1	—
— sulcata	—	—	—	—	—	—	—	—	1	—
Pertusaria amara ...	—	—	—	—	1	—	—	—	2	—
Ramalina farinacea ..	—	—	—	—	—	—	—	—	1	—
— fraxinea	—	—	—	1	—	—	—	—	—	—
— obtusata	—	—	—	**2**	—	—	—	—	—	—
— pollinaria	—	—	**1**	—	**2**	1	1	**2**	**3**	1
Coccoid Chlorophyceae	+	+	+	+	+	+	+	+	+	+
Hypnum cupressiforme	—	—	1	—	1	—	—	—	1	—

Lepraria aeruginosa (sometimes also other *Leprariae*) and green algae (*Desmococcus vulgaris*), and the absence (or rareness) of macrolichens and of *Graphis scripta*, *Opegrapha herpetica*, and other lichens characteristic of the photophobous, but more xerophilous federation *Graphidion* on smooth bark (cf. mainly under *Lecanora glabrata* and *Opegrapha atra*, and p. 219).

Arthonietum impolitae is as a rule a coniophobous union. Of the species listed in tab. II only *Caloplaca phlogina* (and to some extent the *Ramalina* species) can be regarded as species belonging to eutrophiated bark (cf. Chapter VI A).

L. amylacea often grows in rather small specimens scattered over large parts of the oak trunks, thus having a high degree of dispersion,

though it has no great power of competition against *Arthonia impolita* or the *Lepratiae*.

Regarding the pH conditions of this union, cf. under *Arthonia impolita*.

Affinity and Variation. — *L. amylacea* is a uniform and, even in a sterile state, easily recognized species.

In several Scandinavian collections there is a rather unexplicable confusion between *Arthonia impolita* and *Lecanactis amylacea*. In fact the two lichens have not much in common, apart from usually growing together on old oaks. Some of the chief differences between them can be summed up thus:

Arthonia impolita

Thallus grey — yellowish grey, KC+red.
Apothecia irregularly angular, leather-brown with a bluish-grey-pruinose disk.

Lecanactis amylacea

Thallus white, KC —.
Apothecia round, black with white-pruinose disk.

3. *Lecanora glabrata* (Ach.) Malme.

Syn. *L. subfusca* (L.) Ach. var. *glabrata* Ach. — Cf. further ZAHLBRUCKNER Cat. Lich. V (1928) p. 373, VIII (1932) p. 536, X (1940) p. 476, MAGNUSSON Beitr. zur Syst. der Flechtengruppe *Lecanora subfusca* (1932) p. 79, and GALLÖE Nat. Hist. of Danish Lichens IV (1932) p. 62, plates 77—79.

History. — The lichen was described by ACHARIUS (1810) as a variety of *L. subfusca* (»Crusta cartilaginea glabra subrugoso-plicata inaequabile pallida; apotheciis planis variis nigrisque, margine thallode integerrimo discum aequante. Habitat in truncis *Fagi* Sveciae; Helvetiae»). TH. FRIES (1871) gave a more vague delimitation of the variety »Priori (=var. *coilocarpae*) similis, sed apothecia fusca v. rufofusca nitida, margine integro». Agreeing with him, Scandinavian lichenologists have given the name of var. *glabrata* to various forms, even saxicolous, of *L. subfusca* with thin, entire margins of the apothecia. MALME (1912) pointed out that the type described by ACHARIUS is specifically distinct from *L. subfusca* and distributed it in his exsiccat. MAGNUSSON (l.c.) communicated some data of the anatomy of the apothecia and determined part of the material preserved in Scandinavian herbaria. On the whole, Scandinavian lichenologists have paid little attention to this species. There are only 9 Swedish stations recorded in the literature, 6 of them from Gotland. In the present work about 75 stations are enumerated from this country.

Two stations previously unpublished are known from Norway. In Denmark the first records were published in 1946 by CHRISTIANSEN, but it had been collected there already by J. Vahl more than a hundred years ago. GALLÖE (l.c.) published coloured plates of this species (as »*Lecanora subfusca*»). At present I know about 40 Danish stations. The species is not found in Finland.

Scandinavian Distribution (substratum *Fagus* unless otherwise stated).

Sweden.

Skåne. Andrarum: Traneboda. 1946! (L). — Baldringe: Nyvångsskogen. 1945! (L, S). — Bara: Torup. 1946! — Brunnby: Kullen. 1902 B. Nilson (U). — Brönnestad: Påbro. 1945! (L). — Fågeltofta: Kronovall, on *Fraxinus*. 1945! (L, S). — Halmstad: *Daveke*. 1900 Alvthin (N); ibm. 1946! (L). — Hjärnarp: Margretetorp. 1945! (L). — Hjärsås: Skarvik, on *Fagus* and *Fraxinus*. (G, T); Vrångefälle, on *Fraxinus* (G), both 1932 Sthm. — Hörja: 3 km N.E. of the village. 1943! — Konga: Konga lund. 1946! (L). — Linderöd: at the road to Åsphult. 1945! (L). — N. Mellby: at the road to Nävlinge. 1945! (L). — Munkarp: at the road to Hallaröd. 1945! (L). — Oppmanna: Bokenäset. 1946 Me (S); ibm. 1916 Vrang (Dz, G, M, S, U); Arkelstorp, on *Carpinus*. 1946 Me (S). — Riseberga: Skäralid. 1910 T. Hedlund (MALME exs. 211) MALME 1912 p. 100; ibm. 1910 Sthm (G). — S. Rörum: Kvesarum. 1900 Alvthin (L, U). — Röstånga: near the church, on *Fraxinus*. 1934 Sthm (G). — Sireköpinge: Tågarp. 1893 Alvthin (G, U). — Svalöv: Axelvold, on deciduous tree (not *Fagus*). 1934 Sthm (G). — Ö. Sönnarslöv: Maltesholm. 1939 Deg. (Ds); ibm. 1944! (L). — Sövde: Kristinelund. 1945! (L); St. Bölleberga. 1946! (L, S). — Tjörnarp. 1946 Me (S). — Torekov: Hallands Väderö. 1884 Hellb. (f. *evoluta* sec. Magn.) (G); ibm. 1893 Alvthin (L); ibm. 1918 Vrang (S); 1944! (L). — Tosjö: Marieberg. 1945! (L). — Vittsjö: Boalts böke. 1945! (L, S); Ubbalt. 1945! (L). — N. Vram: Vrams Gunnarstorp. 1946! (L, S). — N. Åkarp: 2 km. S. of Bjärnum. 1947 (L). — S. Åsum. 1888 Berg (L). — Örkelljunga: N. of Ö. Spång. 1943! (L). — Österslöv: Gårrö. 1916 Me (S).

Blekinge. Förkärla: Tromtö. 1946! (L). — Jämshög. 1871 Hult. (L). — Karlshamn: E. of the town. 1947! (L). — Karlskrona: Verkö. W. Molér (U). — Kristianopel. 1873 Falk (L together with *Catinaria Laureri*). — Nättraby: Skärva. 1943! (L). — Ronneby: Brunnsskogen. 1946! (L, S). — Sillhövda. 1873 Falk (L). — Sölvesborg: Valje. 1942. 43. 47! (L).

Gotland. Gammelgarn: on *Fraxinus*. — Havdhem: on *Acer*. — Sundre: on *Populus*. — Vamlingbo: on *Pinus*. — Visby: on *Ulmus*. — Östergarn: Katthammarsvik, on *Juglans*. — All 1932 Deg. (Ds). Det. Magn. DEGELIUS 1936 p. 77.

Småland. Femsjö. 1852 Th. Fries (U); ibm. 1859 Blomb. (L); Hallaböke. 1945! (L); Skubbhult. 1945! (L, S). — Grytéryd: Hökabäck. 1945! (L). — Kärda: Åminne. 1945! (L, S). — Landeryd: N. of Jansbergssjön. 1945! (L). — Lid-

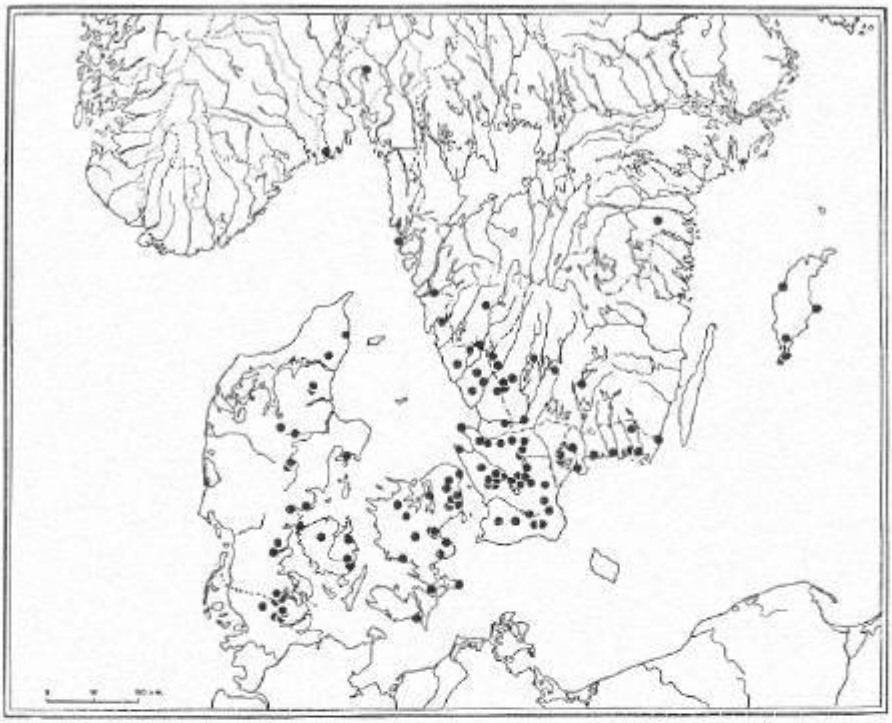


Fig. 7. *Lecanora glabrata* in Scandinavia.

hult: Torsaberg. 1851 Th. Fries (U). — Markaryd: Timsfors, at the viaduct. 1943! (L, S). — Odensjö: Röshult. 1945! (L, S). — Rydaholm: N. of Rafsebo. 1945! (L). — Växjö: Biskopsnäset. 1945, 46! (B, H, L, S).

Halland. Abild: Arnared. 1945! (L, S). — Breared: Moshult. 1933 Sthm (G). — Fagered: Hårsared. 1926 Sthm (G); Klitten, on *Betula*. 1926 Sthm (G). — Fjärås: between Lygnern and Stensjön. 1931 Deg. (Ds). — Getinge: Fröllinge. 1945! (L). — Knäred: Bassalt. 1936 Me (S). — Sibbarp: S. of Angryd. 1945! (L, S); S. end of the lake S. of Skärbäck. 1945! (L). — Slättåkra: Johansfors. 1929 Deg. (Ds); Spenshult. 1947! (L).

Bohuslän. Skaftö: S. of Vägeröd and N. of Evensås, both 1937 Deg. (Ds) DEGELIUS 1939 p. 156.

Västergötland. Målsryd: near the fire station. 1945! (L). — Mårdaklev: Åsabol. 1923 Me (S) MALME 1924 p. 312; Skeppshult. 1945! (L, S). — Partille: Bokedalen. 1945 Magn. and ! (L, M, O).

Östergötland. Ö. Ryd: on *Quercus*. 1822 A. Petrin (U as *L. subfusca*; confirm. Magn.).

Norway.

Akershus. Aker: Abildsö, on *Fraxinus*. 1864 N. G. Moe (U as *L. subfusca* ε *glabrata*).

Vestfold. Larvik: N. of the town, rather abundant in the beech forest. 1947! (L, O, S).

Denmark.

Sjælland. Birkerød: Rude Skov. 1945 Chr. CHRISTIANSEN 1946 b p. 111. — Gjerlev: Færgelunden. 1946 Chr. (in litt.). — Herfölge: Aashöje Overdrev. 1947 Chr. and! (L). — Holsteinborg: Rude Skov (pr. Bisserup). 1947! (L). — Hornbæk—Hellebæk: Teglstrup Hegn. 1943 Chr. (in litt.). — Hörsholm: Fole Have. 1947! (L). — Jyderup: N. of Skarresö. 1946! (L, S). — Köbenhavn (?). J. Vahl (f. *convexa*, sec. Magn.) (G). — Lellinge: L. Skovhusvænge. 1946 Chr. (in litt.); L. Fribed. 1947 Chr. and! — Lidemark: Taageröd Skov. 1947 Chr. and! (L). — Lyngby: Frederiksdal. 1904 Gallöe. GALLÖE 1932 p. 62 (as *L. subfusca*). — Maarum: Grib Skov. 1942 Chr. (M). — Magleby (at the Köge Gulf); M. Skov. 1947 Chr. (K). — Nöddebo: Gribsö. 1943 Chr. (M); N. of N. 1946! (L, S). — Snesløv K.: the churchyard, on *Tilia*. 1946! (L). — Undlöse: Mölleskov. 1946! (L). — Vemmetofte: Vesterskov and Strandskov. 1946!

Falster. Bogö: B. Österskov. 1947 Chr. (K).

Mön. Magleby: Storeklint. Gallöe. GALLÖE l.c.; ibm. 1946! (L); Maglevandfaldet. 1943 Chr. (in litt.).

Lolland. Kettinge: Frejlev Skov. 1946!

Fyn. Langaa (and Svindinge): Glorup Gl Dyrehave. 1946 Chr. (in litt.). — Middelfart: Kongebroskoven. 1947 Chr. (K). — Ore (N. of Svendborg): Fredskov. 1946 Chr. (in litt.). — Revninge: Storskov (pr. Kerteminde). 1947! (L, S). — Tröstrup Korup: near »Kom-igen-Kroen». 1946! (L). — Vejstrup: Tiselholt Skov. 1946 Chr. (in litt.).

Jylland. Agri: Strandmöller. 1943 Chr. CHRISTIANSEN 1946 p. 80. — Bjerning (N. of Haderslev): Vesterskov. 1946! (L S). — Bryrup: Velling Skov. 1947! (L). — Dollerup: Hald, at the pond near the inn. 1946! (L). — Dronninglund: near the mansion. 1947!; D. Storskov. 1947! (K, L). — Gaversiund (pr. Vejle): Munkebjærg. 1946! (L, S). — Hammelev: Pamhule Skov. 1947 Chr. (K). — Holböl: Hönsnap Skov. 1946! — Le: Viskum Skov. 1947! (L). — Rold: S. part of R. Skov. 1947! (K, L, S). — Skörping: Buderupholm. 1943 Chr. (L). — Stovby: Stovby Skov. 1946! — Tem: Sönderskov (S. of Silkeborg) 1946. 47! (K, L, S). — Volstrup (pr. Sæby): Sæbygaard Skov, on *Fraxinus*. 1937 Magn. (M); ibm, on *Fagus*. 1947! (K, L, S).

The species is rather common in the South Scandinavian beech districts. It is rare or lacking in the northernmost occurrences of *Fagus*; nor does it grow on cultivated beeches in Central Sweden. The stations from Gotland and Östergötland (on other substrata than *Fagus*) extend its area somewhat outside the beech districts.

Extra-Scandinavian Distribution. — The European distribution of the species is upon the whole coincident with the area of the beech. Literary records, however, must be regarded with a good deal of suspicion, because the delimitation between *L. glabrata* and other species of the *subfusca* group has often been quite arbitrary. I know trustworthy statements of the real *L. glabrata* from the following stations (several records kindly communicated to me by Dr A. H. MAGNUSSON):

Germany. Schleswig. »An glattrindigen Waldbäumen, besonders Buchen, zerstreut». W. SAXEN (in litt.). — Silesia. Hirschberg. FLOT. exs. 323 C (U); Wohlau, on *Carpinus*. FLOT. exs. 323 C (U). — Baden. Heidelberg, on *Fagus*, leg. Zwackh (H); Black Forest: Belchren, on *Fagus*, leg. Magn. and Lettau. — Bavaria. Eichstätt, leg. Arnold (H, U); Munich, leg. Krempelhuber (S); Oberstdorf in the Allgäu Alps, leg. Rehm (S).

Switzerland. »Helvetia», ex herb. Ach. (U) and herb. Schaer. (U). SCHAER. exs. 309 (U).

Czecho-Slovakia. St. Georgen, on *Carpinus*, leg. DR. and Zahlbruckner (Dz).

Hungary. The Bukk Mountains, several stations, on *Fagus*, leg. Foriss (Ds, M).

France. Pyr. or. Several stations, on *Fagus*, leg. Nylander (H). — Basses-Pyr. Eaux-Bonnes, leg. Richard (H). — Mt Dore, leg. Lamy (H). — Vosges, on *Fagus*. MALBR. exs. 223. (M). — Deux-Sèvres. St. Hérays pr. la Mothe, leg. Lèvres (H).

Spain. Asturia, leg. Clement (H). — Majorca. Monastery of Lluch, pr. Miramar, on *Quercus*, leg. Maheu (M).

Portugal. Oporto, leg. F. Newton (H). — Estremadura, near Setubal, leg. Tavares (TAVARES in litt.).

Italy. Toscana. Mamma, on *Populus*, leg. Deg. (Ds). — Sardinia. Cagliari, leg. Marcucci (S). — »Ital. sept.», leg. Garovaglii (U). — Exs.: ANZI Ital. 185 (H, U), ANZI Sondr. 116 C (U), ANZI Ven. 40 (H), Erb. critt. 934 (H).

Yugo-Slavia. Carniola, Mirna Peč (near Novo Mesto), on *Fagus*, leg. Deg. (Ds). — Dalmatia. Primorje, near the monastery of St. Eufemia, on *Quercus Ilex*, leg. Baumgartner (S).

Habitat Ecology. — *L. glabrata* is mainly an epiphyte on middle-aged and old beeches. Occasionally it can also grow on other trees (especially *Fraxinus*) with smooth bark (cf. the Gotland stations). From Gotland it is also recorded once as growing on *Pinus*. Records of saxicolous specimens refer to other species.

On not too young beeches our species, as a rule, is a component of the union *Pyrenuletum nitidae* (cf. p. 27), often together with other typical beech lichens, as *Opegrapha viridis*, *Pertusaria Wulfenii*, and *Pyrenula nitida*. It is decidedly more photophilous [1] than *Opegrapha viridis* and somewhat more so than *Pyrenula nitida*. Most of the ana-

[1] This term is used in a relative sense, as of course the thick foliage of beech woods always restricts the supply of light during the summer.

Tab. III. Lecanora glabrata - communities.

On the trunks of middle-aged — rather old *Fagus*. — **1. Sk.** Andrarum: Traneboda, S. exposure. — 2. Baldringe: Nyvångsskogen, E. exp. — 3. Bosjökloster: Kulleberga, W. exp. — 4. N. Vram: Vrams Gunnarstorp, W. exp. — 5. Vittsjö: Boalts böke, S. exp. — 6—7. **Bl.** Förkärla: Tromtö, E. exp. — 8. Ibm, W. exp. — 9. Ronneby: Brunnsskogen, S. exp. — 10—11. Ibm, E. exp. — 12. **Sm.** Markaryd: Timsfors, S. exp. — 13. **Hl.** Slättåkra: Spenshult, E. exp. — 14. **Vg.** Partille: Bokedalen, E. exp. — 15. **Sj.** Lidemark: Taageröd, S. exp. — 16. **Mön.** Magleby: Storeklint, S. exp. — 17. **Fyn.** Revninge: Kerteminde Storskov, E. exp. — 18. **Jl.** Bjerning: Vesterskov (pr. Haderslev), E. exp. — 19—20. Tem: Silkeborg Sönderskov, S. exp.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Bacidia rosella	—	—	—	—	—	—	1	—	—	—	—	—	—	1	—	—	—	—	—	—
Buellia betulina ...	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Catillaria Griffithii	—	1	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—
Catinaria Laureri ..	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—
Enterographa graphidioides	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—
Evernia prunastri..	**3**	1	1	—	1	**2**	1	1	—	1	1	1	—	—	—	—	—	—	1	1
Graphis scripta ...	—	—	2	—	—	—	—	—	1	—	—	—	1	—	—	—	—	—	—	—
Haematomma coccineum	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—
— leiphaemum ...	—	3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Lecanora atra	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—
— expallens	**3**	**3**	1	**3**	—	1	—	—	1	**3**	**3**	3	**3**	**3**	—	—	—	—	1	1
— glabrata	**3**	**3**	**3**	**3**	**3**	**3**	**4**	**4**	**3**	**4**	**4**	**3**	**4**	**5**	**3**	**3**	**4**	**4**	**5**	**4**
— intumescens ...	—	—	—	—	1	1	—	—	1	1	1	—	—	—	—	—	—	—	—	—
— subfusca (coll.)	—	1	2	—	—	—	—	1	2	1	1	—	—	2	1	2	2	1	—	1
Lecidea cyathoides var. corticola ..	—	—	—	—	1	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—
— olivacea	—	—	1	—	—	—	1	—	1	—	—	—	1	1	—	—	**2**	1	1	1
— quernea	—	—	—	—	—	—	1	1	2	2	1	1	—	—	—	—	—	—	—	—
Lepraria aeruginosa	**2**	1	**2**	**4**	1	1	1	1	1	2	—	**2**	**2**	—	**2**	**2**	1	1	1	1
— candelaris	—	—	—	—	—	1	—	—	—	1	—	—	—	—	—	—	—	—	—	—
Opegrapha viridis	—	1	—	1	—	—	**3**	2	2	2	—	—	—	—	2	—	—	—	2	1
Parmelia fuliginosa var. laetevirens	1	—	2	—	1	1	**3**	**3**	1	—	1	—	2	—	1	—	—	1	1	1
— physodes	1	—	—	—	1	—	—	—	—	—	**3**	—	—	—	—	—	—	—	—	—
— saxatilis	1	—	—	—	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
— sulcata	1	—	—	—	2	1	2	1	—	—	1	—	—	—	—	—	—	—	—	—
Pertusaria amara ..	**3**	—	1	—	—	3	**4**	**3**	**3**	**4**	**3**	—	**3**	—	1	—	—	—	1	1
— coccodes	2	—	—	—	—	—	1	1	2	—	—	—	—	—	—	—	—	—	—	—
— hemisphaerica ..	—	—	—	—	—	—	—	—	1	1	—	1	—	—	—	—	—	—	—	—
— leioplaca	—	—	1	—	2	—	—	1	1	—	—	—	—	—	—	—	**3**	—	—	—
— leptospora	—	—	—	—	**3**	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
— perfusa	2	—	1	1	**3**	1	1	**3**	—	—	—	1	—	—	2	2	3	—	1	2
— subviridis	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—
— Wulfenii	1	2	1	3	—	—	—	—	—	—	—	1	—	—	2	1	—	2	3	1
Phlyctis agelaea ..	—	—	—	—	—	—	1	1	—	—	—	—	—	—	—	—	—	—	—	—
— argena	—	—	**4**	—	—	3	**4**	**3**	1	1	1	1	**3**	1	2	—	—	—	**3**	**3**
Physcia leptalea ..	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—
Pyrenula nitida ...	—	1	—	1	—	—	—	—	—	—	—	2	—	2	2	**4**	1	1	—	—
Ramalina farinacea	**2**	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—
— fastigiata	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Thelotrema lepadinum	—	—	—	—	—	—	—	—	—	—	—	3	—	—	—	—	—	—	—	—

Tab. III. Continued.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Dichaena faginea	—	—	**3**	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Coccoid Chlorophyceae	—	+	—	+	—	—	—	—	—	—	—	—	—	+	—	—	—	—	—	—
Anomodon attenuatus	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—
Homalothecium sericeum	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	2	—	—
Hypnum cupressiforme	—	1	2	3	1	—	1	—	1	—	—	2	—	—	1	—	—	—	1	1
Leucodon sciuroides	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	2	—	—
Neckera complanata	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—
— pumila	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Ulota Bruchii	—	—	1	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Frullania dilatata	—	—	2	—	—	—	1	—	**2**	1	—	1	1	—	—	1	1	1	—	1
Metzgeria furcata	—	1	1	2	—	—	—	—	1	—	—	—	—	—	—	—	3	3	—	—

lysed sheets listed in tab. III are taken from the southern or eastern sides of the trunks and have been exposed to sunlight in a certain degree. Hence pronouncedly photophilous lichens, such as *Evernia*, *Parmelia fuliginosa* var. *laetevirens*, *Pertusaria amara*, and *pertusa* often play a certain part in *Lecanora glabrata* -communities. Otherwise it is as a rule accompanied by slightly photophilous or photoneutral species, as *Lecanora expallens* and *subfusca*, *Pertusaria Wulfenii*, *Phlyctis argena*, and *Pyrenula nitida*, and the mosses *Hypnum cupressiforme* and *Frullania dilatata*. The photophobous *Opegrapha viridis* is of less importance. Small quantities of the extremely photophobous *Lepraria aeruginosa*, however, are often met with, chiefly in the crevices of the bark, on mosses etc.

Its degree of density can sometimes be rather high and it is not seldom found forming special *L. glabrata* -societies. When growing in beech woods it is mainly a coniophobous lichen, but it can occasionally also be found on somewhat dusty bark, thus having a wider ecological amplitude than the majority of the »beech lichens».

Measurements of pH from 3 *L. glabrata* -societies from dust-free beech bark (Sk. Oppmanna: Bokenäset, Bl. Ronneby: Brunnsskogen, and Jl. Tcm, 5 samples from each station) showed a variation between 5.2 and 5.6, mean 5.4.

Affinity and variation. — *L. glabrata* is one of the best delimited species of the polymorphous *subfusca* group. As a rule it is habitually

easily recognized by its thin, smooth, sometimes oily-shining thallus, often with a yellowish grey colour, and its small apothecia with thin, even margins. Anatomically it differs from *L. subfusca* s. str. (*L. subfuscata* H. Magn.) by its thicker cortex (lower part 50—75 μ; 20—c. 35 μ in *L. subfuscata* and its nearest relatives, see. MAGNUSSON l.c.). The interior morphology of the apothecia agrees with *L. allophana*, which, however, differs in its coarser thallus and especially in the crenulate, often involute margins of the apothecia.

The Scandinavian population growing on *Fagus* is rather uniform. Especially the Gotland and Östergötland specimens gathered on other kinds of tree than *Fagus* look somewhat different, but agree perfectly in the anatomy of the apothecia. They are probably mere modifications caused by the altered substratum.

MAGNUSSON (in herb.) has distinguished two forms, f. *convexa* with almost hemispheric apothecia and f. *evoluta* with evanescent apothecial margins. They seem to be growth states referring to aged specimens.

4. *Lecidea cyathoides* Ach. var. *corticola* (Fr.) H. Magn.

Syn. *Biatora rivulosa* (Ach.) Fr. b. *corticola* Fr. — *L. rivulosa* Ach. var. *corticola* (Fr.) Jatta. — Cf. further ZAHLBRUCKNER Cat. Lich. III (1925) p. 820, MAGNUSSON Studies in the *rivulosa* group of the genus *Lecidea* (1925) p. 28, VAINIO Lich. Fenn. IV (1934) p. 314, and GALLÖE Nat. Hist. of Danish Lichens I (1927) p. 64, plates 35—39 (specimen from Sweden).

History. — In 1818 E. FRIES (E. FRIES exs. 39) distributed a corticolous form of *Lecidea cyathoides* Ach. (=*rivulosa* Ach.), which he described in 1831 as *Biatora rivulosa* b. *corticola*. The locus classicus was probably Femsjö in Småland, as FRIES recorded the lichen as found there in Stirpes agri Femsionensis (1825—26). TH. FRIES (1874) did not attach much importance to this form, but as emphasized by MAGNUSSON (l.c.), it is of considerable interest from the phytogeographical standpoint. This may be the motive of treating it apart from the saxicolous *L. cyathoides*. There are 16 stations of corticolous *L. cyathoides* recorded from S w e d e n. The following list contains about 100 stations from this country.

There are only 2 stations known from N o r w a y (no previous record in the literature). The lichen is not found in D e n m a r k or F i n l a n d.

Scandinavian Distribution.

Sweden.

Skåne. »Copiose ad saxa montana et truncos Fagi.» E. Fries 1835 p. 275. — Bosjökloster: Kulleberga, on *Fraxinus*. 1946! (L.) — Brönnestad: Påbro, on *Fagus*. 1945! — Hörja: 3 km N.E. of the village, on *Fagus*. 1944! (L). — S. Melby: Stenshuvud, very scarce on *Fagus* in the W. slope. 1934 Me (S) Malme 1935 p. 11. — Oppmanna: Arkelstorp. 1916 Me (S) Malme 1937 p. 180. — Röke: 1 km N.W. of the village, on *Fagus*. 1945! (L). — Tosjö: Marieberg, on *Fagus*. 1945! (L). — Vittsjö: near the bridge N. of V., on *Fagus*. 1947! (L); near Lake Lilla sjö, on *Alnus*. 1945! (L); Boalts böke, on *Fagus*. 1945! (K, L); Ubbalt, on *Fagus*. 1945! (L, S). — N. Åkarp: 2 km S. of Bjärnum, on *Fagus*. 1947! (L). — Åsphult: N. of Rickarum, one sterile specimen on *Fagus*. 1945! (L). — Örkelljunga: Åsljunga, on *Alnus*. 1940! (L).

Blekinge. Karlshamn: near the road E. of the town, one specimen on *Fagus*. 1947! (L). — Nättraby: Marieluud, one sterile specimen on *Fagus*. 1945! (L). — Ringamåla: the churchyard, one specimen on *Aesculus*. 1945! (L).

Småland. »In Smolandia occidentali sat frequens». Th. Fries 1874 p. 450. — Anebodа: S.W. side of Lake Fiolen, on *Betula*. 1933 Deg. (Ds). — Angelstad: S. of Sjöhaga, on *Fagus*. 1945! (L); Bolmstad, on *Fagus*. 1945! (L). — Burseryd: S. Påbo, on *Sorbus aucuparia*. 1944 Deg. (Ds). — Femsjö. E. Fries (S) E. Fries 1825—26 p. 37; ibm, on *Fagus* and *Betula*. 1851, 59 Th. Fries (N, S, U, Stur exs. 167, Th. Fries exs. 43); on *Fagus* and *Betula*. 1859 Blomb. (L, N, S, U) Malme 1937 p. 180; Hägnen, on *Betula*. 1851 Th. Fries (U); ibm, on *Fagus*. 1926 Deg. (Ds); S. Sarahöke, on *Fagus*. 1945! (L); Saxhult, on *Populus tremula*. 1945! (L); Skubbhult, on *Fagus*. 1945! (L). — Gryteryd: Hökahäck, on *Fagus*. 1945! (L). — Göteryd: Fagerhult, on *Betula*. 1932 Deg. (Ds). — Hinneryd: Gunghult, on *Fagus*. 1943! (L). — Markaryd: between Axhult and Traryd, on *Alnus*. 1943! (L). — Landeryd: N. of Jansbergssjön, on *Fagus*. 1945! (L). — Misterhult: island of Jungfrun, the N.W. ravine, W. slope, on *Betula*. 1914, 20 DR. (Dz). — Mulseryd: Komosse, on *Betula*. 1925, 36 DR. (Dz). — Odensjö: Hylte, on *Sorbus aucuparia*. 1945! (L); Röshult, on *Fagus*. 1945! (L). — Rydaholm: N. of Rafsebo, on *Fagus*. 1945! (L, S). — Tannåker: near Finntorpet, on *Fagus*. 1945! (L). — Torpa: Rånköp, on *Fagus*. 1943! (L). — Villstad: Käfset, on *Betula*. 1929 Deg. (Ds). — Växtorp: Tagel, near the boardinghouse »Solgården», on a young *Fagus*. 1947 Deg. (Ds). — Växjö: Biskopsnäset, on *Fagus*. 1946! (L). — Sine loco: on *Fagus*. Th. Fries (T).

Halland. Abild: Arnared, on *Fagus*. 1945! (L). — Bredared: Grove. 1933 Sthm (G). — Enslöv: S. of Oskarsström, on *Alnus* near the road. 1947! (L). — Fagered: Höghult, on *Betula*. 1926 Sthm (T). — Fjärås: Dal, on *Sorbus aucuparia*. 1921 Magn. (M); Gäddevik, on *Fagus*. 1921 Sthm (G). — Getinge: Fröllinge, on *Fagus*. 1943, 45! (L). — Gunnarp: Tallsjö. 1936 Sthm (G); ibm, on *Fagus*. 1945! (L). — Hasslöv: Bondäkra, on *Fagus*. 1942! — Hishult: Slätthult, on *Betula*. 1926 Sthm (G). — Knäred: S. of Trälshult, on *Sorbus aucuparia*. 1932 Deg. (Ds); Bassalt, near the power station, on *Fagus*. 1936 Me (S); Ön, on *Fagus*. 1936 Me (S) Malme 1937 p. 180; S. of the village, on *Fagus*. 1945! (L). — Rolfstorp: Huxered, on *Fagus*. 1932 Magn. (M). — Sibbarp: S. of Skärbäck, on *Fagus*. 1945! (L). — Slättåkra: Spenshult, on *Fagus*. 1947! (L).

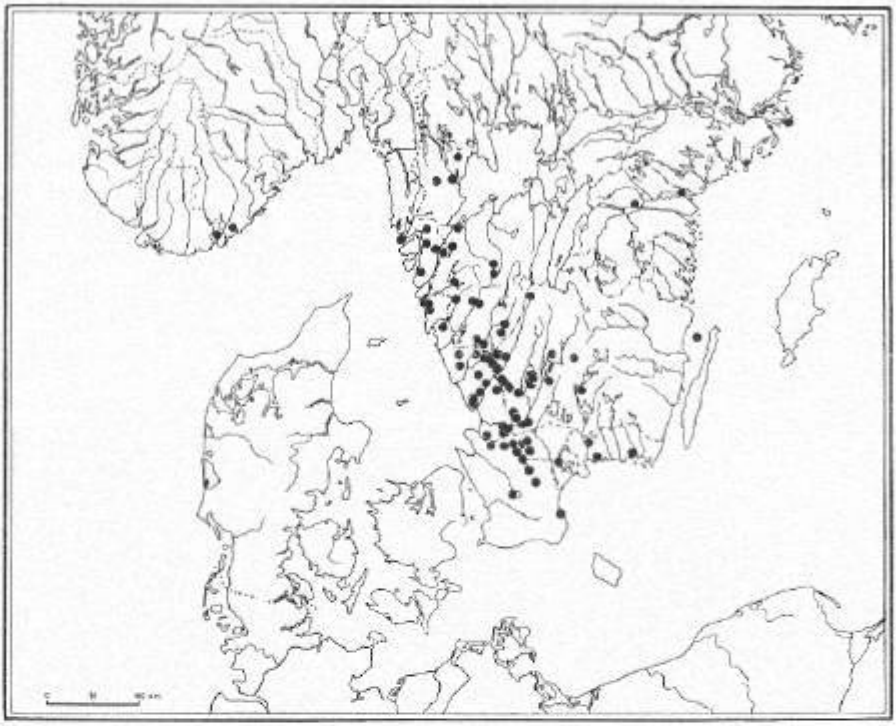


Fig. 8. *Lecidea cyathoides* var. *corticola* in Scandinavia.

Bohuslän. Hjärtum: N. of Vargklintarne, on *Betula*. 1937 Hedv. (L). — Jörlanda: Ranebo lund, one specimen on *Fagus*. 1945 Magn. (M) MAGNUSSON 1946 p. 212. — Ljung: E. of Ljungskile. 1940 Magn. (M). — Skaftö: L. Skaftö, on *Tilia*. Deg. DEGELIUS 1939 p. 127. — Uddevalla: Kristinedal, on *Sorbus aucuparia*. 1942 Magn. (M).

Dalsland. Bäcke: Hjulserud, on *Sorbus aucuparia*. 1919 C. Bergström (M); Regneberg, on *Betula*. 1917 S. and C. Bergström (M); Vättungen, near Lake Marsjön, on *Betula*. 1923 S. Bergström (G). — Edsleskog: Hinsknatten (S), Havsåsen and Ortschakoffsberget (=Oxakoff on the map), all on *Betula*. Hult. HULTING 1900 p. 64. — Skållerud: Håverud, on *Betula*. Hult. HULTING l.c.

Västergötland. Bollebygd: Stockagärde and Vikhult, on *Betula*. 1928, 41 Magn. (M). — Borås: Hultaberg. 1914 Vrang (S, U). — Gärdhem: Velanda, on *Betula*. 1944 Magn. (S). — Kållered: Tärässjön, on *Alnus*. 1927 Magn. (M). — Källunga. Hult. TH. FRIES 1874 p. 450. — Mjöbäck: E. of the church, on *Betula*. 1922 Sthm (G). — Mårdaklev: Åsabol, on *Fagus*. 1923 Me (S) MALME 1924 p. 312, 1937 p. 180. — Mölndal: Bunketorp, on *Quercus*. 1937; near Villa Denninghoff, on *Quercus*. 1933; Långvattnet, on *Sorbus aucuparia*. 1922; Rävekärr, on *Alnus*. 1926; S. of Stensjön, on *Sorbus aucuparia*. 1927; all Deg. (Ds). — Od:

Ljunga, on *Fagus*. 1908 Hult. (G) HULTING 1912 p. 431. — R å d a: Bråta, on *Alnus*. 1924 Sthm (G); Möhlycke, on *Sorbus aucuparia*. 1928 Magn. (M); Pixbo. 1923 Sthm (L); Råda säteri, on *Sorbus aucuparia*. 1930 Sthm (Ds, L. MAGN. exs. 232). — S a n d h u l t: Sandared, on *Alnus*. 1941 Magn. (M). — S j ö t o f t a: Fagerås. 1923 Sthm (G, M). — S k a l l s j ö: Alelund, on *Betula*. 1944 Magn. (S). — T r a n e m o: Hjärphult, on *Betula*. 1923 Sthm (G). — T u n g e: E. of Kärra, on twigs of *Quercus*. 1936 Hedv. (L). — V. T u n h e m: Halleberg, on *Betula*. 1915 Me (M, S, MALME exs. 516); ibm. 1915 Vrang (M, S, U).

Östergötland. K v a r s e b o: Gjutberget, on *Sorbus aucuparia*. Hult. HULTING 1925 p. 45. — V å n g a: Vite Klint, on *Betula*. Hult. HULTING l.c.

Södermanland. N ä m d ö: rather common. 1943 Deg. (Ds) DEGELIUS 1943 b p. 412.

S i n e l o c o. E. FRIES exs. 39 (cf. above).

N o r w a y.

Aust-Agder. V. M o l a n d: Möglestu, one specimen on a cultivated *Fagus* in the village. 1947! (L).

Vest-Agder. O d d e r n e s: Topdalsfjord. 1939 Magn. (M, S).

From a phytogeographical point of view, this lichen cannot directly be compared to other representatives of group C. It has its centre of distribution in Western Småland and the adjacent parts of Skåne, Halland and Västergötland. It is a common plant in some of these districts. The pronouncedly oceanic tendency in its Swedish distribution reminds one of the lichens treated by DEGELIUS 1935 (cf. the Swedish areas of e.g. *Leptogium cyanescens* or *Lobaria amplissima*). But the lichen is rare in Norway and quite lacking in the Norwegian Vestland, where it should be frequent, if it were typically oceanic. Its absence in S. Skåne, Denmark and the N.W. German lowland, where, as it seems, suitable trees are found everywhere, is noticeable, and its area is quite different from other types of distribution among South Scandinavian lichens. Its absence from the last-mentioned districts is perhaps connected with the lacking or rareness of the saxicolous main type there; the variety having small power of invading new distributional areas. In my opinion, it must be characterized as oceanic, having its optimum in the high precipitation districts of S.W. Sweden, while its occurrence in W. Norway is prevented by an insufficient summer temperature. (Cf. further Chapter VI B.)

The variety has a much more limited area than the main type of *L. cyathoides*. The saxicolous type is relatively common on granitic stone in South and Middle Sweden, reaching Ångermanland and Västerbotten (HELLBOM 1884). It is also found in Denmark (Bornholm),

Norway (rather common in W. Norway, see. HAVÅS 1917—18, northernmost station Vågan in Lofoten, see. MAGNUSSON l.c.) and in some places in the western parts of Finland. It is a southern species (group A) though with a certain western tendency.

Extra-Scandinavian Distribution. — As stated by MAGNUSSON (l.c.) the distribution and frequency of var. *corticola* seems to be somewhat obscure and irregular and therefore worthy of further investigation. It is chiefly restricted to the mountain districts in Europe. As it seems to need both a high amount of precipitation and a rather high summer temperature, it is lacking in some of the most extremely oceanic districts, W. Norway (of above) and the British Isles.

In Germany it is recorded, mostly on *Fagus*, mainly from the interior parts e.g. Westphalia (LAHM 1885), Saxony and Thuringia (RABENHORST 1870), Hessen (BAUER 1859), Silesia (STEIN 1879), Baden (BAUSCH 1869), and Bavaria (KREMPELHUBER 1861). It is also known from Switzerland (FREY 1923).

BOULY DE LESDAIN (1905) reported it from Spa in Belgium (on *Fagus*). In France the corticolous form seems to be lacking in the West (not recorded by OLIVIER 1897) but is known from some mountainous interior districts, e.g. Lorraine (HARMAND 1895—99), Mont Dore (LAMY 1880), Espinouze in the Cevennes (CROZALS 1914). As stated above, there is no record from the British Isles.

It is unknown from Portugal (TAVARES in litt.) and recorded from some few places in Spain, mainly Catalonia (DEL AMO 1870, LLENAS Y FERNANDEZ 1909). From Italy JATTA (1909—11) stated it as occurring »ad *Fagorum* cortices in Liguria, Etruria, Aprutio et Calabria». In Yugo-Slavia it seems to be frequent especially along the Dalmatian coast (cf. MAGNUSSON l.c., SERVIT 1929, v. DEGEN 1938).

In Russia it is reported chiefly from the Leningrad district (see. ELENKIN 1911).

MACOUN (1902) reported it as growing »on bark of living beech trees at Ottawa» in Canada, the only exact extra-European statement known by me.

Habitat Ecology. — In its centre of distribution the lichen grows mainly on *Betula* and *Fagus*, sometimes also on *Alnus* and *Sorbus aucuparia*. Occasionally it has also been found on *Fraxinus*, *Quercus*, and *Tilia*. The specimen from Ringamåla in Blekinge, which grew on an *Aesculus* in a somewhat dust-impregnated position, was badly developed and sterile. Otherwise it is as a rule met with in a photophilous epiphytic vegetation, often on solitary trees or in woods with not too small an access of light. Hence it is often accompanied by foliose and fruticose lichens, e.g. *Evernia prunastri*, *Parmelia fuliginosa*, *physodes* and *sulcata*. The rather photophilous crustaceous lichens *Pertusaria amara* and *pertusa*, which play a considerable role in the analysed communities (tab. IV), are also noticeable. Though my analyses were exclusively taken from beech, there were very few »beech lichens» present. *Ope-*

Tab. IV. Lecidea cyathoides var. corticola - communities.

On the trunks of rather young — middle-aged *Fagus*. — 1. **Sk.** Vittsjö: N. of the village, S. exposure. — 2. Ibm, W. exp. — 3—4. Vittsjö: Boalts böke, S. exp. — 5. N. Åkarp: S. of Bjärnum, W. exp. — 6. **Sm.** Landeryd: N. of Jansbergssjön, S. exp. — 7—9. **Hl.** Slättåkra: Spenshult, E. exp. — 10. **Aust-Agd.** V. Moland: Möglestu, E. exp.

	1	2	3	4	5	6	7	8	9	10
Arthonia radiata	—	—	—	—	—	—	—	—	—	**3**
Buellia betulina	1	**1**	**1**	2	**3**	**1**	**2**	3	1	**1**
— disciformis	—	—	—	—	—	—	1	—	—	—
Cetraria glauca	—	2	—	—	—	—	—	—	—	—
Cladonia ochrochlora	—	—	—	1	—	—	—	—	—	—
Evernia prunastri	**1**	1	1	—	—	1	—	—	1—	1—
Graphis scripta	—	—	—	—	—	—	1	2	—	1
Lecanora expallens	**1**	1	—	—	—	—	—	—	1—	—
— glabrata	—	**1**	2	1	—	1	—	—	—	—
— intumescens	**1**	**1**	1	—	—	—	—	3	—	—
— pallida	—	—	—	—	—	—	1	—	—	—
— subfusca (coll.)	—	—	—	—	2	3	1	**1**	1	1
— varia	—	—	—	—	—	—	—	1	—	—
Lecidea cyathoides var. corticola	**3**	**3**	**3**	**3**	**3**	**3**	**3**	3	**3**	2
Lepraria aeruginosa	**1**	1	1	1	2	1	**2**	—	1	—
Ochrolechia androgyna	1	—	—	—	—	1	1	—	—	—
Parmelia fuliginosa var. laete-virens	**1**	**1**	1	—	**1**	1	1	—	2	1
— physodes	**1**	2	1	—	—	1	—	—	—	—
— saxatilis	—	—	2	—	—	—	1	—	**1**	—
— sulcata	**1**	2	2	1	2	1	**3**	—	2	—
Pertusaria amara	**3**	**3**	—	**1**	3	3	**4**	1	3	—
— coccodes	—	—	—	—	—	—	1	—	—	—
— hemisphaerica	1	—	—	—	—	1	—	—	—	—
— leioplaca	1	—	2	—	2	2	—	—	—	**4**
— leptospora	—	—	2	—	—	1	—	—	—	—
— lutescens	—	—	—	—	—	—	—	—	—	1
— pertusa	**4**	**3**	**3**	2	—	1	2	2	2	1
— Wulfenii	1	—	—	—	—	—	—	—	—	—
Phlyctis argena	1	2	—	—	**3**	2	**3**	3	**3**	**4**
Pyrenula nitida	—	—	—	—	—	—	—	2	—	—
Thelotrema lepadinum	—	—	—	3	—	—	—	—	—	—
Dichaena faginea	1	—	—	—	—	—	—	—	—	—
Coccoid Chlorophyceae	—	—	—	—	—	—	—	—	—	+
Hypnum cupressiforme	3	1	—	4	—	2	1	—	1	—
Ulota cfr Bruchii	—	—	1	—	—	—	—	—	—	—
Frullania dilatata	—	—	—	1	—	1	—	—	—	—

grapha viridis was never recorded; the somewhat more photophilous *Lecanora glabrata*, *Pertusaria Wulfenii*, and *Pyrenula nitida* only in some few cases. Its degree of density is not very high, as it has small chances to compete with the accompanying macrolichens. The societies belong to the federation *Physodion* and the union *Physodeto-sulcatetum*,

which is characteristic of relatively illuminated trunks of various deciduous trees on stations with small or no influence from dust (cf. DU RIETZ 1945 p. 117, KRUSENSTJERNA 1945 p. 91, and the present work p. 221). Considering the differences against the far more photophobous federation *Graphidion* with the union *Pyrenuletum nitidae* (with mainly crustaceous lichens), which is also found on beeches, cf. i.a. tables III, VI, IX, and X.

Measurements of pH were made at two stations (Sk. Vittsjö: Boalt, and N. Åkarp); 5 samples from each gave values normal for beech bark, varying between 5.2 and 5.7, mean 5.4 (cf. under *Lecanora glabrata*). Thus there is no difference as to the acidity of the two unions, the differences in the composition of species merely being due to light conditions (cf. Chapter VI A).

Affinity and Variation. — As pointed out by MAGNUSSON, there is no possibility of regarding the corticolous *L. cyathoides* as a proper species, its internal structure being quite the same as in the saxicolous main type. The black intersecting hypothalline lines connecting several thalli, which often gives a conspicuous habit to the type, are not so well developed in the variety. The apothecia are often more sessile than in the main type. The colour of the thallus varies in the same directions in both types, from dark brown to ash grey. It can be discussed whether it has a greater taxonomic value than a form, but the characters mentioned, together with its special geographical distribution may justify its ranking as a variety.

Regarding its similarity with *Catillaria Lightfootii*, cf. MAGNUSSON (l.c.) and VAINIO (1934 p. 316). The latter species has distinctly 2-celled spores, while in *L. cyathoides* no real septa are formed, though the contents of the spores often divides into two drops.

5. *Opegrapha atra* Pers.

Cf. ZAHLBRUCKNER Cat. Lich. II (1924) p. 167 VIII (1932) p. 189, and REDINGER in RABENHORST's Kryptogamenflora IX. 2:1 (1938) p. 334.

History. — The lichen was described in 1794 by PERSOON from Germany. In Lichenographiæ Svecicæ Prodromus (1798) ACHARIUS recorded it from S w e d e n (»in ramis *Fagi* et *Fraxini*») under the name of *Lichen denigratus*. The first exact Swedish locality was published from Femsjö in Småland (E. FRIES 1825—26), and it was distributed, probably also from Femsjö, in E. FRIES exs. 65 (edited in 1824).

Hitherto there are literary records of about 50 Swedish stations. In the present work more than 150 occurrences are listed from this country.

In Norway the species was first collected by M. N. BLYTT in Vestagder and Telemark (published in 1829). The total number of Norwegian localities known to me is only 11.

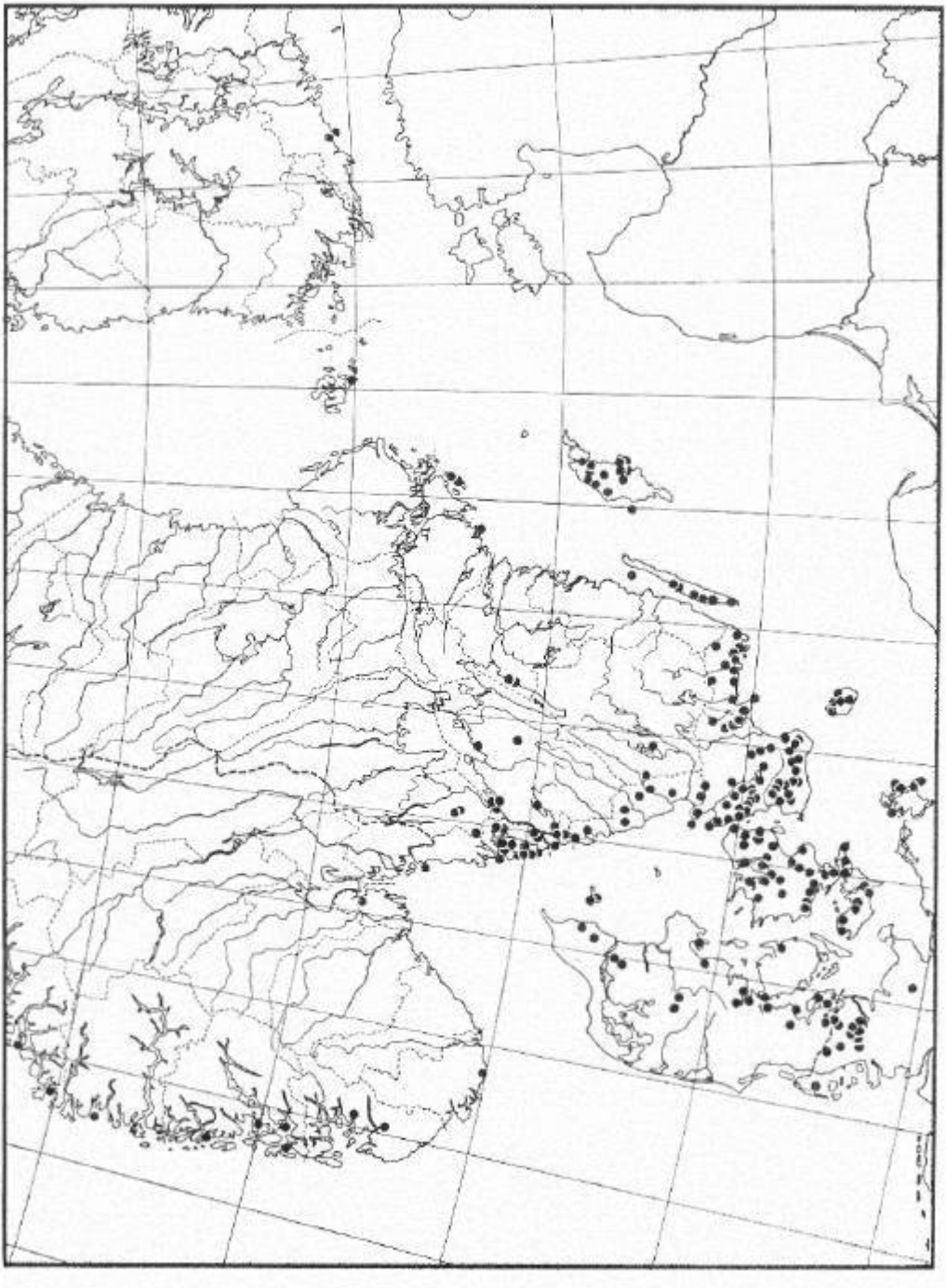
The first statement from Denmark is a figure in Flora Danica, vol. XI. tab. 1949 (1829) with the text »in truncis *Pini*». HORNEMANN (1836) recorded it as growing »on trees with smooth bark» (transl. fr. Dan.). Though the species is not uncommon in Denmark, there are only 12 exact stations published in the literature, most of them from Bornholm. I know about 70 collections of the lichen in Denmark.

The first of the few occurrences in Finland was published from Åland in 1861.

Scandinavian Distribution.

Sweden.

Skåne. »Copiose in corticibus, in ramulis abit in maculas stellatas». E. FRIES 1835 p. 281. — Bara: Torup, on *Fraxinus*. 1946! (L). — Benestad: Örups almskog, on *Fraxinus*. 1915 N. Askelöf (Dz); ibm. on *Corylus*. 1945! (L). — Bosjökloster: Kulleberga, on *Fraxinus*. 1945! (L). — Brunnby: Kullen. 1871 S. Almquist (S) REDINGER 1938 p. 341; ibm, on *Corylus*. 1886 Berg (L); ibm, on *Fraxinus, Quercus, Corylus*, rather frequent. 1902 B. NILSON (B, U) B. NILSON 1903 p. 490; Koekenhus, on *Fraxinus*. 1890 Berg (L); Krapperup, the park, on *Fraxinus*. 1939 Deg. (Ds); Käringmalen, on *Fagus*. 1943! (L). — Bårslöv: Görarpsmölla, on *Corylus*. Alvthin. ALVTHIN 1912 p. 18. — Dalby: Dalby Söderskog. 1891 Berg (B, G); ibm, on *Fraxinus* and *Corylus*. 1934 Me (S) MALME 1934 p. 8; ibm, on *Fraxinus*. 1937 Deg. (Ds); ibm, on *Fraxinus*. 1934! (L). — Degeberga: Forsakar, on *Fraxinus*. 1943! (L). — Fjälkestad: Knutstorp, on *Fagus*. 1944! (L, S). — Fjärestad: N. Vallåkra; on *Fraxinus, Quercus, Corylus*. 1894, 1900 Alvthin (L, U) ALVTHIN l.c. — Fågeltofta: Kronovall, on *Fraxinus*. 1945! (L). — Genarp: Häckeberga, on *Fagus*. 1946! (L). — Hardeberga: Arendala park. 1890 Berg (L); Fågelsång, on *Corylus*. 1889 Berg (L, S); ibm. 1890 Me (S); ibm, on *Fraxinus*. 1946! (L); Maskängen, on lignum. 1890 Berg (L). — Ö. Herrestad: Gärsnäs, on *Sorbus aucuparia, Acer, Juglans*. 1891 Berg (H, L). — Hjärsås: Immeln. 1890 Me (S). — Hov: Ingelstorp, on *Fraxinus*. 1942! (L, S). — Hälsingborg: Pålsjö. 1900 B. Nilson (H, L, N, T, U). — Hörby. 1891 Me (S). — Ivö. P. Cleve (U) S. ALMQUIST 1869 p. 23; Ugnsmunnarna, on *Fraxinus*. 1943! (L). — Kvistofta: Gantofta, on *Fraxinus*. Alvthin. ALVTHIN l.c. — Kågeröd: Knutstorp, on *Fraxinus*. 1937 Deg. (Ds). — Lomma: Almarp. 1892 Berg (B). — Lund. E. Fries (U) S. ALMQUIST l.c. — S. Mellby: Esperöd, on *Fraxinus*. 1890 Me (S); Stenshuvud. 1890 Me (S); ibm, on *Fraxinus, Corylus, Quercus*. 1934 Me (S) MALME 1935 p. 9. — Oppmanna: Arkelstorp, on *Fraxinus*. 1890, 1916 Me (S); Bokenäset, on *Fagus* and *Fraxinus*. 1916 Me (S). — Ottarp: Bälteberga, on *Ulmus, Fraxinus, Corylus*. 1893—1901 Alvthin



(B, Dz, G, L, S, T, U) ALVTHIN l.c. — Raus: Örby, on *Quercus, Corylus, Sorbus aucuparia*. 1901 Alvthin (G, L, U) ALVTHIN l.c. — Riseberga: Farstorp, on *Fraxinus*. Alvthin. ALVTHIN 1912 p. 18. — Röstånga. 1933 Sthm (G). — Sirsköpinge: the park, on *Alnus, Ulmus, Fraxinus*. 1894, 1900 Alvthin (L, O, S, U); Brödåkra. Alvthin (G) ALVTHIN 1904 p. 24. — Skurup. 1903 A. Heintze (B, G, N, U). — Stenestad: Klövahallar, on *Corylus* and *Alnus*. Alvthin ALVTHIN 1912 p. 18. — Svalöv: Axelvold, on *Fraxinus*. 1946! (L). — Ö. Sönnarslöv: Maltesholm. 1890 Me (S); ibm, on *Fagus*. 1944! (L). — Sövestad: Krageholm, Vistorp, on *Fraxinus*. 1943! (L). — Torekov: Hallands Väderö, on *Fagus*. 1884 Hellb. (G, S) HELLBOM 1887 p. 67; ibm. 1944! (L). — Tosterup: Tosterupsskogen, on *Fraxinus*. 1945! (L). — Vallby: Glimmingehus. 1890 Me (S). — V. Vram: on *Fraxinus*. 1890 Me (S). — Örkened: Nyteboda. 1890 Me (S).

Blekinge. »On the bark of deciduous trees, several stations» (transl. fr. Swed.). FALK 1874 p. 21. — Hjortsberga: Tolseboda, near Lake Sännen, on *Fagus*. 1937! (L). — Hoby: Järnavik. 1871 Hult. HULTING 1872 p. 21. — Jämjö: Lökaryd, on *Sorbus aucuparia*. 1872 Svanlund (Ka, L, U) FALK l.c. — Karlskrona: Verkö. 1871 Svanlund (Ka, L); Vämö, on *Fraxinus*. Falk (S, U) FALK l.c. — Lösen: Ringö, on *Fagus*. 1860 H. G. Lübeck (Ka, L); ibm. Falk FALK l.c. — Mjällby: Hanö. 1871 Hult. HULTING l.c. — Mörrum: 1871 Hult. HULTING l.c. — Ronneby: Brunnsskogen, on *Sorbus aucuparia*. 1946! — Sillhövda: Holmsjö, on *Fagus*. 1872 Falk (L) FALK l.c.; ibm. 1879 Falk (Ka). — Sölvesborg: Sissebäck. 1931 Sthm (G); Valje. 1931 Sthm (G); ibm. 1943! — Tving. 1871 W. Molér (Ds, S). — Öljehult: on *Alnus* and *Sorbus aucuparia*. 1873 Falk (KA, S, U) FALK l.c.

Öland. Borgholm: on *Fraxinus*. 1913, 14 DR. (Dz, G, S, MALME exs. 465) REDINGER l.c. — Högsrum: Halltorp, on *Carpinus*. 1913 DR. (Dz). — Kastlösa: St. Dalby, on *Fraxinus*. 1912 DR. (Dz); ibm, on *Acer* and *Fraxinus*. 1943! (L). — Repplinge: the slopes near the castle of Borgholm. 1867 J. E. Zetterstedt (L, S, U) S. ALMQUIST 1869 p. 23; ibm, on *Sorbus aucuparia, Corylus, Ulmus glabra*. 1913 DR. (Dz); Lasarettsskogen, on *Fraxinus*. 1913 DR. (Dz, U); »Garderobstrappan», on *Ulmus*. 1926 Deg. (Ds); E. side of the castle, on *Ulmus*. 1943! (L, S) — Resmo: Gynge lund, on *Fraxinus*. 1912 DR. (Dz). — Torslunda: Arontorp, on *Fraxinus*. 1926 Deg. (Ds); Tveta. 1867 J. E. Zetterstedt (L, S, U) S. ALMQUIST l.c.; ibm, on *Fraxinus*. 1930 Deg. (Ds); the churchyard, on *Fraxinus*. 1943! — Ås: Ottenby lund, on *Sorbus aucuparia*. 1912 DR. (Dz).

Gotland. Alskog: Svejde. 1918 Me (S). — Ardre: near the old church. 1918 Me (S) REDINGER l.c. — Boge: P. T. Cleve (U) S. ALMQUIST l.c. — Bro: on *Fraxinus*. 1892, 93 T. Vestergren (L, S). — Dalhem: at the church, on *Fraxinus*. 1932 Deg. (Ds) DEGELIUS 1936 p. 64. — Eksta: St. Karlsö, on *Juglans*. 1943 Deg. (Ds). — Etelhem. 1845 Sthr STENHAMMAR 1848 p. 219; at the railway station, on *Corylus*. 1932 Deg. (Ds) DEGELIUS l.c. — Gammelgarn: near Kräklingbo, on *Juniperus*. 1932 Deg. (Ds) DEGELIUS l.c. — Othem. 1863 P. T. Cleve (U). — Stenkumla: Myrsjö. 1869 Laurer (U). — Vamlingbo: Bottarve, on *Fraxinus* and S. of the church, on *Pinus*, both 1932 Deg. DEGELIUS l.c. — Västkinde. 1917 Malme (S). — Visby: near V. 1891 Me (S); between Galgberget and Snäckgärdet, on *Hedera*. 1943 Deg. (Ds, S); Palissaderna, on *Corylus*. 1932 Deg. (Ds) DEGELIUS l.c. — Öja: Burgsvik. 1918 Me (S). — Östergarn: Katthammarsvik, Vika, on *Fraxinus*. 1932 Deg. DEGELIUS l.c.

Småland. Angelstad: Bolmstad, on *Fagus*. 1945! (L) — Femsjö: »p(assim)». E. Fries (S, U) E. Fries 1825—26 p. 40. S. Almquist l.c.; ibm. on *Sorbus aucuparia*. 1859 Blomb. (L). — Misterhult: Jungfrun, on *Tilia, Populus tremula, Sorbus aucuparia, Quercus*. 1913, 14 DR. (Dz, U).

Halland. Abild: Arnared, on *Fagus*. 1945! — Eldsberga: Stjärnarp, on *Quercus*. 1947! — Fjärås: Rossared, on *Fraxinus*. 1945! (L). — Hasslöv: Bondåkra, on *Fagus*. 1942! — Köinge: Domarp. 1925 Sthm (G). — Sibbarp: S. of Angryd, on *Fagus*. 1945! — Släp: Särö, on *Ulmus* near the church. 1937 Deg. (Ds). — Slättåkra: Spenshult, on *Sorbus aucuparia*. 1947! — Våxtorp: Ekebråna and Nordanå. 1926 Sthm (G).

Bohuslän. Forshälla: Vassbosjön, on *Fraxinus*. 1940 Magn. (M). — Långelanda: Röd, on *Ulmus*. 1926 Magn. (M). — Marstrand: Koön, Blomb. (L, U) S. Almquist l.c.; ibm. on *Sorbus aucuparia*. 1884 Hellb. Hellbom l.c.; Backudden, on *Corylus*. 1868 Blomb. (L) Blomberg 1869 p. 181; Rosenlund, on *Populus tremula*. 1869 Blomb. (L, S). — Romelanda: Lysegården. 1924 Sthm (G, U). — Rönnäng: Kjärrsö, on *Fraxinus*. 1937 Magn. (M). — Röra: Henån. 1930 Sthm (G); ibm. on *Populus tremula*. Magn. (M); Olseröd, on *Alnus*. 1932 Magn. (M). — Skaftö: common on *Fraxinus*, also on *Fagus, Quercus, Tilia*. Deg. (Ds) Degelius 1939 p. 114. — Stenkyrka: Djupvik, on *Sorbus aucuparia*. 1920 Magn. (M); Skoglandsberget, on *Fraxinus*. 1942 Magn. (M). — Tegneby: Lyrön, on *Fraxinus*. 1926 Deg. (Ds, L). — Tjärnö: Sydkoster, on *Fraxinus* and *Quercus*. 1917 Magn. (G, M) Magnusson 1919 p. 77. — Torp. M. M. Floderus. S. Almquist l.c. — Uddevalla: Kristinedal, on *Fraxinus*. 1942 Magn. (M). — Ytterby: Marieberg, on *Fraxinus*. 1943 Magn. (M). — Ödsmål: on *Fraxinus*. Magn. Magnusson l.c. — Sine loco. »Ad corticem Fagi in Bahusia». Sthr exs. 118.

Dalsland. Bäcke: Björlveten, on *Corylus*. 1918 S. Bergström (S) Rediger l.c.; Regneberg, on *Corylus*. 1928 S. and C. Bergström (U). — Dalskog: Tegen. Hult. Hulting 1900 p. 79. — Valbo-Ryr: Vågsäter, »very rare». Hult. Hulting 1899 p. 229 and l.c.

Västergötland. Alingsås: Fagerlid, on *Fraxinus*. 1936 Magn. (M, S). — Angered: Lärjeholm, on *Fraxinus*. 1936 Sthm (O). — Flo: Mossebo, on *Salix caprea*. 1869 Blomb. (L, S). — Göteborg. C. J. Lindeberg. S. Almquist l.c.; Rya skog, on *Fagus*. C. J. Lindeberg (Ka); Änggården, on *Corylus*. Magn. Magnusson l.c. — Kållered: Labacka, on *Fraxinus*. 1937 Magn. (M). — Medelplana: Kinnekulle, Blomberg, on *Corylus* and *Fraxinus*. 1862 Gruewe (U) S. Almquist l.c.; ibm. on *Corylus*. 1865 Blomb. (G, L, U) Blomberg 1867 pp. 118, 123, Rediger l.c.; Mörkeklev, on *Fraxinus*. 1868 R. Indebetou (S). — Partille: Bokedalen. C. J. Lindeberg (U). — V. Tunhem: Halleberg. Lilleskog. 1915 Me (B, S) Rediger l.c.; Munkesten. 1915 Vrang (Dz, M, S, U); Hälleklev, on *Sorbus aucuparia*. 1927 Deg. (Ds). — Vassända-Naglum: Onsjö, on *Quercus*. 1892 A. G. Eliasson (S). — Vilske-Kleva: Jonstorp, near Mösseberg. 1869 Blomb. (L, S). — Vänersnäs: Hälleklev, on *Sorbus aucuparia*. 1927 Deg. G. Nilsson (Degelius) 1929 p. 104.

Östergötland. [Grebo. Sthr (S) Hulting 1925 p. 14. Belongs to *O. subsiderella*. — Häradshammar: Kättinge, on *Betula*. Sthr (S) Hulting l.c. Belongs to *O. herpetica*.] — V. Tollstad: Alvastra, on *Fraxinus*. 1909 Me (O, S); Hästholmen. 1915 Vrang (U); Omberg. 1853 J. E. Zetterstedt (U); ibm. on *Fraxinus*. 1915 Me (Dz, L, S);

Mullskräerna, on *Alnus incana*. 1915 Me (S); the reserve, several stations, on *Alnus, Corylus, Fraxinus*, and *Ulmus*. 1944 Deg. (+var. *reticulata*) (Ds, S) Degelius 1944 b p. 16. — Ödeshög: Öninge, on *Tilia*. 1915 Me (S, Malme exs. 539); ibm. 1915 Vrang (G, S).

Södermanland. Bälinge: Längö and Sandvik. 1900 F. O. Westerberg (L). — Ornö: Lättinge, on *Corylus*. 1941 Deg. (Ds); Ängsholmen, on *Fraxinus*. 1941 Deg. (Ds, U) Degelius 1942 p. 22.

[Gästrikland. »b. *macularis* t.a.» (=rather frequent). Hartman 1863 p. 54. Probably not referring to *O. atra*.].

Norway.

Vestfold. Holmestrand: the railway station, on *Fraxinus*. Norman (B, O).

Telemark. Sine loco. M. N. Blytt (O).

Vest-Agder. Mandal. M. N. Blytt. Blytt 1829 p. 279. S. Almquist l.c.

Rogaland. Forsand: Dirdal, the slope E. of the church, on *Fraxinus*. 1947! (L, S) — Årdal: Riskedal, on *Fraxinus*. 1947 Deg. (Ds).

Hordaland. Askøy: on *Corylus*. 1909 Hav. (B, Hav. exs. 520). — Eid: Halsenøy Kloster, on *Ilex*. 1919 Holmboe (B). — Moster: Mosterhavn, rather common, especially near Vetahaug, on *Corylus, Sorbus aucuparia*, and other deciduous trees. 1914 Hav. (K, L, M; Hav. occ. exs. 99) Havås 1917—18 p. 15. — Tysnes: Onarheim, on *Fraxinus*. 1927 Deg. (Ds).

Sogn og Fjordane. Florø. 1877 Norman (B, O). — Selje: on *Corylus*. »Rather rare in the Stadt district, probably owing to the lacking of suitable substrata» (transl. fr. Norw.) Havås 1935 p. 30.

Möre. Ålesund: Fredsberg. Norman (O) Rediнger l.c.

Denmark.

Sjælland. Aagerup: Eriksholm, on *Aesculus, Fraxinus*, and *Tilia*. 1941 Chr. (K). — Draaby: Nordskov, on *Fraxinus*. 1942 Chr. (K). — Egebjærg: Kongsöre Nebbe, on *Fraxinus*. 1945! (L). — Fodby: Saltö Skov, on *Fagus*. 1947! (L). — Freerslev (pr. Haslev): on *Fraxinus*. Branth (K). — Gevninge: Borrevejle Skov, on *Fraxinus*. 1946! (L). — Haraldsted: Allindelille Fredskov, on *Cornus*. 1942 Chr. (K); ibm. on *Fraxinus*. 1946! (L). — Herlufsholm: on *Fraxinus*. 1947! (L). — Herslev: Bognæs, Askehoved. 1942 Chr. (K). — Holsteinborg: Rude Skov, on *Fagus*. 1947! (L). — Hornbæk-Hellebæk: Hellebæk. 1901 B. Nilson (L, U). — Hörsholm: Fole Have, on *Fagus*. 1947! — Jyderup: N. of Skarresö, on *Fraxinus*. 1946! (L). — Kalvehave: Stensby Skov, on a young *Acer*. 1946! (L). — Kildebrönde: Pilemölle Skov, on *Sorbus aucuparia*. 1941 Chr. (K). — Köbenhavn. 1849 Ex herb. Liebmann (K). — Lellinge: Köge Aas, on *Fagus*. 1940 Chr. (K). — Lidemark: Taageröd Skov, on *Corylus* and *Fraxinus*. 1947 Chr. and ! (K, L, S). — Lillerød: Ravnsholte, on *Fagus*. 1941 Chr. (K). — Lyngby: Fredriksdal Skov, on *Fraxinus*. Gallöe (in litt.). — Magleby (at the Köge Gulf): Magleby Skov, on *Fraxinus*. 1947 Chr. (K). — Ordrup: Charlottenlund. Ex herb. Liebmann (K). — Præstö: Præstö Overdrev, on *Quercus*. 1946! (L). — S:t Jörgensbjærg: Boserup. 1868 Leg. ? (K); ibm. on *Fraxinus*. 1946! (L). —

Sædder: Vallö Storskov, on *Fraxinus*. 1947! (L). — Sorö: on *Betula*. 1848 J. Lange (K, partly = *O. herpetica*). — Tjæreby: Basnæs Skov, on *Quercus*. Branth (K, L).

Falster. Bogö: Bogö Österskov, on *Fraxinus*. 1947 Chr. (K). — Vegerlöse: Flatö. 1874 Leg. ? (K).

Mön. Damsholte: Hjelmemark, on *Populus canadensis*. 1947 Chr. (K). — Magleby: Liselund, Lille Klint (f. *nigrita*). 1941 Er. Erichsen 1942 p. 140; Möns Klint, on *Fagus*. 1946! (L).

Lolland. Hunseby: Knuthenborg, on *Fagus*. 1946! (L). — Nysted: Roden Skov, on *Fraxinus*. 1946! (L). — Radsted: Holmeskov, on *Fagus*. 1946! (L). — Sandby: Stensgaard, on *Ligustrum*. E. Rostrup (K). — Toreby: Fuglsang Storskov, on *Fraxinus*. 1943 Chr. (K). — Vesterborg: Rosningen, on *Fraxinus*. 1946! (L).

Langeland. Tranekær: near the mansion, on *Fagus*. 1946!

Fyn. Kertemindе: at the pavilion, on *Fraxinus*. 1947! (K, L). — Middelfart: Hinsgavl, on *Fraxinus*. 1946! (L). — Ore: W. of Lundeborg, on *Fraxinus*. 1946! — Revninge (pr. Kertemindе): Storskov, on *Fagus*. 1947! (K, L).

Als. Notmark: near Hellevеd, on *Fraxinus*. 1946! (L). — Ulkeböl: Sönderskov, on *Fraxinus*. 1946! (L).

Jylland. Aarhus: Marselisborg, on *Salix caprea*. 1941 Er. (K). — Agri: Femmöller, on *Fraxinus*. 1943 Chr. (K); Mols Bjærge, on *Populus tremula*. 1944 Chr. (K); Strandkær, on *Fraxinus*. 1943 Chr. (K) Christiansen 1946 p. 75. — Dollerup: Hald, on *Fagus*. 1946! (L). — Dronninglund: near the mansion, on *Fraxinus* and *Tilia*. 1947! (K, L). — Gaverslund (pr. Vejle): Munkebjærg, on *Fraxinus*. 1946! (L). — Gunderup: Lundby Krat, on *Populus*. Branth (G). — Holböl: Hönsnap Skov, W. Saxen (in litt.); ibm, on *Fraxinus*. 1946! — Hoptrup: Pambule Skov, on *Carpinus*. 1947 Chr. (K). — Hornstrup: Grejsdalen, on *Fagus*. 1941 Chr. (K). — Höbjærg: Palstrup Skov, on *Fagus*. 1884 Branth (K). — Skörping: Buderupholm, on *Fagus*. Branth (U); ibm. 1943 Chr. (K). — Sr Stenstrup: Nörreskov, on *Fraxinus*. 1946! (L). — Stovby: Stovby Skov, on *Fraxinus*. 1946! (L). — Nr Vilstrup: Kelstrup, on *Fagus*. 1946! — Volstrup: Sæbygaard, on *Fraxinus*. 1937 Magn. (M); ibm, on *Fagus* and *Fraxinus*. 1947! (L, S).

Læsö. Vesterö: between V. and Byrum. 1902 J. Hartz (K); Nordre Rönner, Langholm, on *Rosa*. 1933 Deg. (Ds) Degelius 1933 b p. 402. — Sine loco. 1870 J. P. Jacobsen (K).

Bornholm. Aaker: Vasegaarden, on *Populus*. 1888 Hellb. (G); Vasenaen, on *Fraxinus*. 1888 Hellb. (G) Hellbom 1890 p. 96. — Allinge-Sandvig: Hammershus, on *Corylus* and *Ulmus*. 1884 Hellb. (G, S) Hellbom l.c. — Pedersker: Brogaarden, on *Salix*. Hellb. Hellbom l.c. — Povelsker: Kristianshöj, on *Ulmus*. 1884 Hellb. (G, S); Rispebjærg, on *Salix*. 1884 Hellb. (G). — Rö: Dynddale Gaard, on *Fraxinus*. 1935 Deg. (Ds); Stammershald, on *Fraxinus*. 1935 Deg. (Ds) Degelius 1936 b p. 427. — Vestermarie: Kodale, on *Carpinus*. 1901 M. P. Porsild (K). — Östermarie: Kofoedsgaard, on *Fraxinus*. Hellb. Hellbom l.c.

Finland.

Åland. »Allmän» (=common). E. NYLANDER 1857 p. 92. Probably including also *O. herpetica*. »Sat frequenter. E. Nyl.» W. NYLANDER 1861 p. 254. S. ALMQUIST l.c. — »Lemland: Ramsholm» (=Lemland; Ramsö or Lumparland; Ramsholm?). 1923 Vainio (Å).

Nyland. Helsinki: Meilans. 1896, 99 Vainio (Å); Mjölö. 1898 Vainio (Å).

O. atra is a rather common species in Denmark (except the western parts, where suitable localities are rare) and in the southern and western coastal districts of S. Sweden as well as in Öland and Gotland. It becomes rarer on the east coast, but it is found northernmost in the Skärgård of Södermanland. As far as I know it is lacking round Lake Mälar, but it might occur there, as it is found in Åland. The few Swedish inland localities known are mostly situated in the lake districts. In Norway the species must be characterized as rare, though distributed over the whole oak region.

Extra-Scandinavian Distribution. — In most parts of Europe *O. atra* is »sehr verbreitet und häufig» (REDINGER 1938).

Sec. ERICHSEN (manuscr.) it is »sehr häufig» in N.W. Germany. LETTAU (1941) recorded stations from most parts of the former German territory (East Prussia, Thuringia, Alsatia, Baden, Wurtemberg, and Bavaria) and also from Austria and Switzerland. From Bavaria, KREMPELHUBER (1861) recorded it as occurring »hie und da, nicht häufig. In den Alpen nur in den Thälern und hier selten beobachtet». In Switzerland it is »häufig, in Jura besonders auf *Fraxinus*» (sec. LETTAU l.c.); in the neighbourhood of Geneva, MÜLLER (1862) even recorded it as »extrêmement commune». Stations from Austria and Bohemia in Czecho-Slovakia are recorded by DALLA TORRE & SARNTHEIN (1902) and ANDERS (1922). Sec. SZATALA (1930) it is a common species in the »historical» Hungary, including as well Hungary in its present delimitation as parts of Czecho-Slovakia, Rumania, and Yugo-Slavia.

In Holland it is frequent (several specimens in herb. Leyden) as well as in Belgium (DUVIGNEAUD & GILTAY 1938). It is distributed in all parts of France, from the western districts (»commun partout», sec. OLIVIER 1897) to Lorraine (»très commun», sec. HARMAND 1895—1899), also recorded from Corsica (ZSCHACKE 1927). A. L. SMITH (1926) stated it to be »common, throughout the British Isles».

It has also a wide area in S. Europe, from the Iberian Peninsula (Spain, sec. COLMEIRO 1867—1868. Portugal, sec. TAVARES in litt.), to Italy (»totam per Italiam», sec. JATTA 1909—1911) and the Balkans, where it is recorded from Yugo-Slavia (stations cited by e.g. ZAHLBRUCKNER 1903, 1919, SERVIT 1931, 1934, and v. DEGEN 1938) Bulgaria (SZATALA 1929 c) and Rumania (at least from Transsylvania, sec. SZATALA 1930).

Its distribution in East Europe is not exactly known. It is reported from Poland (MOTYKA 1924, SULMA 1935; sec. MOTYKA reaching 1100 m in Mount Tatra), the former Lithuania (BACHMANN 1919) and Russia (Ukraine, sec. OXNER 1937 and the Minsk district, sec. TOMIN 1939).

There are several records from Extra-European stations in the literature, but most probably a good deal of them refer to other species.

In Africa it is known mainly from Morocco and Algeria, and besides from Maderia and the Canaries.

It has a wide distribution in the temperate districts of N. America and is also reported from the southern parts of S. America.

Records are also known from New Zealand and Hawaii.

Habitat Ecology. — *O. atra* prefers the smooth bark of young trees, mainly *Fraxinus*, but also not seldom *Fagus*, *Corylus*, and *Sorbus aucuparia*. More seldom does it inhabit other deciduous trees, even, though mainly in isolated small specimens, trees with rather coarse bark (*Quercus*, *Ulmus*). Exceptionally is it also found on coniferous trees. It must be characterized as a photophobous species preferring shadowy trunks (often on the north side, cf. tab. V.). Its societies can be regarded as belonging to a union which I call *Opegraphetum herpeticae*, constituted of crustaceous, mainly hypophloedical lichens and characteristic of smooth bark (mainly ash-trees) with a small access of light. It is subordinate to the federation *Graphidion* (cf. pp. 27 and 219). *O. atra* is often dominant together with *O. herpetica*. Other chief components are *Graphis scripta*, *Lecanora subfusca*, *Lecidea olivacea*, sometimes also *Arthothelium ruanideum* (in Denmark and Skåne), *Pertusaria leioplaca*, and the *Phlyctis* species. Photophobous and hygrophilous green algae are rather often met with, while *Lepraria aeruginosa* plays an unimportant part, the smooth bark of *Fraxinus* etc. offering no suitable conditions for this lichen, which usually grows in crevices and on mosses.

No coniophilous lichens have been tabulated in this union.

Measurements of pH in 20 samples of bark from *O. atra*-communities (Sk. Dalby, Bosjökloster, Ottarp, and Österslöv, all on *Fraxinus*) gave values between 5.2 and 5.8, mean 5.5.

Affinity and Variation. — *O. atra* is easily distinguished from other corticolous *Opegraphae* with 3-septate spores. The common *O. herpetica* Ach. has a darker, brownish thallus and more immersed apothecia. The rare (cf. p. 204) *O. betulina* Sm. (syn. *O. atrorimalis* Nyl., *O. Turneri* Leight.) has thicker apothecia with a more open disk and larger spores (more than 20 μ in length). *O. rubescens* Sandst. differs in its K+red thallus and longer pycnoconidia (12—20 μ; c. 4 μ in *O. atra*). The Scandinavian herbarium material of *O. atra* investigated by me is K—.

The internal morphology of *O. atra* is very uniform. The considerable variation within the species refers to the form and arrange-

Tab. V. Opegrapha atra - communities.

On the trunks of young trees. 1—11, 14—20 on *Fraxinus*, 12 on *Acer*, 13 on *Fagus*. 1—3. **Sk.** Bosjökloster: Kulleberga, N. exposure. — 4. Dalby: Dalby Söderskog, N. exp. — 5. Ibm, W. exp. — 6—7. Ibm, E. exp. — 8—9. Hardeberga: Fågelsång, N. exp. — 10. Österslöv: Gärrö, S. exp. — 11. **Sj.** S:t Jörgensbjærg: Boserup Skov, E. exp. — 12. Kalvehave: Stensby Skov, N. exp. — 13. Fodby: Saltö Skov, S. exp. — 14—15. **Lall.** Vesterborg: Rosningen, N. exp. — 16. **Fyn.** Revninge: Storskov (pr. Kerteminde), N. exp. — 17. **Jl.** Dronninglund, S. exp. — 18. Volstrup: Sæbygaard Skov, S. exp. — 19. **Als.** Ulkebøl: Sönderskov (pr. Sönderborg), E. exp. — 20. **Rog.** Førsand: Dirdal, N. exp.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Arthonia cinnabarina	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2
— radiata	—	—	—	—	—	—	—	—	—	3	—	—	1	—	—	—	—	1	—	1
Arthophyrenia biformis	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—	—	2	—	—
— punctiformis	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2
Arthothelium ruanideum	—	**2**	**3**	1	3	2	—	—	2	—	—	2	—	1	—	—	—	3	1	—
Bacidia chlorococca	—	—	—	—	—	—	—	2	—	—	—	—	—	—	—	—	—	—	—	—
Buellia betulina	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—
Graphis scripta	**2**	1	1	1	3	3	3	—	3	—	—	1	—	1	—	—	—	1	1	1
Lecanora carpinea	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—
— expallens	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—
— subfusca (coll.)	1	—	—	—	1	—	—	2	—	1	1	**3**	1	1	1	3	1	—	2	1
Lecidea olivacea	**4**	1	1	—	—	—	—	—	—	3	1	1	1	2	—	4	1	1	1	2
— quernea	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—
Lepraria aeruginosa	—	—	—	—	1	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—
Opegrapha atra	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**4**	**3**	**3**	**4**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
— fuscella	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
— herpetica	2	4	3	3	4	3	4	4	4	4	4	3	—	3	4	3	4	4	—	3
— viridis	1	—	1	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	1	—
Pertusaria leioplaca	2	—	—	—	—	—	—	—	1	**4**	—	—	3	—	—	—	—	**4**	3	3
— pertusa	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—
Phlyctis agelaea	2	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
— argena	2	1	3	—	—	—	—	—	2	—	1	—	—	—	1	—	3	—	—	—
Porina carpinea	1	1	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	3	—
Pyrenula nitida	—	—	—	—	—	—	—	—	—	—	—	—	3	—	—	—	—	—	—	—
— — var. nitidella	—	—	—	—	1	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—
Coccoid Chlorophyceae	—	—	+	—	—	+	+	+	+	—	—	+	—	+	—	—	—	—	+	—
Hypnum cupressiforme	—	—	—	—	1	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—
Neckera pumila	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—
Orthotrichum ocloblephare	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—
— stramineum	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—
Frullania dilatata	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—	—	—
Radula complanata	—	—	1	—	1	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—

ment of the apothecia. »Fast auf jedem Thallus bieten die Lirellen ein anderes Aussehen, das durch ihre Länge, ihre Häufigkeit, ihre räumliche Anordnung zueinander bedingt ist», sec. REDINGER, to whose treatment of its variation I refer. Most of the 12 varieties and forms enumerated by REDINGER are also met with in the Scandinavian population, but as their borders are wholly confluent, a more thorough-going discussion of them seems superfluous to me. On the whole, the external morphology of the apothecia is of comparatively small importance in the taxonomy of *Graphidineae*.

6. *Opegrapha viridis* Pers.

Syn. *O. involuta* (Wallr.) Jatta — *Zwackhia i.* Kbr — Cf. further ZAHLBRUCKNER Cat. lich. II (1924) p. 255, VIII (1932) p. 196, and REDINGER in RABENHORST's Kryptogamen-Flora IX. 2: 1 (1938) p. 393.

History. — The species was recognized by PERSOON who sent a German specimen with the name of *O. viridis* to ACHARIUS. The latter described it in 1803 but later (1814) he united it with the habitually similar *O. herpetica*, a view which was also accepted by E. FRIES (1831). In 1855 KOERBER pointed out that its multiseptate spores made necessary its treatment as a proper species, different from the majority of *Opegraphae* with 4- or 5—7-septate spores. He even proposed a new generic name, *Zwackhia*, to it, a delimitation which most later lichenologists have considered as superfluous. In NYLANDER's Lichenes Scandinaviae (1861), it was still unknown from our districts (»forte quoque in Suecia meridionali detegenda»). The first statement from S w e d e n was made in 1869, when S. ALMQUIST published it from Småland and Östergötland. The species had, however, been distributed from Sweden already in 1824 by E. FRIES (E. FRIES exs. 64 as *O. rubella*.). In all there are 23 published localities from this country. At present I know near 100 Swedish collections of the lichen.

The first stations from D e n m a r k were recorded by BRANTH in 1867. It is remarkable that there are altogether no more than 6 exact localities published from Denmark (some of which incorrectly determined). At the present time I know about 75 Danish stations.

There are no records of the species from N o r w a y or F i n l a n d.

Scandinavian Distribution (substratum *Fagus* unless otherwise stated).

S w e d e n.

Skåne. A n d r a r u m. Me. MALME 1895 p. 143; Traneboda, 1946! (L). — B a l d r i n g e: Nyvångsskogen, 1945! — B a l k å k r a: Hägrehult, 1943! (L). — B a r a:

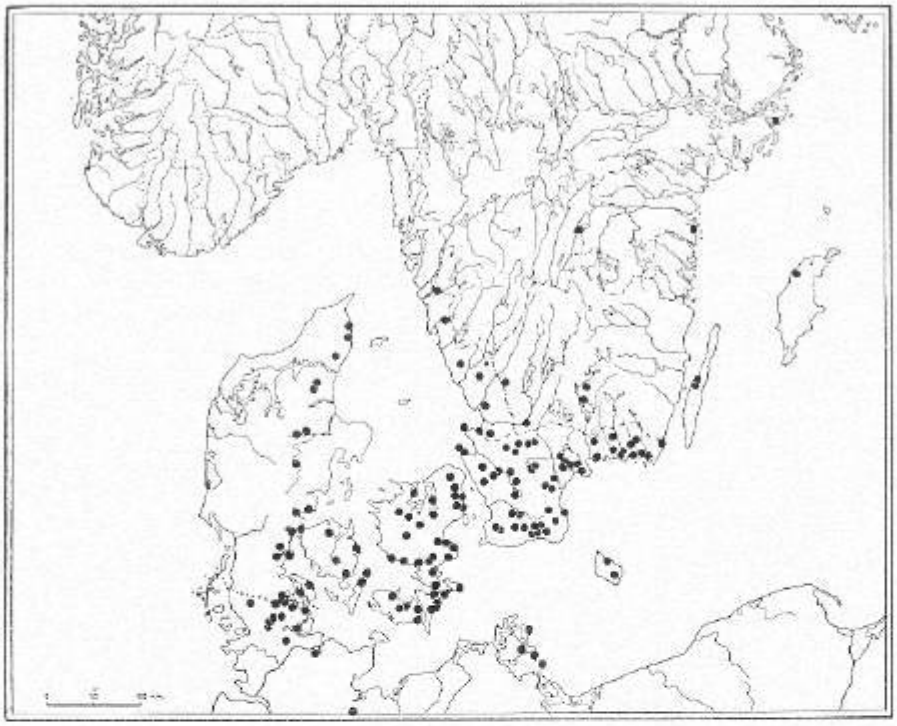


Fig. 10. *Opegrapha viridis* in Scandinavia.

Torup. 1946! (L). — Bjäresjö: N. of Bergsjöholm. 1944! (L, S). — Blåntarp: Elsagården. 1945! (L, S). — Bosjökloster; Kulleberga. 1946! (L, S). — Brunnby: Kullaberg, near Kullavången. 1886 Berg (L) Berg 1890 p. 172; near Ransviken, on *Tilia*. 1911 Er. Erichsen 1913 p. 43; Käringmalen. 1940! (L); S.E. of Ransgården. 1940! (A, L); near Hjorthagen, on *Fagus* and *Fraxinus*. 1944 Deg. and! (Ds, L, S, U). — Brönnestad: Påbro, one specimen. 1945! (L). — Båstad. 1932 Magn. (M). — Dalby: D. Söderskog. 1890, 91 Berg (B, L); ibm, on *Fagus*, rarely on *Fraxinus*. 1934 Me (S) Malme 1934 p. 8; ibm. 1936! (A). — Fjälkestad; Knutstorp. 1944! (L). — Fågeltofta: Kronovall, on *Fagus* and *Fraxinus*. 1945! (L, S). — Färingtofta: Djupadal, on *Carpinus*. 1942! (L). — Genarp: Häckeberga. 1945! (L, S). — Halmstad: Duveke, Påarpsmark. 1903 Alvthin (H, L, S, U) Alvthin 1904 p. 24. — Hjärsås: Gyvik. 1890 Me (S); Skarvik. 1890, 91 Me (S); near Lake Immeln and S. W. of the railway station Immeln. 1890, 91, 1916 Me (L, S, U) Malme 1895. — Hyby: Bökeberg. 1889, 90, 92, 93 Berg (B, G, H, L, S, U) Berg l.c. — Ignaberga. Me. Malme 1895. — Ivetofta: Håkanryd, on *Fagus* and *Carpinus*. 1942! (+f. *minuta*) (L, S). — Ivö: near the limestone quarry. 1942! (L,S). — Kiaby: N.E. part of Ivö. 1942! (L, S). — S. Mellby: Stenshuvud, on *Fagus* and *Fraxinus*. 1934 Me (S) Malme 1935 p. 10. — Munkarp: near the road to Hallaröd. 1945! (L). — Oppmanna: Arkelstorp, on *Fagus* and *Carpinus*. 1916 Me and

Vrang (Dz, G, L, M, O, S, U); Bokenäset, on *Fagus* and *Carpinus*. 1890, 91, 1916. Me (Dz, G, S); ibm. 1943 Deg. (Ds, S, U); ibm. 1943! (L). — Ottarp: Bälteberga, on *Fraxinus*. 1943! (f. *albicans*) (L). — Riseberga: Skäralid. 1900 Alvthin (G); ibm. 1943! (L). — Röke: Blaholma. 1945! (L). — Ö. Sönnarslöv: Maltesholm. 1890 Me (S). — Sövde: Kristinelund. 1945! (L); St. Bölleberga. 1946! — Sövestad: Krageholm. Leg.? S. Almquist 1869 p. 22; ibm. 1943! (S, U); island of Lybäck. 1889 Berg (L, together with *O. fuscella*) Berg l.c.; ibm. on *Fagus*, *Fraxinus*, and *Tilia*. 1944! (L, S); Vistorp. 1943! (G, L); S.W. end of the lake, on *Fraxinus*. 1945! (S). — Torekov: Hallands Väderö. 1884 Hellb. (G, S) Hellbom 1887 p. 67; ibm. 1944! (L). — Torna Hällestad: Tvedörra. 1943! (f. *ferruginea*) (A, L, S, U). — Träne: Ovesholm, on *Fraxinus*. 1946! (B, L, S). — Verum: Mölleröd. 1945! (L, S). — Vittsjö: Boalts böke. 1945! (L, S); Ubbalt. 1945! (L). — N. Vram: Vrams Gunnarstorp. 1946! (L, S). — V. Vram. 1891 Me (L, S. Malme exs. 48) Malme 1895; S.E. of the village. 1942! (L, S). — Örkelljunga: N. of Ö. Spång. 1943! (L). — Österslöv: Gärrö. 1916 Me (S); Tommarp. 1944! (L).

Blekinge. »Several stations». Falk 1874 p. 20. — Backaryd. Falk l.c. — Bräkne-Hoby. Falk l.c. — Förkärla: Tromtö. 1945! (L, O, S). — Hjortsberga: near Lake Sännen. 1937, 44! (A, L). — Karlshamn: Lindeborg. 1944! (L); Hunnemara. 1945! (S); Tubbaryd. 1945! (L). — Karlskrona. Falk l.c.; Vämö. Lübeck (B, N); Verkö. 1871 W. Molér (Ds, U); Gullberna. 1945! — Kristianopel. 1873 Falk (L, S) Falk l.c. — Lösen: Ringö. 1860 Lübeck (G, Ka, L, O, S); ibm. 1873 Falk (L, U). — Nättraby: Trantorp. 1872 Svanlund (Ka, L, U); Skärva. 1943! (L); Bjärby. 1945! (L). — Ringamåla: N. of N. Hoka. 1945! (L). — Ronneby: Djupadal. 1873 Falk (G); Brunnsskogen, on *Fagus* and *Carpinus*. 1937—47! (G, L, S, U); near Härstorpssjön. 1943! (L). — Rödeby: S. of Häjetorp. 1945! (L, S). — Sölvesborg: Valje. 1871 Hult, Hulting 1872 p. 21; ibm. 1942, 47! (S); Sissebäck. 1931 Sthm (G, M, O). — Tving. 1873 Falk (S) Falk l.c. — Sine loco. W. Molér (S).

Öland. Borgholm. 1920 Sthm (G). — Högsrum: Halltorp, on *Carpinus*. 1913 DR. (Dz). — Repplinge: the slopes near the castle, on *Corylus*, *Euonymus* and *Sorbus intermedia*. 1913 DR. (Dz).

Gotland. Stenkyrka: N.W. of the church, scarce on *Quercus*. 1943 Deg. (Ds) Degelius 1944 p. 39.

Småland. Femsjö. E. Fries (U) S. Almquist 1869 p. 23; Hallaböke. 1945! (L). — Markaryd: Timsfors, scarce in a grove near the viaduct. 1947! (L). — Skatelöv: Agnäs. 1945! (L, S). — Växjö: Biskopsnäset. 1945, 46! (L, S).

Halland. Abild: Arnared. 1945! (L, S). — Fjärås: Rossared. 1945! (L). — Hasslöv: Bondåkra. 1942! (L). — Sibbarp: S. of Angryd. 1945! — Snöstorp: Skedala, on *Corylus*. 1947 H. Runemark (L).

Västergötland. Partille: Bokedalen, several specimens. 1945 Magn. and! (L, M, S).

Östergötland. »In the Skärgård». Sthr (U) S. Almquist l.c. — Jonsberg: on *Tilia*. 1859 Sthr (L). — V. Tollstad: Omberg. Sthr (S) S. Almquist l.c.; Alvastra. 1908, 11, 15 Me (B, Dz, L, S) Malme 1909 p. (81); ibm. 1915 Vrang (Dz, G, M, N, S, U); in the national reserve, on *Alnus* and *Sorbus intermedia*. 1944 Deg. (Dz, S) Degelius 1944 b p. 17; near the tourist hotel. 1944 Deg. (Ds) Degelius l.c.

Uppland. Ingarö: Forsvik, on deciduous tree, probably *Quercus*. 1868 Hellb. (f. *permutata*) (U). — [Värmdö: Lövberga, on *Fagus*. 1916 Vrang (G, S). Probably a confusion of labels, according to a note by Malme on the specimen in S.]

Sine loco. E. Fries exs. 64 (cf. above).

Denmark.

Sjælland. Avnsö K: Kongens Möller. 1870 J. Lange (K). — Braaby: Villa Gallina. 1946! — Draaby: Nordskov. 1942 Chr. (K). — Egebjærg: Kongsöre Nebbe. 1946! — Ör Egede: Jomfruens Egede. Branth. Branth 1867 p. 86. — Esbönderup: Grib Skov, near Hjortelyngsvej. 1946! (L). — Fodby: Bösseväng. 1892 J. Jeppesen (B, K, L, S). — Frederiksborg Slotssogn: St. Dyrehave. 1946! (L). — Haraldsted: Kastrup Skov, on *Fraxinus*. 1946! (L). — Haslev: Bregentved. Branth (K, L, U) Branth l.c. S. Almquist 1869 p. 22; ibm. 1946!; Orneden. Branth (K); ibm. 1946! (L, S). — Herfölje: Aashöje Overdrev. 1947 Chr. and ! (L). — Herlufsholm: S. of the mansion, on *Fagus* and *Fraxinus*. 1947! (L). — Holsteinborg: Rude Skov. 1947! (L). — Hörsholm: Fole Have. 1947 Chr. and ! — Jyderup: N. of Skärresö, on *Fagus* and *Fraxinus*. 1946! (L, S). — Kalvehave: Stensby Skov, on *Fagus* and *Acer*. 1946! (L). — Lellinge: Lellinge Frihed. 1947 Chr. and ! — Lidemark: Taageröd Skov, on *Fagus* and *Fraxinus*. 1947 Chr. and ! (L, S). — Lyngby: Frederiksdal. 1886 W. Taussing (K); ibm. 1904 Gallöe (K). — Magleby (pr. Skælskör): Stigsnæs. Branth (L). — Magleby (at the Köge Gulf): Magleby Skov. 1947 Chr. (K). — Nöddebo: between N. and Egelund. 1946! (L). — Præstö: P. Overdrev (Hollænderskov). 1946! — Sorö: near the Næstved road. 1946! (L, S); near »Parnassen». 1946! — S:t Jörgensbjærg: Boserup Skov, on *Fagus* and *Fraxinus*. 1946! — Taarbæk: Jægersborg Dyrehave. Branth (G). — Undlöse: Mölleskov. 1946! (L, S). — Vallöby. 1867 Chr. Grönlund (K, L, U). — Vemmetofte: Vesterskov and Strandskov. 1946!

Möen. Damsholte: Liseby Strandskov. 1946! (L). — Magleby: Storeklint. 1946!

Falster. Aastrup: Österskov, near Næsgaard. 1943 Chr. (K, L). — Sr Alslev: Korselitze Hovedskov. 1946! — Bogö: Bogö Österskov, on *Fagus* and *Fraxinus*. 1947. Chr. (K, L). — Horbelev: Hesnæs (L), Pomlenakke, and Österskov. 1946! (L).

Lolland. Hunseby: Knuthenborg. 1946! (L). — Kettinge: Frejlev Skov. 1946! — Nysted: Roden Skov. 1946! — Skörringe: N. of Christianssæde. 1946! (L). — Toreby: Storskov. 1946! (L). — Vesterborg: Rosningen, on *Fagus* and *Carpinus*. 1946! (L).

Langeland. Hov K: Lohals, S. of the village. 1946! — Tranekær: at the road to Aasö. 1946! (L).

Fyn. Sr Broby: E. of the village. 1946! (L). — Middelfart: Hinsgavl Skov. Branth (K); ibm. on *Fraxinus*. 1946! (L); Kongebroskoven. 1947 Chr. (K, L). — Nyborg: Christianslund. 1946! (L). — Sönderse: Sönderse Skov. 1947! — Tved: Björnemose, on *Aesculus*. 1869 E. Rostrup (K).

Als. Notmark: near Helleved. 1946! (L). — Ulkebøl: Sönderskov, on *Fagus* and *Fraxinus*. 1946!

Jylland. »Vendsyssel». Branth (G). — Aalum: S. of Fussing Sö. 1947! (L). — Bjerning K.: Vesterskov (N. of Hadersley). 1946! — Dronninglund: near the mansion. 1947! — Flade: V. of Pikkerbakken (pr. Frederikshavn). 1947 Magn. (L, M). — Gaverslund (pr. Vejle): Munkebjærg. 1946, 47! (L, S). — Hammelev: Pamhule Skov, on *Fraxinus*. 1947 Chr. (K). — Holbøl: Hönsnap Skov. W. Saxen (in litt.); ibm. 1946! (L). — Hoptrup: Pamhule Skov, on *Carpinus*. 1947 Chr. (K, L). — Le: Viskum Skov. 1947! (L). — Rold: Rold Skov. 1947! (L). — Skörping: Buderupholm. 1943 Chr. (K, L). — Sr Stenderup: Nörreskov. 1946! (L, S). — Stovby: Stovby Skov. 1946! — Tem: Sönderskov (pr. Silkeborg). 1946! (L). — Nr Vilstrup: Kelstrup. 1946! (L). — Volstrup (pr. Sæby): Sæbygaard Skov. 1947! (L).

Bornholm. [Aaker: Riseløek, on *Fraxinus*. 1888 Hellb. (G). Belongs to *O. subsiderella*.] — Bodilsker: [near the parsonage. N. H. Bergstedt. HELLBOM 1890 p. 96. No specimen;] Gadegaardsskov, on *Carpinus*. 1888 Hellb. (K) [A specimen in G. belongs to *O. cinerea*]. — [Ibsker. Hellb. — Olsker: S. of Allinge, on *Fraxinus*. Hellb. — Pedersker: Bille Gravsgaarden. Hellb. All sec. HELLBOM l.c. No specimens. — Povlsker: Rispebjærg, on *Fraxinus*. 1884 Hellb. (G, S, U). Specimens belong to *O. cinerea* and *O. dubia*.] — Rö: Dynddalen, on *Fraxinus*. 1935 Deg. (Ds) DEGELIUS 1936 b p. 427.

The species has its chief Scandinavian distribution in the beech districts of Denmark, Skåne, and Blekinge. There are also scattered stations on beech in Småland, Halland, and the neighbourhood of Göteborg and, on other trees, on Öland, Gotland, and near Stockholm.

Extra-Scandinavian Distribution. — *O. viridis* is, as far as is known, distributed mainly in Europe and N. America. In parts of Central and Western Europe, at least, it is a rather common species.

It is recorded from all provinces in Germany (e.g. »häufig» in N. W. Germany, sec. ERICHSEN in manuscr., »verbreitet und nicht selten auf den verschiedensten Laubbäumen» in Baden, sec. LETTAU 1941). In Switzerland STITZENBERGER (1882) stated it as occurring chiefly on *Abies* but also on *Fagus*. In Austria it ascends to a level of 1600 m in Carinthia (sec. REDINGER 1938). In Czecho-Slovakia it is recorded from Bohemia (i.a. ANDERS 1922) as well as from several stations in Slovakia (SZATALA 1930). SZATALA (l.c.) also reported it from Hungary proper.

It is distributed over all France. OLIVIER (1897) recorded it from several provinces in W. France. FLAGEY (1883) stated it to be »assez rare . . . ou plutôt inobservée» in Franche-Comté, whereas HARMAND (1897) reported it as »assez commun», chiefly on *Fagus* and *Carpinus* in Lorraine. — In the British Isles it is stated to be »rare in the Channel Islands, England, Wales and Ireland». (A. L. SMITH 1926). From Ireland KNOWLES (1929) recorded it as occurring »on beech and holly; rare, no recent record».

No statement has been published from the Iberian Peninsula. — In Italy it is recorded from the Alps, Lombardia and Etruria (see. JATTA 1909—1911). Its Balkan distribution is imperfectly known. It is recorded from Mount Papuk in Yugo-Slavia (KUŠAN 1935) and from several stations in Transsylvania in the present Rumania (see. SZATALA l.c.).

In E. Europe it is reported from Russia (near River Beresina in the Minsk district, see. TOMIN 1939).

The only statements from Africa in the literature are two stations from Morocco (on *Olea* and *Chamaerops*, see. WERNER 1932 and 1936).

From America FINK (1935) recorded it from the states of Massachusetts, Illinois, Florida, and Missouri in the United States (»the northern specimens doubtful»).

Habitat Ecology. — The species prefers smooth bark. As a rule it is a component of the *Pyrenuletum nitidae* on the trunks of *Fagus* and *Carpinus* but it is also not seldom found on *Fraxinus* and *Sorbus*. It often grows on the northern sides of the trunks, but it should be considered as hygrophilous rather than directly photophobous, as it is often found near the crevices of the bark and on the bases of the trunks, where moisture is retained longer than elsewhere. On middle-aged and old beech trunks *Opegrapha viridis* -societies can often be distinguished (cf. table VI) containing also *Graphis scripta, Lecanora subfusca* (coll.), *Phlyctis argena, Pyrenula nitida*, and the more photophilous *Pertusaria amara, pertusa*, and *Wulfenii*. In the crevices the photophobous *Lepraria aeruginosa* is a constant, often together with photophobous green algae. *Hypnum cupressiforme* is often met with, especially towards the ground.

Macrolichens (e.g. *Evernia* and *Parmelia fuliginosa* and *sulcata*), which are often found on somewhat more illuminated beech trunks, (cf. under *Lecanora glabrata, Pertusaria Wulfenii*, and *Pyrenula nitida*) play a subordinate part in *O. viridis* -societies.

What is mentioned above is valid for communities growing on *Fagus* and *Carpinus*. On *Fraxinus*, *O. viridis* is often associated with crustaceous lichens constituting the *Opegraphetum herpeticae* characteristic of ash trunks, e.g. *Arthopyrenia biformis, Arthothelium ruanideum, Graphis scripta, Opegrapha atra* and *herpetica*, and the *Phlyctis* species (cf. tab. VI: 1 and analyses tabulated under *Arthonia cinnabarina, Arthothelium ruanideum*, and *Opegrapha atra*).

Measurements of pH in *O. viridis* -societies from 4 stations (Sk. Oppmanna: Bokenäset, Bl. Ronneby: Brunnsskogen and Nättraby: Skärva, Jl. Tem; 5 samples from each; all from dust-free *Fagus*) have given values between 5.3 and 5.8, mean 5.5.

Tab. VI. Opegrapha viridis - communities.

1 on the trunk of a middle-aged *Fraxinus*, 2—20 on the trunks of middle-aged — rather old *Fagus*. — 1. **Sk.** Sövestad: Lybäck, N. exposure. — 2. Bosjökloster: Kulleberga, W. exp. — 3. Torekov: Hallands Väderö, N. exp. — 4. **Bl.** Förkärla: Tromtö, N. exp. — 5—7. Ronneby: Brunnsskogen, all E. exp. — 8. Ibm, N. E. exp. — 9. Rödeby: Johannesberg, N. exp. — 10. Sölvesborg: Valje, N. exp. — 11. **Sm.** Växjö: Biskopsnäset, N. exp. — 12. **Vg.** Partille: Bokedalen, W. exp. — 13. **Sj.** Lidemark: Taageröd Skov, N. exp. — 14. Nöddebo: S. exp. — 15. Vemmetofte: Vemmetofte Strandskov, S. exp. — 16. **Falst.** Horbelev: Österskov, N. exp. — 17—18. **Jl.** Gaverslund: Munkebjærg, both N. exp. — 19. Aalum: Fussingö, S. W. exp. — 20. **Als.** Nordmark: Helleved, E. exp.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Arthopyrenia biformis	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Arthothelium ruanideum	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Catinaria Laureri	—	—	—	—	—	—	—	—	—	**4**	—	—	—	—	—	—	—	—	—	—
Catillaria Griffithii	—	—	2	—	—	—	—	—	—	—	1	—	—	—	—	—	—	2	—	—
Enterographa crassa	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2
Evernia prunastri	—	—	—	2	1	—	—	1	—	1—	1	—	—	—	—	—	1	—	—	1—
Graphis scripta	1	1	1	—	—	2	1	1	—	1	1	—	—	1	—	—	—	1	—	—
Haematomma coccineum	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Lecanora atra	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—
— expallens	—	1	1	—	—	—	2	3	—	—	1	—	—	—	—	—	—	—	—	1
— glabrata	—	2	3	—	3	—	—	—	—	—	—	—	1	—	—	—	—	1	—	—
— intumescens	—	—	—	—	1	—	—	—	1	—	—	—	—	—	—	—	—	2	—	—
— subfusca (coll.)	1	1	—	1	1	1	1	1	2	1	1	2	1	1—	1	—	—	—	1	2
Lecidea olivacea	—	—	1	—	—	1	—	—	1	—	—	1	—	—	—	—	—	—	—	—
— quernea	—	—	—	—	1	—	2	1	—	—	—	—	—	—	1	—	—	—	—	—
Lepraria aeruginosa	—	2	1	3	1	1	4	3	1	2	4	1	2	1	2	—	2	1	2	1
— candelaris	—	—	—	1	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—
Opegrapha atra	1	—	—	—	—	1—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
— fuscella (pycnidia)	—	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
— herpetica	4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
— viridis	2	4	3	5	3	4	4	5	4	5	3	4	4	4	3	3	4	4	3	4
Parmelia fuliginosa var. laetevirens	—	—	—	1	1	—	—	1	1	—	—	—	—	—	—	—	1	1	—	—
— physodes	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	1	—	—	—
— sulcata	—	—	—	—	1	—	—	—	—	—	2	—	—	—	—	—	—	—	—	—
Pertusaria amara	—	—	—	2	4	—	4	2	1	1	2	—	1	—	—	—	1	—	—	—
— globulifera f. Henrici	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
— hemisphaerica	—	—	—	—	1	1	1	2	—	—	—	—	—	—	—	—	—	—	—	—
— leioplaca	—	1	2	—	—	4	—	—	1	—	—	—	—	—	—	—	1	—	1	—
— pertusa	—	—	1—	1	—	1	1	—	4	1	2	2	2	3	2	3	3	3	2	1
— Wulfenii	—	2	—	—	—	1	—	—	—	1	—	2	2	—	3	4	2	1	4	2
Phlyctis agelaea	1	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—
— argena	2	2	—	1	1	—	2	3	1	3	3	—	2	2	2	—	2	1	—	—
Pyrenula nitida	—	1	3	—	—	—	—	—	—	1	1	3	2	4	2	1	—	—	1	1
Ramalina farinacea	—	—	—	—	—	—	—	—	—	—	1—	—	—	—	—	—	—	—	—	—
Sphinctrina gelasinata	—	—	1	—	—	2	1	—	—	—	1	—	—	—	—	—	—	—	—	—

Tab. VI. Continued.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Thelotrema lepadinum	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—
Dichaena faginea	—	1	1	2	—	—	—	—	1	—	—	—	—	1	3	—	—	—	—	—
Coccoid Chlorophyceae	—	+	—	+	+	+	—	+	+	+	—	+	+	—	+	+	1	+	—	+
Hypnum cupressiforme	1	1	—	2	—	—	—	1	—	1	1	2	1	—	1	—	—	—	1	1
Neckera pumila	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—
Frullania dilatata	1	—	—	—	1	2	2	1	—	—	—	1	—	—	—	—	—	—	1	—
Metzgeria furcata	—	—	—	—	—	1	—	1	1	—	—	2	—	—	—	—	—	—	—	—

Affinity and Variation. — *O. viridis* can sometimes be confused with *O. herpetica*, which also has a brown thallus.[1] As a rule the two species are habitually easily distinguished, but in dubious cases the form of the spores is the best specific character (10—15-septate in *viridis*, 3-septate in *herpetica*). The colour of the thallus varies somewhat. Extreme forms are f. *ferruginea* (Krmph.) Zahlbr. and f. *albicans* (Krmph.) Red. The former seems to be rather common. A form with very small, roundish apothecia, f. *perminuta* Erichs., has also been collected in Sweden. The colour of the spores is occasionally brownish, especially in old specimens, a fact, which has already been pointed out by KOERBER (1855). To judge from the diagnosis it seems probable that *Sclerographa squalida* described by ERICHSEN (1938 c) is such a form of *Opegrapha viridis*. As stated by REDINGER (1937), there is no reason for retaining the genus *Sclerographa*, not even as a section of *Opegrapha*. A brownish colour of the spores is known in different species of *Opegrapha* and is apparently of small taxonomic importance.

7. *Pertusaria hemisphaerica* (Flk.) Erichs.

Syn. *Variolaria hemisphaerica* Flk. — *Ochrolechia variolosa* (Wallr.) Sandst. — *P. speciosa* Höeg — Cf. further ZAHLBRUCKNER Cat. Lich. V (1928) p. 148, VIII (1932) p. 524, X (1940) p. 452, and ERICHSEN in RABENHORST's Kryptogamen-Flora IX.5: 1 (1936) p. 541.

History. — Like most sterile sorediate lichens, this characteristic species was overlooked during the largest part of the past century. It

[1] The epithet »*viridis*» is not very adequate, the colour of the thallus being nearly always ± brown.

was described by FLOERKE in 1815 from Germany and distributed in his exsiccata, but according to the general tendency among 19th century lichenologists, of regarding all sorediate lichens as forms belonging to other fertile species, it soon lost its specific rank. WALLROTH (1831 p. 465) united it with *Parmelia* (=*Ochrolechia*) *parella* as »γ m. *variolosum*» and E. FRIES (1831 p. 422) considered most *Variolariae* as forms of *Pertusaria communis* (=*pertusa*). Not until the present century did the lichen revert to its previous status. SANDSTEDE (1912 p. 182) pointed out that it should be regarded as a proper species, *Ochrolechia variolosa*, and through his description and collections, Central European lichenologists began to pay more attention to this forgotten species. In 1923, HÖEG described *Pertusaria speciosa* from Norway. ERICHSEN (1929 p. 116) stated that this lichen was identical with SANDSTEDE's species, but later (1932 p. 85) he showed that it should be named *Pertusaria hemisphaerica*, being identical with FLOERKE's *Variolaria hemisphaerica*.

The lichen was recorded from S w e d e n by MALME in 1924 (as *P. speciosa*; two stations from Västergötland). In 1927 MAGNUSSON communicated it from several places in W. Sweden (collected by him as early as 1908). In all, there are about 35 published localities of the species from Sweden. At present I know it from about 170 Swedish stations.

The only stations still published from N o r w a y are those communicated by HÖEG in 1923 (as *P. speciosa* n. sp.). I now know about 30 Norwegian localities.

The species was published from D e n m a r k (Sjælland, Fyn, as *P. speciosa*) by ERICHSEN in 1929. There are in all 18 Danish localities known from the literature. In the present work the lichen is cited from more than 50 stations in Denmark.

There are three stations published from F i n l a n d, where it was first found by ERICHSEN in 1933.

Scandinavian Distribution.

S w e d e n.

Skåne. A n d r a r u m: Traneboda, on *Fagus*. 1946! (L). — B a l d r i n g e: Nyvångsskogen, on *Fagus*. 1945! (L). — B l ä n t a r p: Elsagården, on *Fagus*. 1945! (L). — B o s j ö k l o s t e r: at the youth hostel, on *Fagus*. 1942! (L). — B r u n n b y: Kullaberg. Ransgården, on *Quercus*. 1939! — B r ö n n e s t a d: Påbro, on *Fagus*. 1945! (L). — B ö r r i n g e: Hästhagen, on *Fagus*. 1944! (L). — D a l b y: D. Söderskog, scarce on *Fagus*. 1934 Me (S) MALME 1934 p. 10, ibm, on *Quercus*. 1937 Deg. (Ds). —

Degeberga: Kyllingaröd, on *Fagus*. 1940! (L). — Fjälkestad: Knutstorp, on *Fagus*. 1944! (L). — Flenninge: the churchyard, on *Aesculus*. 1943! (f. *diffusa*) (L, U). — Genarp: Häckeberga, on *Fagus* and *Fraxinus*. 1947! — Glimåkra: Övraryd, on *Alnus*. 1938! (L). — Gärdslöv: Näsbyholm, on *Fagus*. 1943! — Hjärsås: Gyvik, on *Fagus*. 1942! — Högestad: Lyckås, on *Quercus*. 1937! (L). — Hyby: Bökeberg, on *Fagus*. 1939! — Hörby: Osbyholm, on *Quercus*. 1947! (L). — Höör: on *Quercus* and *Carpinus*. 1934 Me (S) Malme 1937 p. 180. — Ivetofta: Valje, on *Quercus*. 1942! (L). — Konga: Konga lund, on *Quercus*. 1946! — Kågeröd: Nyhus and W. of K. 1934 Sthm (T). — S. Mellby: Stenshuvud, scarce on *Quercus* and *Fagus*. 1934 Me (S) Malme 1935 p. 15. — Munkarp: Uggleskrik. 1937 Sthm (G); at the road to Hallaröd, on *Fagus*. 1945! (L). — Ottarp: Bälteberga, on *Fraxinus*. 1945! — Röke: Stenslid, on *Fagus*. 1945! (L). — Skabersjö: W. of Yddingen, on *Fagus* and *Quercus*. 1934 Me (S) Malme 1937 p. 180. — Smedstorp: Tunbyholm, on *Fagus*. 1943! (L). — Stehag: Gustavslund. 1937 Sthm (G). — Ö. Sönnarslöv: near Maltesholm, on *Fagus*. 1942! — Sövde: Sövdeborg, on *Fagus*. 1945! — Sövestad: Ebbedal, on *Fagus*. 1945!; Krageholm, Vistorp, on *Fagus*. 1943!; the island of Lybäck, on *Alnus*. 1944! — Tjörnarp: N. of the station, on *Fagus*. 1943! (L). — Torekov: Hallands Väderö, on *Quercus*. 1932 Magn. (M); ibm. 1934 Deg. (Ds). — Torrlösa: Trolleholm, on *Aesculus*. 1942! (L). — Tosjö: Rösjöholm, in the park, on *Fagus*. 1933 Deg. (Ds). — Törringe: Törringelund, on *Quercus*. 1946! — Verum: Mölleröd, on *Fagus*. 1945! (L). — Vittsjö: Boalts böke and Ubbalt, on *Fagus*. 1945! (L). — N. Vram: Vrams Gunnarstorp, on *Fagus*. 1946! — Örkelljunga: Hjälmsjö, on *Alnus*. 1937! (L); Lärkesholm, on *Alnus*. 1940! (L, U); N. of Ö. Spång, on *Fagus*. 1943! (L). — Örkened: Ulfshult, on *Fagus*. 1938! — Österslöv: Karsholm, on *Alnus*. 1939 Deg. (Ds). — Öved: Skartofta, on *Fagus*. 1946!

Blekinge. Augerum: Hässlegården, on *Fagus*. 1945!; the churchyard, on *Acer*. 1945! — Backaryd: at the road to Ärsjö, on *Quercus*. 1936! (L). — Bräkne-Hoby: »Hoby ekbacke», on *Quercus*. 1947! — Edestad: Aspan, on *Quercus*. 1934! (L). — Fridlevstad: the churchyard, on *Tilia*. 1945! — Förkärla: the churchyard, on *Aesculus*. 1943!; N. of the cross-roads, on *Fagus*. 1945! — Hjortsberga: N. of H., on *Quercus*. 1942! (L); Tolseboda, at Lake Sännen, on *Fagus*. 1937!; Värmansnäs, on *Fagus*. 1942! (L). — Karlshamn: Vägga, on *Fagus*. 1947! — Karlskrona: Gullberna, on *Fagus*. 1945! — Listerby: the churchyard, on *Tilia*. 1945! — Nättraby: Bjärby and Marielund, on *Fagus*. 1945! — Ronneby: several stations, on *Fagus* and *Quercus*. 1937—47! (Ds, G, L, S, T, U). — Rödeby: Inglatorp, on *Quercus*. 1938! (L); on the churchyard and near Johannesberg, on *Fagus*. 1945! — Sölvesborg: near Lake Siesjö, on *Quercus*. 1937! (L); Valje, on *Fagus*. 1947! — Tving: the churchyard, on *Fraxinus*. 1947!

Öland. Böda: between Melby and Stora Mossen, on *Quercus*. 1940 Deg. (Ds). — Vickleby: L. Vickleby, on *Quercus*. 1944 Deg. (Ds).

Gotland. Ardre: S. of the church, on *Quercus*. — Bäl: Uppuse, on *Quercus*. — Eke: N.E. of the church, on *Ulmus*. — Fide: N. of the church, on *Quercus*. All 1943 Deg. Degelius 1944 p. 48. — Fårö: Gotska Sandön, N.E. part of »Höga åsen», on *Quercus*, and 1 km. E. of the lighthouse, on *Pinus*. Both 1941 B. Pettersson (Pn). — Gammelgarn: near the church, on *Fraxinus*. 1932 Deg. (Ds)

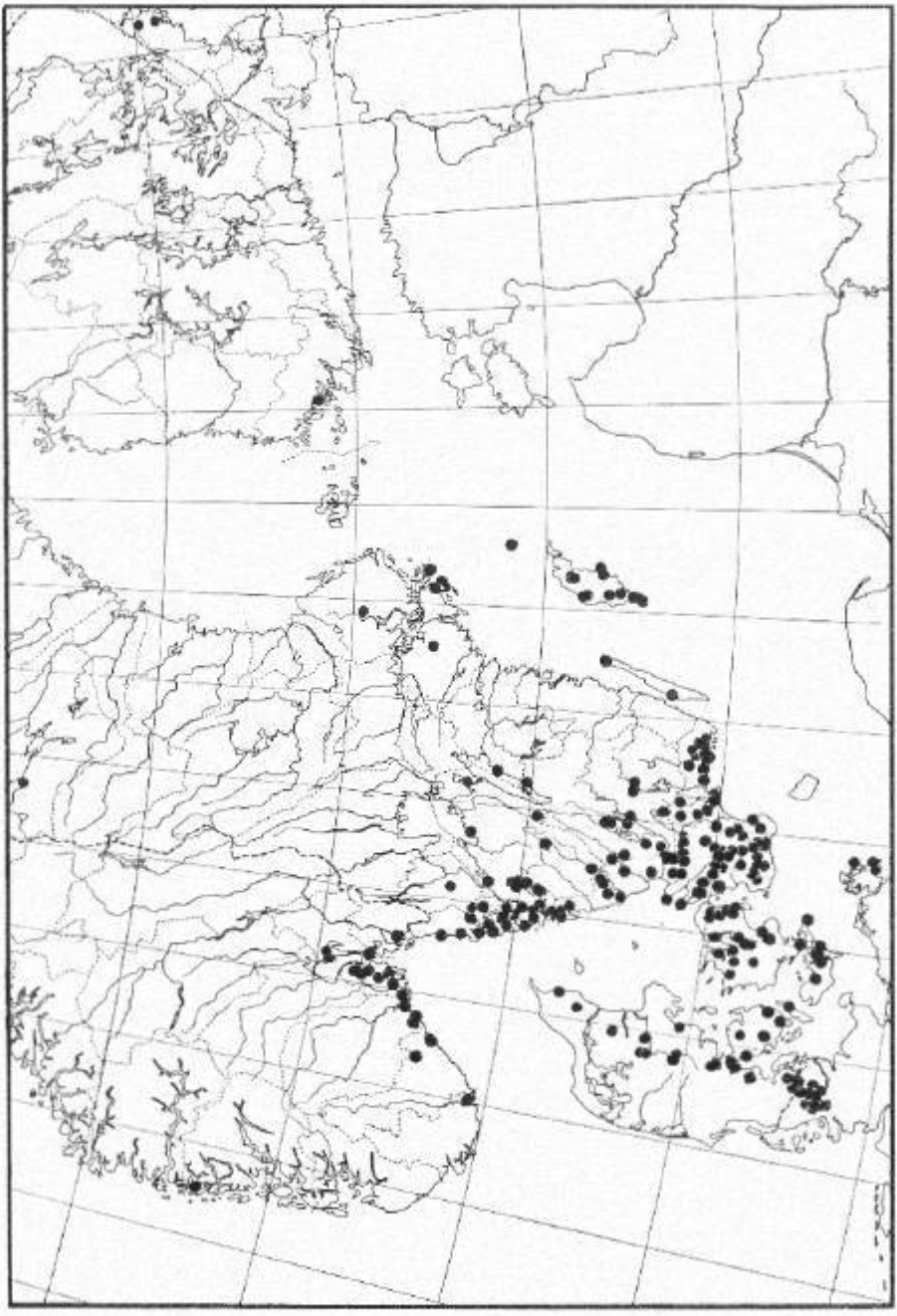


Fig. 11. *Pertusaria hemisphaerica* in Scandinavia.

DEGELIUS 1936 p. 75. — Hejnum: S. of Bjers, on *Pinus*. 1932 Deg. (Ds) DEGELIUS 1936. — Lojsta: near the church, on *Quercus* (»Lojstaeken»). 1943 Deg. DEGELIUS 1944. — Stenkumla: on *Juniperus*. 1869 Laurer. ERICHSEN 1936 p. 544. — Vamlingbo: S. of the church, on *Pinus*. 1932 Deg. (Ds) DEGELIUS 1936. — Visby: Snäckgärdet. 1897 Me (S). — Västerhejde: several stations, on *Picea* and *Pinus*. 1932, 43 Deg. (Ds, S) DEGELIUS l.cc. — [Västkinde. MALME 1937 p. 180. A specimen in S = *Ochrolechia androgyna*.]

Småland. Aringsås: Alvesta, on *Quercus*. 1931 O. Vesterlund (S). — Femsjö: Hallaböke, on *Fagus*. 1945! (L). — Färgaryd: at the road Ekenäs—Skoga, on *Fagus*. 1929 Deg. (Ds). — Gränna: on *Quercus*. 1933 Me (S) MALME 1937 p. 180. — Hinneryd: Gunghult, on *Fagus*. 1943! (L). — Kärda: Herrestad, in the park, on *Tilia*. 1933 Deg. (Ds); Åminne, on *Fagus*. 1945! — Landeryd: N. of Jansbergssjön, on *Fagus*. 1945! (L). — Rydaholm: N. of Rafsebo and Yxkullsund, on *Fagus*. 1945! (L). — Stenbrohult: near the church, on *Quercus*. 1935 Me (S) MALME l.c. — Torpa: S. of the church, on *Populus tremula*. 1932 Deg. (Ds). — Vittaryd: the churchyard, on *Tilia*. 1929 Deg. (Ds). — Växjö: Bokhultet, on *Fagus*. 1945!

Halland. Eldsberga: Stjärnarp: on *Quercus*. 1947! (L). — Fagered: Hårsared, on *Fagus*. Sthm. MAGNUSSON 1927 p. 124. — Fjäråsa: Rossared, on *Fagus*. 1945! — Hasslöv: the churchyard, on *Ulmus*. 1942! (L). — Hishult: Ågård, on *Quercus*. Sthm. MAGNUSSON l.c. — Knäred: Bassalt, on *Fagus*. 1936 Me; Ön, on *Fagus*. 1936 Me (S) MALME l.c. — Lindome: the churchyard, on *Fraxinus*. 1932 Magn. (f. *diffusa*) (M); Skäggared, on *Alnus*. 1937 Deg. (Ds). — Sibbarp: S. of Angryd, on *Fagus*. 1945! (L). — Släp: Särö, on *Fagus*. 1923 Höeg (T). — Slättåkra: Spenshult, on *Fagus*. 1947! (L). — Ullared: N. of the church, on *Populus tremula*. 1929 Deg. (Ds). — Vinberg: Tröinge, on *Alnus*. 1943! (L).

Bohuslän. Bro: Näverkärr. 1928 Magn. (M). — Dragsmark: the churchyard, on *Aesculus*. 1928 Deg. (Ds). — Foss: Åtorp, on *Quercus*. 1928 Magn. (M). — Harestad: Kornhall, on *Quercus*. 1929 Magn. (M). — Jörlanda: Ranebo lund, on *Tilia* and *Fagus*. 1945 Mngn. (M) MAGNUSSON 1946 p. 213. — Kville: the churchyard, on *Sorbus intermedia*. 1934 Magn. (M). — Ljung: Höggeröd, on *Fraxinus*. 1940 Deg. (Ds); Ljungskile, on *Quercus*. 1926 Magn. (M) MAGNUSSON 1927 p. 124. — Lycke: Instön, on *Quercus*. 1944 Magn. (f. *diffusa*) (M, S). — Längelanda: Gömme (pr. Svanesund), on rocks. 1928 Er. and Magn. (M) ERICHSEN 1936 p. 545; Ängen, on *Quercus*. 1926 Magn. (M). — Romelanda: Lysegården, on *Ulmus*. 1925 Magn. (M); the churchyard, on *Ulmus*. 1935 Magn. (G, M). — Rödbo: Pileröd, on *Quercus*. 1932 Deg. (Ds). — Skaftö: several stations, on *Fagus*, *Populus tremula*, *Quercus*, *Tilia*, *Ulmus*. 1928, 38 Deg. (Ds) DEGELIUS 1939 p. 149. — Stala: Ringseröd, on *Quercus*. 1926 Magn. (MAGN. exs. 7) MAGNUSSON 1927 p. 124. MALME l.c.; Rörvik, on *Ulmus*. 1928 Magn. (M). — Tanum: Nedre Säm, on *Alnus*. 1937 Deg. (Ds). — Uddevalla: N. of U., on *Fraxinus*. 1942 Magn. (M). — Ucklom: Huveröd, on *Quercus*. 1926 Magn. (M). — Valla: Mjörn, Sundsby, on *Quercus*. 1931 Deg. (Ds). — Ödsmål: Kycklingedalen, on *Quercus*. 1930 Magn. (T); the old churchyard, on *Acer* and *Aesculus*. 1932 Magn. (M).

Dalsland. Dalskog: Rönsliden, on *Quercus*. 1944 Magn. (S). — Valbo-Ryr: Vågsäter, on *Fagus*. 1928 Magn. (M).

Västergötland. Alingsås: Nollhaga, on *Fagus*. 1919 Magn. (M). — Askim: Billdal, on *Fraxinus*. 1926 Magn. (M) MAGNUSSON 1927 p. 124; ibm, Anneberg, on *Ulmus*. 1937 Deg. (Ds). — Bergum: Björsared. 1939 Sthm (G). — Brunn: Brunnsnäs, on *Tilia*. 1938 Magn. (M). — Erska: Grävsnäs, on *Quercus*. 1917 Magn. (M) MAGNUSSON l.c. — Göteborg: St. Torp, on *Fraxinus*. 1945 Magn. (M). — Hålanda: Rösåsen, on *Fraxinus*. 1939 Hasselrot (Ht). — Kållered: Sagered, on *Quercus* and *Ulmus*. 1926 Deg. and Magn. (Ds, M, S) MAGNUSSON l.c. — Långared: Hällnäs udde, on *Quercus* and *Tilia*. 1942, 43 Hasselrot (Ht); Ulvarås, on *Quercus*. 1942 Hasselrot (Ht). — Medelplana: Kinnekulle, Råbäck, on *Quercus*. 1945 Deg. (Ds); Trolmen, on *Picea*. 1928 Deg. (Ds). — Mårdaklev: Skeppshult, on *Fagus*. 1945! (L); Åsabol, on *Fagus*. 1923 Me (S) MALME 1924 p. 315 and l.c. — Mölndal: the churchyard, on *Tilia*. 1931 Hasselrot (Ht); Gunnebo, on *Quercus*. 1927 Deg. (Ds). — Nykyrka: Mullsjö, on *Fraxinus*. 1923 Me (S) MALME l.cc. — Partille: Bokedalen, on *Fagus* and *Quercus*. 1945 Magn. and! (f. *diffusa*) (L, M). — Råda: near the church, on *Quercus*. 1927 Magn. (M). — Skallsjö: Alelund, on *Quercus*. 1944 Magn. (S); Floda, on *Quercus*. 1942 Magn. (M); Näs, on *Quercus*. 1933 Deg. (Ds). — Undenäs: Brotorp, on *Alnus*. 1934 Deg. (Ds). — Vänе-Åsaka: Börsled, near Hunneberg, on *Quercus*. 1939 Deg. (Ds). — Örgryte: Delsjön, on *Ulmus*. 1908 Magn. (M). — Östad: Kleven, on *Quercus*. 1946 Hasselrot (Ht).

Östergötland. V. Tollstad: Omberg, the reserve, on *Picea*. 1944 Deg. (Ds) DEGELIUS 1944 b p. 27.

Södermanland. Gåsinge: Skeppsta, Stora Lövan, on *Populus tremula*. 1940 Ahlner (Ar). — Nämdö: Nämdö Böte, on *Juniperus*. 1943 Deg. (Ds). — Ornö: on *Alnus*, *Corylus*, *Picea*, *Populus tremula*, *Quercus*, rather common, but in few individuals. 1941 Deg. (Ds) DEGELIUS 1942 p. 35. — Österhaninge: Sandemar, in an avenue. 1937 Deg. (Ds).

Uppland. Funbo: Halmbyboda, on *Quercus*. 1944 Ahlner, L. Hedlund, and Magn. (Ar).

Jämtland. Undersåker: Ristafallet, on *Picea*. 1914 Magn. (M, T) MAGNUSSON 1927 p. 124.

Norway.

Östfold. Borge: Skallegård. 1932 B. Lunde (T). — Jelöy: Island of J. (Jelöen). 1919 Lynge (O); ibm. 1923 Höeg (O) HÖEG 1923 p. 150.

Akershus. Aker: Ullern, on *Tilia*. 1922 Höeg (T) HÖEG l.c. — Asker: Skaugumsåsen, on *Populus tremula* and *Tilia*. 1922 Höeg (T) HÖEG l.c.; Tveter, on *Quercus*. 1932 Höeg (T).

Vestfold. Andebu: Einarsröd, on *Alnus*; Enden and Halsås, on *Fagus*, all 1922 Höeg (T) HÖEG l.c. — Brunlanes: several stations, on *Fagus* and *Quercus*. 1922, 23 Höeg (T) HÖEG l.c. — Hedrum: several stations, on *Alnus*, *Fagus*, and *Quercus*. 1921, 22 Höeg. HÖEG l.c. — Hof: Hildestad, on *Fagus* and *Quercus*. 1921, 22 Höeg (T) HÖEG l.c. — Larvik: the beech forest N. of L., rather abundant. 1947! (L, O, S). — Sande: Holm, on *Sorbus aucuparia*. 1922 Höeg (T) HÖEG l.c. — Stokke: near the church (T) and Stavnum, both on *Fagus*. 1922 Höeg l.c. —

Tjölling: Malmö, on *Sorbus aucuparia*. 1919 Lynge (O); ibm, on *Quercus*. 1922 Höeg (T) HÖEG l.c.; Ögården, on *Betula*. 1930 Höeg (T). — Våle: Rykåsen, on *Fagus*. 1922 Höeg (T) HÖEG l.c.

Telemark. Bamle: Lövtangen, on *Fraxinus*. 1923 Höeg (T). — Kragerö: at the Oslo high road, on *Tilia*. 1932 Deg. (Ds). — Skåtöy: on *Quercus*. 1922 Höeg (T).

Aust-Agder. Dyvåg (Dybvaag): on *Alnus*. 1922; Askeröy, pr. Lyngör, on *Quercus*. Both 1922 Höeg (T) HÖEG l.c. — Åmli: Nergarden. 1911 Lynge (O).

Vest-Agder. Oddernes: Topdalsfjord, on *Quercus*. 1939 Magn. (M).

Hordaland. Lindås: Lygrefjorden, between Mongstad and Poltnesset, on *Fagus*. 1922 Höeg (T) HÖEG l.c.

Denmark.

Sjælland. Asminderöd: Fredensborg, in the park, on *Tilia*. 1939! (L). — Birkerød: Rude Skov, on *Fagus*. 1945 Chr. CHRISTIANSEN 1946b p. 111. — Bjærgsted: at the road to Jyderup, on *Quercus*. 1946! — Draaby: Nordskoven, saxicolous. 1942 Chr. CHRISTIANSEN 1947 p. 182. — Egebjærg: Kongsöre Nebbe, on *Fagus*. 1946! — Frederiksborg Slotssogn: in the mansion park, on *Fagus*. 1923 Höeg (T); ibm, on *Quercus*. 1941 Er. ERICHSEN 1942 p. 145. — Grandlöse: Dragerup, on *Fagus* and *Quercus*. 1946! — Herfölge: Aashöje Overdrev, on *Fagus*. 1947! (L). — Hilleröd. 1919 Er. ERICHSEN 1929 p. 117; ibm, on *Fagus*. 1923 Höeg (T). — Hvalsö: the churchyard, on *Fraxinus*. 1943 Chr. (L) CHRISTIANSEN 1947. — S:t Jörgensbjærg: Boserup Skov, on *Fagus* and *Fraxinus*. 1946! — Kalvehave: Stensby Skov, on *Fagus*. 1947! — Lidemark: Taageröd Skov, on *Quercus*. 1947! (K, L). — Lilleröd. 1919 Er. ERICHSEN 1929. — Lyngby: Frederiksdal Storskov, on *Fagus*. 1946 Chr. CHRISTIANSEN 1947. — Maarum: Grib Skov, on *Fagus*. 1943 Chr. CHRISTIANSEN 1947. — Nöddebo: Grib Skov, on *Fagus*. 1938 Deg. (Ds); ibm, on *Fagus*. 1943 Chr. (L) CHRISTIANSEN 1947; 5 km. N. of Hilleröd, on *Fagus*. 1939! (L). — Sorö: at the road to »Parnassen», on *Quercus* and *Fagus*. 1946! — Taarbæk: Jægersborg Dyrehave, on *Quercus*. 1903 Gallöe (K); ibm, on *Fagus*. 1923 Höeg (T); ibm, on *Quercus*. 1943 Chr. (L) CHRISTIANSEN 1947. — Tureby: near the high road, on *Quercus*. 1947! (L). — Undlöse: Mölleskov, on *Fagus*. 1946! — Valsölille: Vesterskov, on *Fagus*. 1946! — Værlöse: Hareskoven, on *Fagus*. 1946 Chr.; Nörreskov, near Lake Furesöen, on *Fagus*. 1942 Chr. (K) CHRISTIANSEN 1947.

Mön. Magleby: Storeklint, on *Fagus*. 1946!

Falster. Horbelev: Bönned Skov, on *Quercus*. — Tingsted: Hannenav Skov, on *Betula*. Both 1943 Chr. (L) CHRISTIANSEN 1947.

Lolland. Hunseby: Knuthenborg, on *Quercus*. 1946! — Toreby: Fuglsang Storskov, on *Quercus*. 1943 Chr. (L) CHRISTIANSEN 1947.

Langeland. Tranekær: near the castle, on *Quercus*. 1946!

Fyn. Assens. 1925 Er. ERICHSEN 1929 p. 117. — Sr Broby: E. of the village, on *Fagus*. 1946! (L). — Egense: Hvidkilde, in the park, on *Tilia*. 1939! (L). — Husby: Wedellsborg, on *Fagus*. 1939! (L). — Langaa: Glorup Gl Dyrehave, on *Fagus*. 1946 Chr. CHRISTIANSEN 1947. — Middelfart: Fænö. Er. ERICHSEN 1929. — Tröstrup Korup: near »Kom-igen-Kroen», on *Fagus*. 1946!

Jylland. Aalum: S.W. of Fussing Sö, on *Fagus*. 1947! (K, L, S). — Aarhus: Marselisborg, on *Fagus*. 1939! (L). — Bjerning K. (pr. Haderslev): on *Fagus*. 1946! — Bov: Kollund. W. Saxen (in litt.). — Dronninglund: D. Storskov, on *Fagus*. 1947! (K, L). — Flade K: Bangsbo Skov, on *Fagus*. 1942 Chr. Christiansen 1947. — Gaversland: Munkebjærg, on *Fagus*. 1946! — Graasten: on *Quercus*. 1939! (L). — Hornstrup and Hover: Grejsdalen, on *Fagus*. 1941 Chr. (L) Christiansen 1947. — Le: Viskum Skov, on *Fagus*. 1947! (K, L, S). — Rold: S. part of R. Skov, on *Fagus*. 1947! (K, L). — Rye: Himmelbjærget, on *Fagus*. 1941 Er. Erichsen 1942. — Sr Stenderup: Frydenborg, on *Fagus*. 1939! (L); Nörreskov, on *Fagus*. 1946! (L). — Tem: Silkeborg Sönderskov, on *Fagus*. 1947! (L).

Finland.

Regio aboënsis. Åbo (Turku): Runsala (Ruissalo), on *Quercus*. 1933 Er. Erichsen 1936 b p. 8.

Karelia ladogensis (both stations now Russian). — Ruskeala: Härkämäki, in the churchyard, scarce on *Sorbus aucuparia*. Räsänen. Räsänen 1939 p. 84. — Sortavala: Kirjavalahti, saxicolous. M. Laurila and Räsänen. Räsänen l.c.

P. hemisphaerica is a rather common species in Denmark, the coast districts of S. Sweden, and in S. Norway. It reaches the middle Swedish lake district with scattered localities, but it is rare N. of Småland and Västergötland.

As it has a very striking appearance, it cannot have been overlooked by lichenologists collecting in Svealand during the last decennia.

Under these circumstances the isolated station in Jämtland is of great interest, forming a considerable northern extension of the range of the species. As pointed out by Magnusson, the Jämtland specimens differ from the main type (»a noticeable variety«), but after examining the collection, I cannot but consider it as being within the form-circle of *P. hemisphaerica*. It is not impossible that the locality has a connection with undetected occurrences in the Trondheim district. As stated by Ahlner (in a treatise in preparation), several oceanic lichens have wide distributional areas in Sörtröndelag and Jämtland. In my opinion it is, however, a more essential fact that the lichen was found near a water-fall. From the same locality, Ristafallet, Malme (1912 b p. 312) recorded another southern lichen, *Catinaria leucoplaca* (syn. *Catillaria grossa, C. premnea*), whose nearest known localities were Ladehammern near Trondheim, and in the neighbourhood of Gävle. Greta Sernander (1920 p. 340) reported the southern lichen *Ramalina obtusata* as growing at Ristafallet. Further records of southern and oceanic lichens from isolated northern stations near water-falls have been made by Du Rietz (1913 p. 82 and 1914 p. 271: *Nephroma lusitanicum* and

Catinaria leucoplaca from Tännforsen resp. Handölsfallen in Jämtland), AHLNER (1938; several species, e.g. *Nephroma lusitanicum, Pannaria pityrea,* and *Parmelia conspersa* from water-falls in Åsele Lappmark) and DEGELIUS (1940 b; *Sticta fuliginosa* from Styggforsen in Dalarna). For records of southern phanerogams occurring near waterfalls in Norrland I refer to CEDERGREN (1922 p. 225) and the literature cited there. CEDERGREN points out the favourable local climate created by the mist from the running water, through which frosts are impeded in summer and autumn and the period of vegetational growth becomes considerably extended.

Apart from the Jämtland locality, the lichen goes farther to the north than e.g. *P. subviridis* and *Wulfenii*. Its extension to Hordaland, Uppland, and Finland might justify its place in group B. On the other hand, it is very rare in Svealand, according to our present knowledge, and it does not reach the oak limit. Preliminarily I have chosen to treat it in group C rather than in B.

Extra-Scandinavian Distribution. — The European distribution is recorded by ERICHSEN (1936), who has also published a schematic map (1940 p. 30) of its total area.

In Germany it is known from numerous stations over the whole country. In the mountains it ascends to about 1100 m. ERICHSEN (1936) recorded it from Austria and Czecho-Slovakia. — DUVIGNEAUD (1937) published a station from Belgium. Sparse stations have been quoted ERICHSEN (l.c.) from France and the British Isles, but the lichen will probably prove to be more common in these districts. — Its South-European area is imperfectly known. It has been recorded from several stations in Portugal (TAVARES 1946) and from the neighbourhood of Barcelona in Spain (see. ERICHSEN 1940). The latter author (1936) also quoted stations from Italy (Varazze near Genoa) and the Balkan Peninsula, viz. Yugo-Slavia (Dalmatia) and Rumania. There is no statement of it from E. Europe (apart from the former German East Prussia).

Outside Europe there is only one locality known, in Tunis (ERICHSEN 1938 b).

Habitat Ecology. — *P. hemisphaerica* is an epiphyte on various species of deciduous trees, preferably on old beeches and oaks. Yet it is very rarely met with on *Betula*. Occasionally it can also grow on coniferous trees and on rocks.

It is a pronouncedly photophilous lichen, chiefly restricted to light beech and oak forests or to free-standing trees. Its communities contain large amounts of photophilous macrolichens, as *Evernia* and several *Parmelia* species, sometimes also *Physciae, Ramalinae,* and *Xanthoriae*.

Tab. VII. Pertusaria hemisphaerica - communities.

1, 5—6, 8—15 on middle-aged — rather old *Fagus*, 2, 3, 7 on old *Quercus*, 4 on a middle-aged *Aesculus*. — 1. **Sk.** Andrarum: Traneboda, W. exposure. — 2. Brunnby: Kullen, Ransgården, S. exp. — 3. Bosjökloster, S. exp. — 4. Flenînge, the churchyard, E. exp. — 5. Vittsjö: Boalts böke, S. exp. — 6. **Bl.** Nättraby: Skärva, S.W. exp. — 7. Ronneby: near the road Härstorp—Lugnet, S. exp. — 8—9. Ibm: Brunnsskogen, E. exp. — 10. Sölvesborg: Valje, S. exp. — 11. **Sm.** Markaryd: Timsfors, S. exp. — 12. **Hl.** Slättåkra: Spenshult, N. exp. — 13. Ibm, E. exp. — 14. **Sj.** Tureby, N. exp. — 15. **Jl.** Tem: Silkeborg Sönderskov, **E.** exp.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Bacidia rosella	—	—	—	—	—	3	—	—	—	—	—	—	—	—	—
Buellia betulina	1	—	—	—	1	—	—	—	—	—	—	—	—	—	—
— disciformis	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—
— punctiformis	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—
Candelaria concolor	—	—	—	2	—	—	—	—	—	—	—	—	—	—	—
Candelariella xanthostigma	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—
Catinaria Laureri	—	—	—	—	—	—	—	—	—	3	—	—	—	—	1
Cladonia ochrochlora	1	—	—	—	—	—	—	—	—	—	—	—	1	—	—
Evernia prunastri	—	**1**	2	1	1	1	1	1	—	—	1	—	1	**2**	—
Graphis scripta	—	—	—	—	—	—	—	—	—	1	—	1	1	—	—
Haematomma coccineum	—	—	—	—	—	1	1	1	—	—	—	—	—	—	—
— leiphaemum	—	**3**	—	—	—	—	—	—	—	—	—	—	—	—	—
Lecanora expallens	—	—	—	—	2	—	—	—	**3**	—	3	1	**2**	**4**	—
— glabrata	—	—	—	—	1	—	—	—	**3**	2	2	—	3	—	—
— intumescens	—	—	—	—	1	—	—	1	—	—	—	—	1	—	—
— subfusca (coll.)	—	1	—	—	—	1	2	**3**	1	1	—	—	1	1	1
Lecidea cyathoides var. corticola	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—
— quernea	—	2	1	—	—	—	3	1	1	—	1	—	—	1	—
Lepraria aeruginosa	**2**	**1**	**3**	**1**	**2**	2	1	1	**3**	**1**	**2**	**2**	**1**	**2**	**2**
Ochrolechia androgyna	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Opegrapha varia	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—
— viridis	—	—	—	—	—	1	—	2	**3**	2	—	—	—	—	1
Parmelia acetabulum	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—
— fuliginosa var. laetevirens	—	1	—	1	1	**2**	1	1	1	—	—	1	1	—	—
— physodes	2	1	—	1	2	—	—	—	—	—	—	—	—	—	—
— saxatilis	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—
— sulcata	3	1	—	1	—	—	1	1	—	—	—	—	1	—	—
Pertusaria amara	2	2	—	2	2	—	3	**4**	2	1	—	1	2	—	—
— coccodes	1	—	—	—	—	—	3	3	—	—	—	—	—	—	—
— globulifera	—	—	—	—	—	2	—	—	—	1	—	—	—	—	—
— — f. Henrici	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—
— hemisphaerica	**3**	**3**	**4**	—	**3**	**3**	**3**	**3**	**4**	**3**	**3**	**4**	**3**	**4**	**3**
— — f. diffusa	—	—	—	3	—	—	—	—	—	—	—	—	—	—	—
— leioplaca	—	—	—	—	1	—	—	—	—	—	—	—	—	1	—
— lutescens	—	1	**2**	—	—	—	1	—	—	1	—	—	—	—	—
— pertusa	1	2	—	—	**4**	—	2	—	—	2	1	2	2	—	2
— Wulfenii	3	—	—	—	—	—	—	—	—	2	1	1	—	—	2
Phlyctis argena	—	—	—	**2**	1	**4**	—	1	2	**2**	1	—	2	1	—
Physcia grisea	—	—	—	1	—	—	1	—	—	—	—	—	—	—	—
— tenella	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—
Pyrenula nitida	—	—	—	—	—	—	—	—	—	1	2	—	1	2	1
Ramalina farinacea	—	1	—	—	—	—	1	—	—	—	—	—	—	—	—
— pollinaria	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—

Tab. VII. Continued.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Thelotrema lepadinum ...	—	—	—	—	—	—	—	—	—	—	3	—	—	—	2
Xanthoria candelaria	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—
— parietina	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—
— polycarpa	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—
Dichaena faginea	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—
Coccoid Chlorophyceae ...	—	+	—	—	—	—	+	—	—	+	—	—	—	+	+
Antitrichia curtipendula ..	—	—	—	—	—	—	—	—	—	—	—	3	1	—	—
Hypnum cupressiforme ...	3	—	4	2	4	1	2	—	1	—	3	2	1	1	2
Ulota cfr Bruchii	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Frullania dilatata	—	—	—	—	1	3	1	1	1	—	1	1	1	1	—
Metzgeria furcata	—	—	—	—	—	1	1	—	1	1	—	1	—	—	—

It is also often associated with other *Pertusariae*, mainly photophilous species (*P. amara, coccodes, lutescens, pertusa*). In the crevices of the bark or overgrowing the omnivagant moss *Hypnum cupressiforme*, the otherwise photophobous lichen *Lepraria aeruginosa* is a constant. *Phlyctis argena*, which has a wide ecological amplitude, is also a rather true companion of *Pertusaria hemisphaerica*.

Rather seldom is it met with on dust-influenced trunks, mostly as f. *diffusa* (cf. below). Tab. VII: 4 refers to such a trunk, where it was accompanied by a number of coniophilous lichens (*Buellia punctiformis, Candelaria, Parmelia acetabulum, Physcia grisea, Xanthoria candelaria* and *polycarpa*). Otherwise it is as a rule restricted to coniophobous stations.

Owing to its rather wide ecological amplitude, its communities are not very uniform, containing elements from the *Physodion* (*Cladonia ochrochlora, Evernia, Parmeliae*), as well as from the *Xanthorion* (cf. above). On *Fagus*, they also often contain species belonging to the union *Pyrenuletum* of the *Graphidion*, e.g. *Bacidia rosella, Catinaria Laureri, Graphis scripta, Lecanora glabrata, Opegrapha viridis, Pertusaria leioplaca* and *Wulfenii, Pyrenula nitida*, and *Dichaena faginea*. Yet it is more photophilous than the majority of these species.

As a rule it has a smaller power of competition than e.g. *Pertusaria amara*. It is often met with only in some few specimens on each trunk, only exceptionally covering large sheets and forming societies of its own.

Measurements of pH from 3 stations [Sk. Bosjökloster (*Quercus*), Bl. Ronneby: Brunnsskogen, and Hl. Slättåkra: Spenshult (both *Fagus*); each

10 samples, all from rather dust-free trees] gave varying results. The samples from oak bark gave pH=4.5—4.9 (mean 4.7), from beech bark 5.1—5.8 (mean 5.4), thus corresponding to values characteristic of dust-free oaks and beeches (cf. under *Arthonia impolita*, *Pyrenula nitida* and p. 221).

Affinity and Variation. — HÖEG and ERICHSEN recorded the species as a *Pertusaria*, but, as mentioned above, SANDSTEDE referred it to *Ochrolechia*. In fact, there is nothing definite upon which to base an arrangement in either genus, as long as the species is only known in a sterile form. In his monograph of Central European *Pertusariae*, ERICHSEN (1936) referred it to subgenus *Variolaria*, sect. *Lacteae*, distinguished by a red C reaction of the medulla. Most of the species of this section, some 10 in all, have never been found with apothecia. It is possible that the whole section had better be referred to *Ochrolechia*, but preliminarily I prefer to retain the delimitation of *Pertusaria* known from »RABENHORST», until a necessary taxonomic revision of *Ochrolechia* has been undertaken.

It has sometimes been confused with *Ochrolechia androgyna*, a common species, whose relations to *O. tartarea* should be studied further. The chief differences can be summed up thus:

P. hemisphaerica	*O. androgyna*
Thallus silver grey with a white marginal zone.	Thallus ± impurely grey with no marginal zone.
Soredia (yellowish—) purely white.	Soredia yellowish grey.
Medulla and soredia C+ bloodred.	Medulla and soredia C+ reddish (not bloodred).

Sec. ERICHSEN (1937 p. 104), *P. hemisphaerica* is »eine vergleichsweise konstante Art». The only variety described from N.W. Europe is var. *commutata* Erichs. (l.c.) from the Hamburg district. It is said to have hemispherical corticate verrucae instead of soredia. It must be compared with *P. inaequalis* Erichs. (1936), which is recorded from Denmark (CHRISTIANSEN 1947 p. 182). It is, however, evident that a certain variation can be observed in the form of the soredia. Normally, in woods and generally on rather dust-free bark, they are hemispherical and well delimitated. On stations with a certain influence from dust (road-side trees etc.), part of the soredia grow more diffuse and confluent. I call the latter type f. *diffusa* n. f.[1] It is analogous to *P. pulvinata* Erichs. and *P. Henrici* (Harm.) Erichs., which, in my opinion, are also not much more than modifications induced by the dust-impregnated habitat. They are better treated as *P. amara* (Ach.) Nyl.

[1] Soredia non stricte delimitata, demum confluentia.

f. *pulvinata* (Erichs.) n. c. and *P. globulifera* (Turn.) Nyl. f. *Henrici* Harm. ap. Sandst. A similar relation exists between the saxicolous *P. leucosora* (Ach.) Nyl. and »*P. dealbescens*» Erichs. (cf. DEGELIUS 1942 p. 36).

Occasionally it is also met with on rocks, f. *saxicola* Erichs., only slightly differing from the corticolous main type. The saxicolous type is similar to *P. lactea* (L.) Arn., which, however, has a more wrinkled, areolate thallus and more orbicular soredia, constricted at the base.

8. *Pertusaria subviridis* Höeg.

Syn. *P. velata* auct. plur., non (Turn.) Nyl. — *Ochrolechia subviridis* Erichs. — Cf. further ZAHLBRUCKNER Cat. Lich. V (1928) p. 245, VIII (1932) p. 549, X (1940) p. 465, and ERICHSEN in RABENHORST's Kryptogamen-Flora IX. 5:1 p. 546.

History. — This lichen was described as a species as late as 1923 from Norway by HÖEG. Previously it was well-known by lichenologists in Central and Western Europe though considered as a sterile, isidiate form of *P. velata*.

The first statement of the species from Sweden was made in 1927, when MAGNUSSON published it (determined by HÖEG) from the neighbourhood of Göteborg where he had collected it in 1908. But already in 1913 ERICHSEN had published »*P. velata*» (from Kullen in Skåne, collected in 1911), which is identical to *P. subviridis*. In the literature there are in all 14 Swedish records of the lichen. At present I know it from about 125 localities in Sweden.

From Norway it was first known from the Larvik district (HÖEG 1923). I know only two further Norwegian stations. From Denmark the lichen was first recorded in 1939 by ERICHSEN. In the literature there are published 17 Danish localities. At present I know about 70 stations of the species from Denmark. There is no record from Finland.

Scandinavian Distribution.

Sweden.

Skåne. Allerum: Kulla-Gunnarstorp, on *Ulmus* and *Fraxinus*. 1943! (L, S). — Andrarum: Traneboda, on *Fagus*. 1946! (B, L, S). — Ask: Vindfälle, on *Quercus*. 1946! (L). — Bara: Torup, on *Fagus*. 1946! (L). — Billinge: Bögerup. 1937 Sthm (G). — Bjäresjö: N. of Bergsjöholm, on *Fagus*. 1944! (L, S). — Bläntarp: Simontorp, on *Betula*. 1946! (f. *sordidescens*) (L, S). — Bosjöklooster: several stations, on *Acer*, *Fagus*, *Quercus*. 1942, 47! (A, L, S). —

Brunnby: Björkeröd, on *Fagus, Quercus, Ulmus*. 1911 Er. (+ f. *pulverulenta*) ERICHSEN 1913 p. 64, 1936 p. 550; Arild, Hagagården, on *Ulmus*. 1940! (L); Krapperup, on *Acer*. 1937! (f. *pulverulenta*) (A) ERICHSEN 1940 p. 34; between Hjorthagen and Ransgården, on *Quercus*. 1943 Deg. (Ds); S. of Ransgården, on *Quercus*. 1939, 40! (A, L, O, S, T, U) ALMBORN 1939 p. 778. — Brösarp: Lökaröd, on *Fagus*. 1943! (L, S). — Börringe: Hästhagen, on *Fagus*. 1944! (L); Ramnakärr, on *Fraxinus*. 1942! (L, S). — Degeberga: Kyllingaröd, on *Fagus*. 1940! (A, L, S). — Fågeltofta: Kronovall, on *Acer*. 1945! (L, S). — Genarp: Häckeberga, on *Aesculus, Fagus, Fraxinus, Quercus*. 1943, 45, 46! (L, S). — Gryt: Vanås, at the mansion, on *Tilia*. 1942! (L); between V. and Spångamölla, on *Quercus*. 1942! (L, S). — Halmstad: Duveke, on *Fraxinus*. 1942, 46! (L, S). — Hammarlunda: V. of the mansion, on *Acer* and *Tilia*. 1942! (A, L, S). — Hyby: Västerskog, on *Fagus*. 1944! (L). — Högestad: Lyckås, on *Fagus*. 1945! (L). — Hörby: between H. and Fulltofta, 1891 Me (S). — Ivetofta: Håkanryd, on *Fagus*. 1942! (L, S). — Konga: Konga lund, on *Fagus*. 1942, 46! (L, S). — Kropp: Rosendal, on *Quercus* and *Fraxinus*. 1943! (H, L, O, S). — Kviinge: Spångamölla, on *Fraxinus*. 1942! (f. *soralifera*) (L). — Kågeröd: several stations. 1934 Sthm (G, O). — Linderöd: at the road to Åsphult, on *Fagus*. 1945! (L, S). — Matteröd: Pilatorpet, on *Fagus*. 1945! (S). — S. Mellby: Kiviks Äsperöd, on *Ulmus*. 1944! (L, S); Stenshuvud, on *Tilia*. 1944! (L). — Munkarp: Vittseröd. 1937 Sthm (G); at the road to Hallaröd, on *Fagus*. 1945! (L, S). — Odarslöv: the exclave W. of S. Sandby, on *Quercus*. 1948! (L). — Ottarp: Bälteberga, on *Fraxinus*. 1943! (S). — Riseberga: Herrevadskloster, on *Quercus* and *Fraxinus*. 1942! (L); Råred, on *Fagus*. 1940! (A, L, S); Skäralid, on *Quercus*. 1943! (L). — N. Rörum: Svenstorp, on *Fagus*. 1943! (S, U); Toftaröd, on *Quercus*. 1943! (L). — S. Sandby: Linnehjär, on *Quercus*. 1945 Magn. (L, M). — Skabersjö: W. of the castle, on *Fraxinus*. 1946! (L). — Slimminge: Skönabäck, on *Quercus*. 1943! (L). — — Stehag: Gustafslund. 1937 Sthm (G). — Svalöv: Axelvold. 1934 Sthm (G). — Ö. Sönnarslöv: Maltesholm, in the park, on *Fagus* and *Tilia*. 1939 Deg. and ! (Ds, L) ALMBORN l.c. — Sövde: Kristinelund, on *Fagus*. 1943! (L); S. of Snogeholm, on *Quercus*. 1943! (L). — Sövestad: Bällinga, on *Quercus*. 1943! (L); Elledal, on *Fagus*. 1944! (S); Krageholm, on *Fagus* and *Quercus*. 1943! (L, S); Lybäck, on *Alnus* and *Tilia*. 1944! (L, S); Vistorp, on *Fagus*. 1943! (S, U). — Tjörnarp: N. of the station, on *Fagus*. 1943! (L). — Torekov: Hallands Väderö, on *Quercus*. 1945! (L, S). — Torrlösa: Trollcholm, on *Aesculus*. 1942! (L, S). — Törringe: Törringelund, on *Quercus*. 1943 Deg. (Ds); ibm. 1945! (L). — Verum: Mölleröd, on *Fagus*. 1945! (L, S). — Villie: Rydsgård, on *Aesculus* and *Ulmus*. 1943! (L). — Vitsjö: Boalts böke, on *Fagus*. 1945! (L). — N. Vram: Vrams Gunnarstorp, on *Quercus*. 1946! (L, S). — Örkelljunga: Lärkesholm, on *Fagus*. 1940! (L, S); N. of Ö. Spång, on *Fagus*. 1943! (L, S). — Öved: Övedskloster, on *Quercus*. 1946! (L).

Blekinge. Bräkne-Hoby. 1935 Sthm (G, O, T). — Edestad: Aspan, on *Quercus*. 1938! (A, L, S) ALMBORN l.c. — Förkärla: Tromtösunda, on *Quercus*. 1946! (L, S). — Hjortsberga: N. of H., on *Quercus*. 1942! (G, L, S, U). — Listerby: Kärragården, on *Quercus*. 1946! (L). — Mörrum: Stensnäs, on *Fagus*. 1942! (L, S). — Nättraby: Marielund, on *Fagus*. 1945! (L). — Ron-

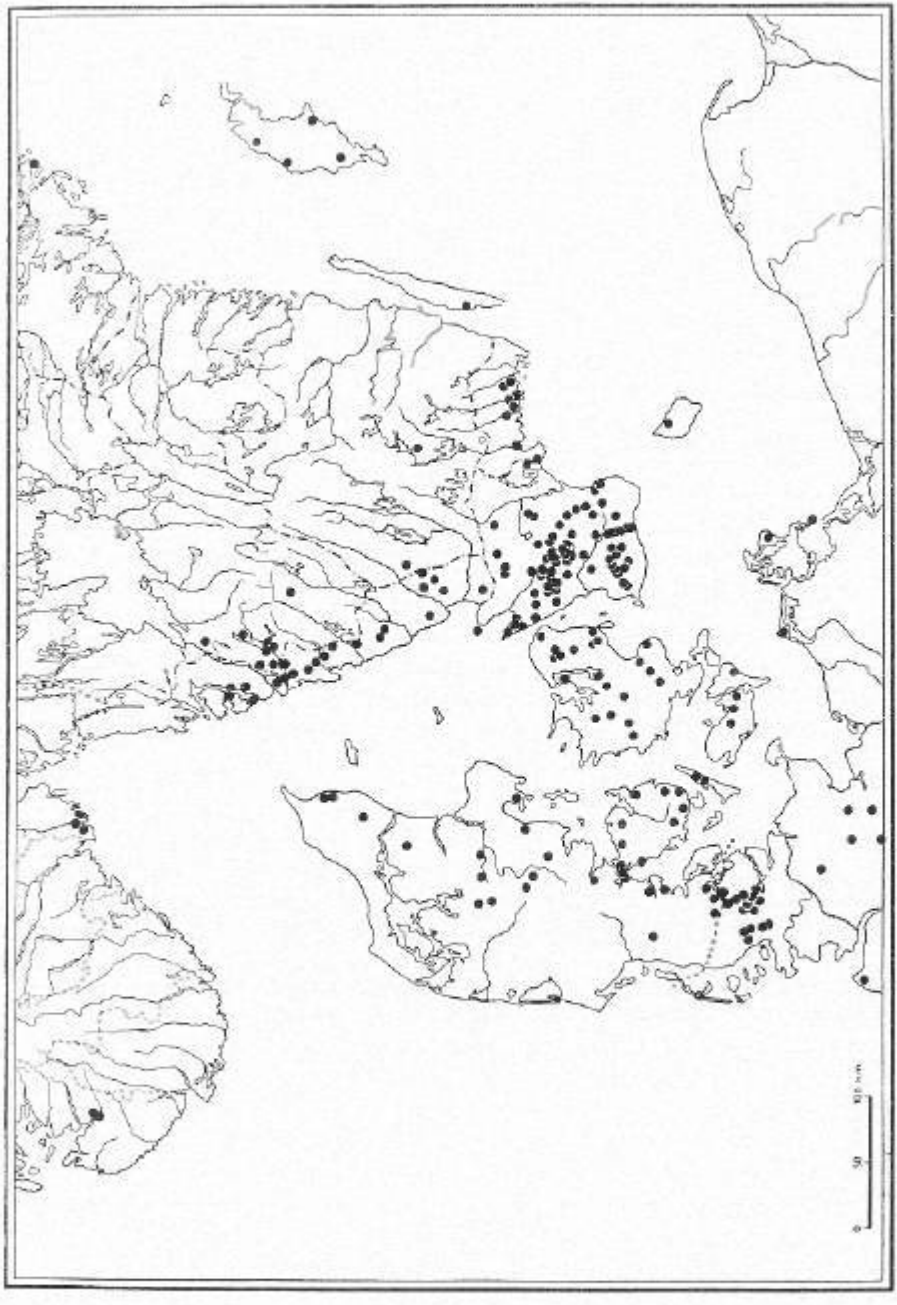


Fig. 12. *Pertusaria subviridis* in Scandinavia.

neby: several stations, on *Fagus* and *Quercus*. 1944, 45! (H, L, S, U). — Sölvesborg: Valje, on *Fagus*. 1942, 43! (L, S).

Öland. Kastlösa: St. Dalby, on *Quercus*. 1943! (L).

Gotland. Ardre: S. of the church, on *Quercus*. 1943 Deg. — Hablingbo: Simes, on *Quercus*. 1943 Deg. (Ds). — Stenkyrka: N.W. of the church, on *Quercus*. 1943 Deg. (Ds). — Västerhejde: Högklint, abundant on *Pinus*. 1943 Deg. (Ds, S). All sec. DEGELIUS 1944 p. 49.

Småland. Femsjö: Skubbhult, on *Fagus*. 1945! (L, S). — Växjö: Biskopsnäset, on *Fagus*. 1945! (L, S).

Halland. Breared: Linghult, on *Tilia*. 1933 Sthm (G); between Mahult and Ryaberg, on *Fagus*. 1942! (L); the churchyard, on *Fraxinus*. 1943! (L). — Enslöv: E. of Oskarsström, on *Fagus*. 1942! (L). — Fjärås: Rossared, on *Fagus*. 1945! (L, O, S). — Frillesås: Berg, on *Quercus*. 1937 Magn. (M). — Getinge: Fröllinge, on *Fagus*. 1943, 45! (L). — Hasslöv: near the church, on *Tilia*. 1932 Magn. (M). — Lindome: Greggered. 1939 Magn. (M). — Rolfstorp: Kärrsgården, on *Alnus*. 1943! (L). — Sibbarp: S. of Angryd, on *Fagus*. 1945! (L, S). — Tvåker: N. of Galtabäck, on *Alnus*. 1947! (L). — Tölö: Gåsevadholm, on *Fraxinus*. 1928 Magn. (f. *pulverulenta*) (M) ERICHSEN 1936 p. 550. — Veddige: at the road to Sällstorp, on *Alnus*. 1945! (L, S).

Bohuslän. Jörlanda: Ranebo, on *Quercus*. 1945 Magn. (M) MAGNUSSON 1946 p. 213. — Marstrand: Koön, on *Quercus*. 1933 Deg. (Ds); ibm. 1947 Magn. (M); ibm, Rosenlunds park, on *Quercus*. 1947 Deg. (Ds, L). — Tuve: Hökälla, on *Quercus*. 1928 Magn. (Ds, L, M, S, MAGN. exs. 60). — Valla: Sundsby, on *Quercus*. 1931 Deg. and Magn. (Ds, G, M). — Ödsmål: Kyckling, on *Quercus*. 1930 Magn. (M); the old cemetery, on *Aesculus*. 1932 Magn. (M).

Västergötland. Göteborg: Slottsskogen, on *Quercus*. 1908 Magn. (M) MAGNUSSON 1927 p. 127; Kärralund, on *Fraxinus*. 1944 Magn. (S). — Hemsjö: Slävik, on *Quercus*. 1945 Deg. (Ds). — Kållered: Lagåker, on *Ulmus*. 1927 Magn. (M). — Lerum: Aspedalen, on *Quercus*. 1928 Er. and Magn. (f. *pulv.*) (M) ERICHSEN 1936 p. 550; Aspenäs, on *Tilia*. 1936 Magn. (M); Stålebo. 1931 Sthm (G). — St. Lundby: Björboholm, on *Fraxinus*. 1928 Magn. (f. *pulv.*) (M). — Långared: Hällnäs udde, on *Tilia*. 1947 Hasselrot (Ht, L); Östergärdskullen, on *Quercus*. 1947 Hasselrot (Ht). — Målsryd: near the fire station, on *Fagus*. 1945! (L). — Mölndal: Lagklarebäck, on *Quercus*. 1938 Deg. (Ds). — Partille: Bokedalen, on *Quercus*. 1945, 46! (L, S). — Råda: near the church, on *Quercus*. 1928 Magn. (M); Råda säteri. 1932 Sthm (G). — Skallsjö: Drängsered. 1931 Sthm (G); Floda. 1931 Magn. and Sthm (G, M); Nääs, on *Tilia*. 1919 Magn. (T). — Starrkärr: Grunhed, on *Quercus*. 1928 Magn. (M). — Väne-Åsaka: Börsled (pr. Hunneberg), on *Quercus*. 1939 Deg. (Ds).

Södermanland. Nämdö: Lindberget, on an old *Sorbus intermedia*. 1943 Deg. (Ds, L, U) DEGELIUS 1943 b p. 410.

Norway.

Vestfold. Brunlanes: Tenviksskogen and Fritzöparken, on *Fagus*. 1922 Höeg (T). — Hedrum: Lovisenlund, on *Fagus* and *Populus balsamifera*. 1922, 25 Höeg (T). — Larvik: near Kilen, on *Fagus*. 1922 Höeg (T). All sec. HÖEG 1923

p. 151. — Tjölling: »Bergelunden», on *Quercus*. 1930 Höeg (T); Eftang, Stuejordet, on *Fagus*. 1928 Höeg (T); Malmö, on *Quercus*. 1922 Höeg (T) Höeg l.c.

Rogaland. Forsand: Dirdal, between the firth and the church, on *Fraxinus*. 1947 Deg. (Ds); Frafjorddalen, Nordalen, on *Fraxinus*, abundant. 1947 Deg. (Ds, L).

Denmark.

Sjælland. Asminderöd: Fredensborg, in the park, on *Fagus* and *Tilia*. 1939! (K, L, S) Almborn l.c. — Birkerød: Rude Skov, on *Fagus*. 1945 Chr. Christiansen 1946 p. 111. — Bjærgsted: at the road to Jyderup, on *Quercus*. 1946! (L, S). — Braaby: Gisselfeld, on *Quercus*. 1946! (L, S); Villa Gallina, on *Fagus*. 1946! (L). — Draaby: Nordskoven, on *Quercus*. 1942 Chr. (K). — Farum: on *Tilia*. 1942 Chr. (f. *granulosa*) (L); Fiskebæk, on *Fraxinus*. 1942 Chr. (K). — Frederiksborg Slotssogn: St. Dyrehave, on *Fagus*. 1946! (L). — Haraldsted: Egtved Fælled, on *Fagus*. 1946! (L). — Hersley: Bognæs, on *Quercus*. 1942 Chr. (K). — Hilleröd. 1919 Er. Erichsen 1936 p. 548; ibm, on *Quercus*. 1923 Höeg (T). — Holtug: Gjorslev Bögeskov, on *Quercus*. 1941 Er. (in litt.). — Hornbæk: Teglstrup Hegn, on *Fagus*. 1943 Chr. (L). — Hvalsö: the churchyard, on *Fraxinus*. 1943 Chr. (L). — Hörsholm: Fole Have, on *Fagus*. 1947! (L). — Jyderup: N. of Skarresö, on *Fagus*. 1946! (L, S). — Lilleröd. 1919 Er. Erichsen l.c. — Lyngby. 1919 Er. Erichsen l.c. — Nöddebo: Grib Skov, on lignum. 1943 Chr. (ad f. *soralifera*) (K); N. of Hilleröd, on *Fagus*. 1939! (L). — St Peder: Slagelse Lystskov, on *Fagus*. 1946! (L). — Sorö: at the road to »Parnassen», on *Fagus*. 1946! (L). — Tuarbæk: Jagersborg Dyrehave, on *Quercus*. 1941 Chr. (K). — Tureby K.: near the highroad, on *Quercus*. 1947! (L). — Undlöse: Mölleskov, on *Quercus*. 1946! (L). — Vallöby: at the castle, on *Tilia*. 1947 Deg. (Ds, L).

Falster. Horbelev: Pomlenakke, on *Fagus*. 1946! (L).

Lolland. Hunseby: Knuthenborg, in the park, on *Quercus*. 1939, 46! (L, S) Almborn l.c. — Skörringe: Christianssæde, on *Ulmus*. 1946 Chr. (L). — Toreby: Fuglsang Storskov, on *Quercus*. 1943 Chr. (L).

Langeland. Tranekær: Korsebölle, on *Quercus*. 1939! (K, L) Almborn 1939 p. 779. — Tullebölle: S. of Frellesvig, on *Quercus*. 1946! (L).

Fyn. Brahetrolleborg: in the avenue, on *Tilia*. 1939! (L, S). — Egense: Hvidkilde, in the park, on *Tilia*. 1939! (K, L, S). — Husby: Wedellsborg, in the park, on *Fagus* and *Fraxinus*. 1939! (A, K, L, S). All see. Almborn l.c. — Middelfart: Fænö: Er. Erichsen 1930 p. 4; Hinsgavl, in the avenue, on *Tilia*. 1939, 46! (A, K, L O, S) Almborn l.c. — Ore (S. W. of Bogense): the churchyard. 1947! (L). — Revninge: (pr. Kerteminde): Storskov, on *Fraxinus*. 1947! (L). — Svindinge: Glorup, Gl Dyrehave, on *Fagus*. 1946 Chr. — Sönderse: Sönderse Skov, on *Fraxinus*. 1947! (L). — Vejstrup: Tiselholt Skov, on *Fagus*. 1946 Chr. (K).

Jylland. Aalum: S.W. of Fussing Sö, on *Quercus*. 1947! (L). — Aarhus: Marselisborg, on *Fagus*. 1939! (L) Almborn l.c. — Agri: »Lyngbakkerne», on *Juniperus* and *Calluna*. 1943 Chr. (L) Christiansen 1946 p. 81. — Bjerning: Vesterskov, on *Fagus*. 1946! (L). — Bov: Frösley Skov. W. Saxen (in litt.). — Dollerup: Hald Egelund, on *Quercus*. 1946! (L). — Dronninglund: D. Storskov,

on *Fagus*. 1947! (L); near the mansion, on *Quercus*. 1947! (L, S). — F l a d e: Bangsbo Skov, on *Fagus*. 1942 Chr. (L); ibm, near the mill, on *Fraxinus*. 1942 Chr. (L); Pikkerbakken, on *Quercus*. 1947 Magn. (L, M). — G a v e r s l u n d (pr. Vejle): Munkebjærg, on *Fagus*. 1946! (L). — G r a a s t e n: on *Fraxinus* and *Ulmus*. 1939! (K, L) ALMBORN l.c. — G r a m: Gram Slot, on *Fagus* and *Fraxinus*. 1941 Er. (in litt.). — H a d e r s l e v: on *Fagus*. 1941 Er. (in litt.). — H o l b ø l: Hönsnap Skov, on *Fagus*. 1946! (L); W. of Rönshoved, W. Saxen (in litt.). — L e: Viskum Skov, on *Fagus*. 1947! (L). — R y e: Himmelbjærget, on *Fagus*. 1941 Er. (c. fr.) ERICHSEN 1942 p. 146. — S k a n d e r b o r g: S. of the town, on *Fagus*. 1939! (L, S) ALMBORN l.c. — S k ö r p i n g: Bjæropskov near Buderupholm. 1943 Chr. (f. *sordidescens*) (L). — S r S t e n d e r u p: Frydenborg, on *Fagus*. 1939! (A, L, S); Nörreskov, on *Fagus*. 1946! (L, S). — T e m: Sönderskov (S. of Silkeborg), on *Fagus*. 1946! (L). — N r V i l s t r u p: Kelstrup, on *Quercus*. 1945 Er. (c. fr.) ERICHSEN 1940 p. 33, 1942 p. 146. — V i u m: Aunsbjærg, in the park, on *Fagus*. 1946! (L). — V o l s t r u p (pr. Sæby): Sæbygaard Skov, near the hotel, on *Quercus*. 1936 Deg. (Ds); ibm, on *Fagus*. 1947! (L).

Bornholm. R ö: Dynddalen, near »Amtmandstenen», on *Quercus*. 1935 Deg. (Ds) DEGELIUS 1936 b p. 430.

As shown by the map, the species has a wide distribution in almost the whole of Denmark and in the southern and western coastal districts of Sweden. As far as is known, it is lacking in the interior parts of S. Sweden as well as in the coastal districts of Småland and Östergötland. Its distribution in W. Norway is still imperfectly known. As it is a rather inconspicuous lichen it is, however, easily overlooked, and it is not impossible that future discoveries will somewhat increase its Scandinavian area.

Extra-Scandinavian Distribution. — The European distribution of *P. subviridis* is shown in a map by ERICHSEN (1940 p. 34), which, however, is very schematic. As to its Scandinavian area this map is directly wrong.

The species is known from almost all parts of G e r m a n y (ERICHSEN 1936, 1940). In the N.W. German lowland it is said to be »verbreitet und oft häufig». »*P. velata*» recorded from Spa in B e l g i u m (BOULY DE LESDAIN 1905) is probably *P. subviridis*. In F r a n c e it is stated to be »verbreitet, wenn auch nicht häufig» (ERICHSEN 1936). There is no record of the species from the B r i t i s h I s l e s, but probably it is only overlooked there. From P o r t u g a l it is known from several stations (ERICHSEN 1940, TAVARES 1947). It is also collected in Y u g o - S l a v i a (Dalmatia and Montenegro, leg. Servit, sec. ERICHSEN 1936). In E. E u r o p e there are statements from the former German East Prussia (leg. Führer) and from Lithuania (leg. Bachmann), sec. ERICHSEN 1936.

There is no record of the species from other continents.

Habitat Ecology. — The lichen prefers the trunks of rather old deciduous trees, chiefly *Quercus* and *Fagus*, but also *Acer, Fraxinus, Tilia,*

and *Ulmus*. Exceptionally it can inhabit other substrata, such as the twigs of *Calluna* or the bark of coniferous trees (collected on *Pinus* and *Juniperus*). It has also been recorded from lignum. Sometimes it can overgrow mosses on the bark, but it has not been recorded as saxicolous.

It is a rather photophilous lichen, often growing in the outskirts of forests or on solitary trees. As is shown in tab. VIII, it prefers a southern exposure, and is as a rule lacking on the northern sides of the trunks. It is associated with photophilous macrolichens, such as *Anaptychia, Evernia, Parmeliae, Physciae, Ramalinae,* and *Xanthoriae*. Other photophilous *Pertusariae* (e.g. *amara, coccodes, lutescens, pertusa*) are also often present. The rather frequent occurrence of the photophobous *Lepraria aeruginosa* is due to the fact that our species prefers rugged bark with a large amount of crevices (hence also the relatively large quantities of *Hypnum cupressiforme*).

P. subviridis is as a rule met with on dust-impregnated trunks, near roads etc., where it is a member of the coniophilous federation *Xanthorion* (cf. Du Rietz 1945 p. 148, Krusenstjerna 1945 p. 94 and the present work p. 221), characterized by the presence of certain »rich bark» epiphytes. As such decidedly coniophilous constituents of *P. subviridis* -communities can be mentioned *Anaptychia, Buellia punctiformis, Candelaria, Candelariella xanthostigma, Parmelia acetabulum, elegantula, exasperatula, laciniatula, Pertusaria globulifera* f. *Henrici*, the *Physcia* and *Xanthoria* species from tab. VIII, and to a certain extent also the *Ramalina* species. Yet there are no large quantities of coniophilous macrolichens present together with *P. subviridis* (cf. especially the small amount of *Xanthoriae*), as it cannot compete with these lichens on still more illuminated and dust-impregnated stations (e.g. the willow hedges of Skåne and Denmark). *Parmelia physodes*, the index species of the coniophobous union *Physodion*, can exceptionally be found together with *Pertusaria subviridis*, though in very small quantities. Though often growing on beech, *P. subviridis* is rarely associated with the »beech lichens» belonging to the coniophobous *Pyrenuletum nitidae* (only *Pertusaria Wulfenii* and *Pyrenula nitida* listed in tab. VIII).

The *P. subviridis* -communities are very rich in species. Though *P. subviridis* has a limited power of competition against several macrolichens, it is not seldom found constituting societies of its own. These societies form a transitional facies of the *Xanthorion*, somewhat more photophobous and acidiphilous than usual (cf. under *Parmelia elegan-*

Tab. VIII. Pertusaria subviridis - communities.

On the trunks of middle-aged — rather old deciduous trees. — 1. **Sk.** Andrarum: Traneboda, on *Fagus*, E. exposure. — 2. Bosjökloster: near the youth hostel, on *Quercus*, S. exp. — 3. Konga: Konga lund, on *Quercus*, S. exp. — 4. Odarslöv: W. of S. Sandby, on *Quercus*, S. exp. — 5. Skabersjö: on *Fraxinus*, S. exp. — 6. Slimminge: Skönabäck, on *Quercus*, E. exp. — 7. Sövestad: Krageholm, on *Fagus*, E. exp. — 8. Villie: Rydsgård, on *Aesculus*, S. exp. — 9. Törringe: Törringelund, on *Quercus*, S.W. exp. — 10. **Bl.** Ronneby: Brunnsskogen, on *Fagus*, W. exp. — 11. **Sm.** Växjö: Bokhultet, on *Fagus*, E. exp. — 12. **Vg.** Partille: Bokedalen, on *Quercus*, E. exp. — 13. **Sj.** Tureby: on *Fraxinus*, S. exp. — 14. **Fyn.** Middelfart: Hinsgavl, on *Tilia*, W. exp. — 15. Ore: on *Fraxinus*, S. exp.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Anaptychia ciliaris	—	1	—	—	—	1	—	2	—	—	—	—	—	**1**	**2**
Buellia canescens	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
— punctiformis	—	1	—	**2**	1	**2**	—	1	—	—	—	—	1	1—	—
Candelaria concolor	—	—	—	3	1—	—	—	—	—	—	—	—	—	—	—
Candelariella xanthostigma	—	—	—	1	—	**1**	—	—	—	—	—	1	**2**	1	1
Cladonia ochrochlora	2	—	1	—	—	—	2	—	1	—	1	—	—	—	—
Evernia prunastri	—	**3**	**2**	1—	—	1—	2	1	—	—	**2**	**1**	1	1	—
Haematomma coccineum	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—
— leiphaemum	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—
Lecanora expallens	—	1	1	—	**2**	—	—	—	1	—	—	—	**2**	1	—
— Hageni	—	—	—	—	—	—	—	—	1—	—	—	—	—	—	—
— subfusca (coll.)	—	—	1	2	—	1—	—	**1**	—	2	1	—	**2**	1—	—
Lecidea olivacea	—	—	—	—	—	1	—	1	—	—	—	—	1	—	—
— quernea	—	—	—	**2**	—	—	—	—	—	3	—	—	**2**	—	—
Lepraria aeruginosa	**2**	1	**1**	—	**2**	1	**3**	—	1	**1**	1	1	1	—	—
— flava	—	—	—	—	—	—	—	—	—	—	1	—	1—	—	—
Parmelia acetabulum	—	—	—	—	1	—	—	**1**	—	—	—	—	—	1	—
— elegantula	—	—	—	—	3	1	—	1	—	—	—	—	—	**3**	—
— exasperatula	—	—	—	—	1	1	—	—	—	—	—	—	—	—	—
— fuliginosa var. laetevirens	—	—	**2**	—	—	—	1	—	1—	1	1	**2**	**2**	—	—
— furfuracea	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—
— laciniatula	—	—	—	3	1	**2**	—	2	—	—	—	—	—	**3**	—
— physodes	—	—	1	—	1	—	1	1—	—	—	—	—	1	—	—
— saxatilis	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—
— sulcata	—	2	2	1	1	—	—	1	1	1—	**3**	**2**	—	**2**	—
Pertusaria amara	**3**	**3**	—	2	—	2	**1**	—	—	**3**	**3**	**2**	—	—	1
— coccodes	—	—	1	—	—	—	—	—	—	**3**	1	2	—	—	—
— globulifera	—	—	3	—	1	1	—	1	—	—	—	—	2	—	—
— — f. Henrici	—	—	—	—	**3**	—	—	**1**	**2**	—	—	—	—	1	1
— hemisphaerica	—	—	1	—	—	—	2	—	—	1	—	—	—	—	—
— lutescens	—	—	—	1	—	1	—	—	—	—	—	**3**	—	—	—
— pertusa	1	—	2	2	—	—	—	1	—	—	1	2	1	1	1
— subviridis	**4**	**3**	**4**	**4**	**3**	**3**	**3**	**3**	**5**	**3**	**3**	**3**	**4**	**3**	**3**
— Wulfenii	1	—	—	—	—	—	3	—	—	—	1	—	—	1	—
Phlyctis argena	—	—	2	1	—	1	1	**2**	—	—	1	1	**3**	—	—
Physcia ascendens	—	—	—	—	—	—	—	—	—	—	—	—	—	1—	1
— grisea	—	**3**	—	—	—	1	—	—	1	—	—	—	—	1	—
— orbicularis	—	—	—	—	—	—	—	—	—	—	—	—	—	—	**2**
— tenella	—	—	—	**2**	1	**1**	—	1	**2**	—	—	—	—	—	—
Pyrenula nitida	—	—	—	—	—	—	2	—	—	—	—	—	—	—	—
Ramalina farinacea	—	—	1	—	1	1	—	—	1	—	1	—	**2**	—	—
— fastigiata	—	—	—	—	1	—	—	1	—	—	—	—	1—	1—	1
— obtusata	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—

Tab. VIII. Continued.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Sphinctrina gelasinata	—	—	—	—	—	—	—	—	—	—	1	1	—	—	—
Thelotrema lepadinum	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—
Xanthoria candelaria	—	—	—	—	—	—	—	1—	—	—	—	—	—	—	—
— parietina	—	—	—	—	—	—	—	—	—	—	—	—	—	1—	2
— polycarpa	—	—	—	1	—	1—	—	1	—	—	—	—	—	—	—
Dichaena faginea	—	—	—	—	—	—	2	—	—	—	—	—	—	—	—
Hysterium pulicare	—	1	—	—	—	—	—	—	—	—	—	2	—	—	—
Coccoid Chlorophyceae ...	+	+	—	+	+	—	+	+	+	—	+	+	+	—	+
Homalothecium sericeum ..	—	—	—	—	—	—	—	—	—	—	—	—	2	—	—
Hypnum cupressiforme ...	2	4	1	1	—	—	2	—	3	2	3	2	—	1	—
Leucodon sciuroides	2	—	—	—	—	—	—	—	—	—	—	—	3	—	—
Neckera complanata	3	—	—	—	—	—	—	—	—	—	—	—	—	—	—
— pumila	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Orthotrichum Lyellii	1	—	—	—	—	1	—	—	—	—	—	—	—	—	—
— cfr octoblephare	—	—	—	—	2	—	—	—	—	—	—	—	—	—	—
— striatum	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—
— sp.	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—
Frullania dilatata	1	—	—	—	—	—	1	1—	—	1	—	—	1	1	—
Metzgeria furcata	1	—	—	—	—	—	—	—	—	1	—	—	—	1	—
Radula complanata	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—

tula and *laciniatula*). To the delimitation and nomenclature of the unions which can be distinguished in this facies, I hope to be able to return in a later treatise.

Measurements of pH from 4 stations [Sk. Bosjökloster and Hörby (both *Quercus*), Sj. Tureby (*Fraxinus*), and Fyn. Middelfart: Hinsgavl (*Tilia*); each 5 samples] gave values between 5.2 and 5.9 (mean 5.6). The oak samples showed only slightly lower values than the others. Cf. the similar results recorded under *Parmelia laciniatula*.

Affinity and Variation. — *P. subviridis* belongs to the section *Lacteae* of the subgenus *Variolaria* (cf. ERICHSEN 1936 p. 523 and the present work p. 76). Its rank as a species of *Pertusaria* is merely preliminary. Previously ERICHSEN (1930 p. 3) recorded it as *Ochrolechia s.*, and later (1940, 1942), after finding fertile specimens (with lecanorine apothecia), he returned to this view. There is no doubt that this arrangement can be well-grounded, but it has the consequence that related species of the section *Lacteae*, whose apothecia are hitherto unknown, should also be transferred to *Ochrolechia* (cf. under *P. hemisphaerica*).

Our species can be confused with several sterile sorediate *Pertusariae* from various sections. A survey of the differences between some species with diffuse soredia is given in the following scheme:

A. Thallus K+yellow (or finally rust red—blood red; soredia developing from papillae or cylindrical isidia *P. coccodes* (Ach.) Nyl.
[incl. *P. coronata* (Ach.) Th. Fr. and *P. phymatodes* (Ach.) Erichs.]

B. Thallus K—; no cylindrical isidia.

I. Thallus C+red.

a. Thallus wholly dissolved in sorediate isidia *P. subviridis* Höeg.

b. Thallus partly with hemispherical soredia
P. hemisphaerica (Flk.) Erichs.
f. *diffusa* Almb.

II. Thallus C—.

a. Thallus with a bitter taste; KC+violet *P. amara* (Ach.) Nyl.
f. *pulvinata* (Erichs.) n.c.

b. Thallus without a bitter taste; KC—.

1. Soredia coarse, with a greyish white colour
P. globulifera (Turn.) Nyl.
f. *Henrici* Harm.

2. Soredia formed by minute granules, with a browhisn grey colour
P. leprarioides Erichs.

After some training it is possible to recognize *P. subviridis* merely on morphological characters. It has a characteristic type of sorediate isidia, as a rule with a somewhat greenish grey colour (hence the specific name). Otherwise it has a considerable variation, from dark greyish (f. *sordidescens* Erichs.; perhaps identical with *P. sordidogrisea* Erichs.) to whitish [f. *albescens* (Erichs. pro var.) n. c.]; from rather coarsely granulose (f. *granulosa* Erichs.) to wholly effused in fine soredia [f. *pulverulenta* (Erichs.) n. c.]. Sometimes the sorediate isidia can be mingled with small round soredia (f. *soralifera* Erichs.). All these forms are not unfrequent in our district together with the type. The lignicolous »var. *lignaria*» Erichs. seems hardly worth a special name.

9. *Pertusaria Wulfenii* DC.

Syn. *P. Wulfenii* var. *fallax* (Ach.) Th. Fr. — Cf. further ZAHLBRUCKNER Cat. Lich. V (1928) p. 225, X (1940) p. 466, TH. FRIES Lich. Scand. I (1871) p. 312, ERICHSEN in RABENHORST's Kryptogamen-Flora IX.5:1 (1936) p. 434, and GALLÖE Nat. Hist. of Danish Lichens V (1936) p. 62, plates 60—62.

History. — This lichen was described in 1805 by DE CANDOLLE from France. ACHARIUS described the same species (1814) both as *Porina rugosa* and as *Porina fallax*. The identity of these species to *Pertusaria Wulfenii* DC. was pointed out by E. FRIES (1831). ACHARIUS

evidently did not know the lichen from Sweden. The first Swedish record in the literature (as *Porina fallax*) is from Blekinge (ASPEGREN 1823; no exact locality stated). From the same year is the oldest dated herbarium specimen (from Omberg, leg. G. Wahlenberg). In all, there are published 19 Swedish stations. At present I know the lichen from about 115 localities in this country.

The species was first collected in Norway (Hordaland) by M. N. Blytt and S. C. Sommerfelt in 1827. The first statement in the literature was made by BLYTT in 1829. HÖEG (1923) published a list of 14 stations. At present I know about 20 Norwegian localities.

The first statement of the lichen from Denmark was made in 1867 by BRANTH from N. Jylland (no exact locality published). The oldest herbarium specimen seen (from Fyn, leg. E. Rostrup) is from 1865. In the literature there are very few localities published. I know in all, about 100 collections from Denmark.

There is no sure record of the species from Finland (cf. below).

Scandinavian Distribution (substratum *Fagus* unless otherwise stated).

Sweden.

Skåne. »Ad Fagi cortices copiose» (incl. *P. lutescens*), E. FRIES 1835 p. 288. — Andrarum: Traneboda. 1946! (L). — Baldringe: Nyvångsskogen. 1945! (S). — Bara: Torup. 1946! (L). — Bläntarp: Elsagården. 1945! (L). — Bosjökloster: Kulleberga. 1946! — Brunnby: Kullen, Kockenhus. 1902 B. Nilson (L) B. NILSON 1903 p. 477; Arild and Björkeröd, on *Betula*, Haga, on *Quercus*. 1911 Er. ERICHSEN 1913 p. 63; S.E. of Ransgården, on *Quercus*. 1939! (L). — Brönnestad: Påbro. 1945! (L). — Brösarp: Lökaröds boställe. 1943! (L, S). — Börringe: Gistorp. 1942! (L); Rammakärr. 1942! (S). — Degeberga: Kyllingaröd. 1940! (L). — Fjälkestad: Knutstorp. 1944! (L, S). — Fågeltofta: Kronovall, on *Acer, Fagus*, and *Fraxinus*. 1945! (L, S). — Genarp: Häckeberga. 1945! (L, S). — Halmstad: Bullstofta (L, U) and Duveke (L), both 1903 Alvthin, ALVTHIN 1901 p. 13. — Hjärnarp: Margretetorp. 1945! (L). — Hjärsås: Gyvik. 1890 Me (S); Skarvik. 1891 Me (S). — Hällestad: Gryte skog. 1945 O. Gertz. — Högestad: Lyckås. 1945! (L). — Katslösa: S.E. of Kadesjö. 1943! (L). — Kiaby: N.E. part of Ivö. 1942! (L, O, S). — Konga: Konga lund. 1946! (L, S). — Kägeröd: Olstorp; Skaftarp, on *Quercus* and *Fagus*. Alvthin, ALVTHIN 1912 p. 11. — Linderöd: at the road to Äsphult. 1945! (L). — Matteröd: Pilatorpet. 1943! (L). — Munkarp: at the road to Hallaröd. 1945! (L). — Oppmanna: Arkelstorp. 1916 Me (M, S); Bokenäset. 1943 Deg. (Ds, S, U); the churchyard, on *Aesculus*. 1943 Deg. (Ds). — Ottarp: Bältelberga. 1896 Alvthin (L) ALVTHIN 1904. — Röke: Blaholma. 1945! (L). — Röstånga: Tibbaröd, on *Quercus*. 1900 Alvthin (L). — Smedstorp: Tunbyholm. 1943! (L). — Stehag: Rårröd. 1888 Berg (L). — Stenestad: Stubbaröd, Alvthin. ALVTHIN 1912. — Ö. Sönnarslöv: Mallesholm. 1939 Deg. (Ds); ibm. 1944! (L, U). — Sövde:

St. Bölleberga. 1946!; Kristinelund. 1943, 45! (L); Sövdeborg. 1896 Alvthin (L). — Sövestad: Krageholm, on *Fagus* and *Fraxinus*. 1938, 43! (L); ibm, Vistorp. 1943! (S); Lybäck, on *Tilia*. 1944! (L). — Tjörnarp. 1916 Me (S); ibm. 1943! (L). — Torekov: Hallands Väderö, S. forest. 1884 Hellb. (G, L, M, S, U) HELLBOM 1887 p. 48; ibm. 1944! (L). — Tosjö: Marieberg. 1945! (L). — Tränne: N.E. of Ovesholm. 1946! (L, S). — Veberöd: S. of Grönland. 1925 J. A. Nannfeldt (U). — Ö. Vemmerlöv: Gyllebo. 1891 Berg (L). — Verum: Mölleröd. 1945! (L). — Vittsjö: Boalts böke. 1945! (L); at the road to Markaryd. 1947! (L). — N. Vram: Vrams Gunnarstorp. 1946! (L, S). — V. Vram. 1890, 91 Me (S); S.E. of the village. 1942! (L). — Örkelljunga: Lärkesholm. 1940! (L); V. Spång. 1943! (L); N. of Ö. Spång. 1943! (L, S). — Örkened: Nyteboda. 1890 Me (S). — Österslöv: Gårrö. 1916 Me (S).

Blekinge. »Common on *Fagus*» (transl. fr. Swed.). HULTING 1872 p. 14. — Förkärla: Tromtö. 1945! (L, S). — Hjortsberga: Tolseboda, at Lake Sännen. 1937, 44! (L, O, S, U); Värmansnäs. 1942! (S). — Bräkne-Hoby: Runamo. 1871 Hult. (G). — Karlskrona: Gullberna. 1872 H. G. Lübeck (Ka); Yttre Vämö. 1874 Falk (L, S) FALK 1874 p. 13; ibm. 1877 Svanlund (f. *rugosa*) (Ka, L) ERICHSEN 1936 p. 442. — Mjällby: Hanö, on *Tilia*. 1871 Hult. (G) HULTING l.c. — Nättraby: Bjärby. 1945!; Mariclund. 1872 Svanlund (f. *lactea*) (L, U); ibm. 1945! (L, S); Skärva. 1872 Svanlund (Ka); ibm. 1943! (f. *plumbea*) (S). — Ronneby: Brunnsskogen. 1942, 44! (L, S); Ö. Påtorp, on *Quercus*. 1944! (L). — Rödeby: S. of Häjetorp. 1945! (L). — Sölvesborg: Sissebäck. 1871 Hult. (L); Valje. 1942, 47! (L, S). — Sine loco. ASPEGREN 1823 p. 87 (cf. above).

Gotland. »On the trunks of oaks» (transl. fr. Swed.). STENHAMMAR 1848 p. 219 (mainly referring to *P. lutescens*). — Fårö: Gotska Sandön, near the N. border of the national reserve, on *Juniperus*, and »Alpen», S. E. of the lighthouse, on *Sorbus aucuparia*, both 1941 B. Pettersson (Pn). — Lummelunda: between Lummelunds träsk and Kams. Sthr (S) DEGELIUS 1936 p. 75.

Småland. Angelstad: Bolmstad and S. of Sjöhaga, both 1945! (L). — Femsjö. E. Fries. (S); ibm. 1851, 52, 59 Th. Fries (Dz, L, N, S, T, U) TH. FRIES 1852 p. 52; ibm. 1859 Blomb. (G, L, S, T, U); ibm. Leg.? (Sthr exs. 143) STENHAMMAR 1863 p. 477; Råknen and Valshult, both 1851 Th. Fries (U); Hallaböke (L) and Skubbhult (H, L, S), both 1945! — Färgaryd: Skoga. 1929 Deg. (Ds). — Kärda: Åminne. 1945! (L). — Landeryd: N. of Jansbergssjön. 1945! (L, O, S, U). — Lidhult: Torsaberg. 1851 Th. Fries (U). — Markaryd: Timsfors. 1943! (S). — Misterhult: Jungfrun, S. part, on *Acer*, *Fraxinus*, *Quercus*. 1913 DR. (Dz). — Skatelöv: Vevik. 1945! (L). — Torpa: Gashult. 1943! (S). — Växjö. 1880 E. Köhler (Dz, H, Ka, L, N, S, U); Biskopsnäset. 1945! (L, S).

Halland. Abild: Arnared. 1945! (L, S). — Fjärsås: between Lygnern and Stensjön. 1931 Deg. (Ds); Rossared. 1945! (L, S). — Getinge: Fröllinge. 1885, 86 Berg (B, H, L, T); S. of Fröllinge. 1943! (L). — Knäred: near Ön, abundant. 1936 Me (S) MALME 1937 p. 180. — Sibbarp: S. of Angryd. 1945! (L, S). — Slättåkra: Alarp. 1866 Fr. Elmqvist (L); Spenshult. 1947! (L).

Bohuslän. Hjärtum: Hasteröd, on *Quercus*. 1937 Hedv. and Magn. (L, M); ibm. 1937, 39 Deg. (Ds). — Ljung: N. of Kärr, on *Quercus*. 1940 Magn. (M). — Marstrand: Koön, on *Quercus*. 1947 Magn. (M); ibm, Halsen, on *Quercus*.

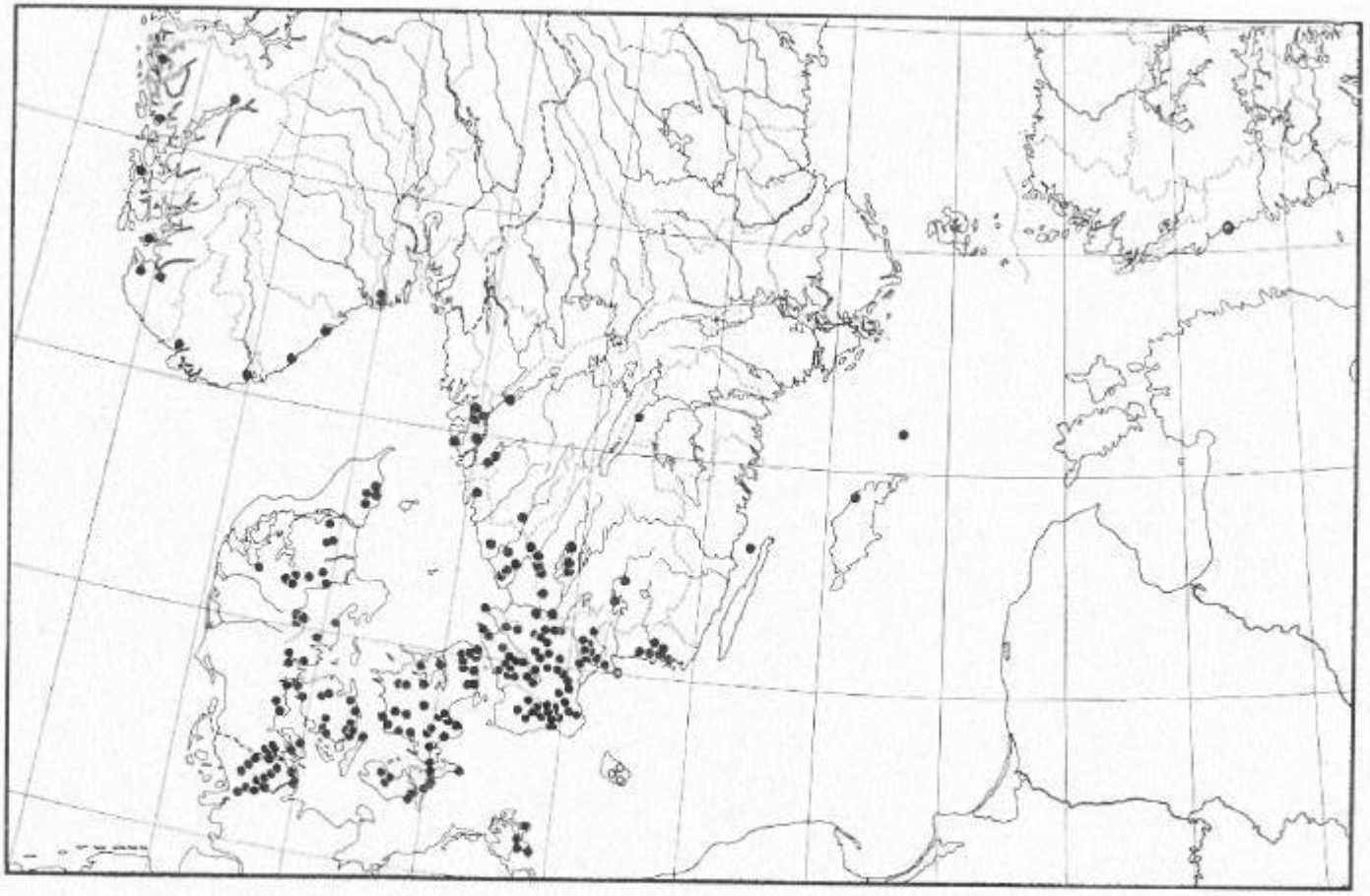


Fig. 13. *Pertusaria Wulfenii* in Scandinavia. Open circles = dubious stations (not verified by specimens).

1933 Deg. (Ds). — Romeland a: Lysegården, on *Ulmus*. 1925 Magn. (M) Magnusson 1937 p. 133. — Ucklom: Huveröd, on *Quercus*. 1926 Magn. (M) Magnusson l.c.

Västergötland. Lerum: Aspenäs, on *Quercus*. 1936 Magn. (M). — Mårdaklev: Skeppshult, 1945! (L). — Partille: Jonsered, Bokedalen, on *Quercus*. 1915, 35 Magn. (M, Magn. exs. 256) Magnusson 1919 p. 86; ibm. on *Fagus*. 1945 Magn. and ! (L). — V. Tunhem: on *Quercus*. 1876 K. B. J. Forssell (U); Lilleskog, on *Quercus*. Me (S) Malme 1937 p. 180.

Östergötland. »On deciduous trees, especially *Quercus*, not rare» (transl. fr. Swed.). Hulting 1925 p. 37 (probably including also *P. latescens*). — V. Tollstad: Omberg. Leg. ? (U); ibm. Sthr (S, U) Th. Fries l.c.; S. part of O. 1823 G. Wahlenberg (U).

Sine loco. E. Fries exs. 95 (as *Porina hymenea*).

Norway.

Vestfold. Brunlanes: Fritzöparken. Höeg; Jordfalden. 1880, 82 Norman (B, T) Höeg 1923 p. 163. — Larvik. 1826 M. N. Blytt (O) Blytt 1829 p. 256; ibm. Sommerfelt (O) Höeg l.c.; Velleradbakkerne. Norman (f. *tetraspora*) (O); the beech forest N. of L. 1947! (L).

Aust-Agder. Dyvåg: Hovdanvann, and Risöya, both on *Quercus petraea*. 1922 Höeg (T) Höeg l.c. — Fjære: Espenes, on *Fagus* and *Fraxinus*. 1922 Höeg (T); S.W. of the home for the aged. 1922 Höeg (T) Höeg l.c. — Lyngör: Skibvig. 1911 Lynge (O) Höeg l.c.

Vest-Agder. Flekkefjord: on *Quercus*. 1901 Hav. (B) Höeg l.c. — Kristiansand: Ravnedalen, not on *Fagus*. 1918 Lynge (O) Höeg l.c. — Oddernes: Vaagsbygden, not on *Fagus*. 1918 Lynge (O) Höeg l.c.

Rogaland. Finnöy: island of Finnöya, not on *Fagus*. M. N. Blytt (B, O) Höeg l.c. — Forsand: Dirdal, N. of the church, on *Tilia*. 1932 Deg. (Ds); ibm. E. of the church, on *Sorbus aucuparia*. 1947! (L). — Sandnes. Hav. Havås 1909 p. 22.

Hordaland. Fana: on *Sorbus aucuparia*. 1827 Blytt and Sommerfelt (O, U) Th. Fries l.c. — Granvin: on *Quercus*. 1907 Hav. (Hav. exs. 350); ibm. 1915 Hav. and Lynge (O). »Common on the trunks of *Tilia parvifolia*, *Quercus pedunculata* etc. in warm, wooded slopes, mainly near the sea» (transl. fr. Norw.). Havås 1899 p. 13; Kattedal. 1900 Hav. (v. *rupicola*) (B) Havås 1909 p. 22. — Lindås: Lygrefjorden, Poltnesset. 1922 Höeg (T) Höeg l.c. — Moster. 1915 Hav. and Lynge (O); Mosterhavn. 1912 Hav. (B). »On the trunks of deciduous trees, mainly *Tilia parvifolia*. Very rare» (transl. fr. Norw.). Havås 1917—18 p. 28.

[Nordland. »*Endocarpon foliax* β *rupicola* . . . Hab. in rupibus submaritimis occultis Nordlandiae saltensis rarius, ex. gr. inter Löb et Mikelbostad». Sommerfelt 1826 p. 135, Hornemann 1836 p. 587. Refers to *P. pertusa* f. *rupestris* (»*P. rupestris*»). Cf. Th. Fries 1860 p. 260, 1871 p. 318.]

Denmark.

Sjælland. Boeslunde: Egerup Skov. 1947! — Braaby: Gisselfeld, on *Quercus*. 1946! (L); Villa Gallina. 1946! — Draaby: Nordskov. 1942 Chr. (K). — Egebjærg: Kongsöre Nebbe. 1946! (L). — Esbönderup: Grib Skov, near

Hjortelyngsvej. 1946! (L). — Fodby: Sallö Skov. 1947! — Frederiksborg Slotssogn: St. Dyrehave. 1946! — Grandlöse: Dragerup Skov. 1946! (L). — Haraldsted: Egtved Fælled. 1946! (L). — Haslev: Bregentved. Branth (K); Orneden. 1946! (L). — Herfölge: Aashöje Overdrev. 1946! (L). — Holsteinborg: Rude Skov, on *Fagus* and *Quercus*. 1947! — Hornbæk-Hellebæk: Teglstrup Hegn. Chr. (L). — Hörsholm: Folo Have. 1947! — Jyderup: N. of Skarresö. 1946! (L). — Katvehave: Stenshy Skov. 1946! (L). — Lellinge: Lellinge Skovhusvænge. 1946 Chr. (K); Lellinge Frihed. 1947! — Lidemark: Taageröd Skov. 1947! (L). — Lyngby: Frederiksdal. 1904 Gallöe (+ f. *rugosa*) (K) GALLÖE 1936 p. 62, ERICHSEN 1942 p. 146. — Maalöv: Jonstrup Vang. 1903 Gallöe (K). — Magleby (at the Köge Gulf): Magleby Skov. 1947 Chr. (K). — Nöddebo: Grib Skov. 1940, 43 Chr. (A, K, L); between N. and Egelund. 1946! — St Peder: Slagelse Lystskov. 1946! (L, S). — Præstö: P. Overdrev (Hollænderskov). 1946! — Sædder: Vallö Storskov. 1947! — Sorö: at the road to Næstved. 1946! (L); near »Parnassen». 1946! — Taarbæk: Jægersborg Dyrehave, on *Alnus*. 1904 Gallöe (K). — Taarnborg: Klarskov. Branth (L). — Tiköb: between Gurre and Hellebæk. 1873 Hellb. (G); Gurre Vang and Krogenborg Hegn. 1946! — Undlöse: Mölleskov, on *Quercus*. 1946! (L). — Valsölille: Vesterskov. 1946! — Vemmetofte: Vesterskov and Strandskov. 1946!

Mön. Magleby: Lille Klint. 1941 Er. (f. *rugosa*) ERICHSEN 1942 p. 146; Liselund, on *Aesculus*. 1939! (L); Möns Klint. 1873 Hellb. (G, S); ibm. 1946! (L).

Falster. Sr Alslev: Korselitze Hovedskov. 1946! — Bogö: Bogö Österskov. 1947 Chr. (K). — Horbelev: Pomlenakke and Österskov. 1946!

Lolland. Hunseby: Knuthenborg. 1946! (L). — Kettinge: Frejlev Skov. 1946! — Nysted: Roden Skov. 1946! — Skörringe: S. of Christianssæde. 1946! (L). — Vesterborg: Rosningen, on *Fagus* and *Carpinus*. 1946!

Langeland. Hov K.: Lohals, S. of the village. 1946!

Fyn. Aastrup: the churchyard, on *Ulmus*. 1939! (L, S). — Sr Broby: S. of the village. 1946! — Diernæs: N. of Kongehöj. 1946! — Husby: Wedellsborg. 1939! (L, S). — Langaa: Glorup Gl Dyrehave. 1946 Chr. — Middelfart: Hinsgavl. 1946!; Kongebroskoven. 1947 Chr. (K). — Nyborg: Christianslund. 1946! — Ore (N.E. of Svendborg): Fredskov. 1946 Chr. — Revninge (pr. Kerteminde): Storskov. 1947! (L). — Skaarup. 1865 Rostrup (K). — Svindinge: Glorup Gl Dyrehave. 1946 Chr. — Sönderse: Sönderse Skov. 1947! — Tröstrup Korup: at »Kom-igen-Kroen». 1946! — Vejstrup: Tiselholt Skov. 1946 Chr.

Als. Notmark: pr. Helleved. 1946! — Ulkeböl (pr. Sönderborg): Sönderskov. 1946!

Jylland. »Common in forests, especially on *Fagus*» (N. Jylland) (transl. fr. Dan.). BRANTH 1867 p. 82. — Aalum: S.W. of Fussing Sö, on *Fagus*. 1947! — Aarhus: Marselisborg. 1939! — Bjerning (N. of Haderslev): Vesterskov. 1946! (L, S). — Dal: Dal Skov. 1873 Branth (K). — Dollerup: Hald Skov. Branth (K, U); ibm. 1946! (L). — Dronninglund: Dronninglund Storskov. 1866 C. A. Fellberg (K, U); ibm. 1947! (L). — Elling: Lerbæk Skov. 1878 Branth (K). — Flade: Pikkerbakken. 1947 Magn. (L, M). — Gaverslund (pr. Vejle): Munkebjærg. 1946! (L). — Granstén: on *Fraxinus*. 1939! (K, L, S). — Haderslev: Hejsager Strand. 1941 Er. (f. *rugosa*) ERICHSEN 1942 p. 146. — Holböl:

Hönsnap Skov. 1946! (L). — Hornstrup: Grejsdalen, 1941 Chr. — Lavrbjærg. 1903 Gallöe (K). — Le: Viskum Skov. 1947! (L, S). — Ovsted K.: Sneptrup. Branth (K); ibm. 1888 Hellb. (G). — Rold: S. part of Rold Skov. 1947! — Ryde: Rydhave. Branth (K). — Rye: Rye Mölle. 1887 Branth (K). — Silkeborg: S. Vesterskov. Branth (?) (K). — Skörping: Buderupholm. Branth (G, U); Mosskov. 1870 Branth (K). — Sr Stenderup: Frydenborg. 1939! (L, S); Nörreskov. 1946! (L, S). — Stovby: Stovby Skov. 1946! — Tem (pr. Silkeborg): Sönderskov. 1946! (L). — Nr Vilstrup: Kelstrup. 1946! (L). — Vinkel: Randrup Skov. Branth (K). — Sr Vissing: Addit Skov. 1946! — Vium: Avnsbjærg. 1946! — Volstrup (pr. Sæby): Sæbygaard Skov. 1947! (L). — Ör Vraa: Ormholt. Branth (f. *rugosa* + f. *carnea*) ERICHSEN 1942 p. 146.

[Bornholm. »Rare on deciduous trees» (transl. fr. Swed.). HELLBOM 1890 p. 67. — Bodilsker: Kjöllergaards Skov, substratum? N. H. Bergstedt. — Vestermarie: Almindingen, on *Ulmus*. Hellb. — Östermarie: Kofoedsgaard, on *Carpinus*. — All sec. HELLBOM l.c. No specimens seen.]

Finland.

[Nyland. Helsingfors. ERICHSEN 1936 p. 437. No specimen seen.]

P. Wulfenii is no rare lichen on *Fagus* in Denmark (except the poorly wooded W. Jylland) as well as in S.W. Sweden. In the few stations outside the Swedish beech districts (in Bohuslän, Västergötland, and Gotland) it grows chiefly on *Quercus*. In Norway it is »not rare along the southern coast» (HÖEG 1923), i.e. in the Norwegian *Fagus* and *Quercus* regions.

Extra-Scandinavian Distribution. — The European distribution of the species is very schematically recorded in a map published by ERICHSEN (1940 p. 23). It is rather frequent in Central, Western, and Southern Europe, chiefly on *Fagus* and *Quercus*, but as ancient records in the literature from these districts often refer to other species (cf. below) they are not to be relied upon without an examination of herbarium specimens.

In Germany it is »nicht selten, aber ungleichmässig verteilt» (ERICHSEN 1936). The corticolous form does not ascend to high levels, and in Switzerland (STIZENBERGER 1882) and Austria (DALLA TORRE & SARNTHEIN 1902) it is only known as var. *rupicola*. — From Holland several stations are known (sec. herb. Leyden), as well as from Belgium (DUVIGNEAUD & GILTAY 1938). In France it is »assez commun» (HARMAND 1913). It is »general and fairly common in the wooded districts of the British Isles» (SMITH 1918). KNOWLES (1929) recorded it as »common on trees, throughout Ireland». — In S. Europe it is no rare plant, especially as var. *rupicola*. In Portugal it is »widely distributed, mainly in the Western districts», sec. TAVARES in litt. Its distribution in Spain is imperfectly known; at least in Catalonia it is recorded as common on the rocks (LLENAS Y FERNANDEZ 1909). Sec. JATTA (1909—11) it is »ad truncos varios, praecipue Fago-

rum totam per Italiam frequens». Most specimens seen from Italy are saxicolous. From the Balkans I know statements from Yugo-Slavia (Dalmatia, sec. ZAHLBRUCKNER 1919, v. DEGEN 1938; Croatia and Herzegovina, sec. ERICHSEN 1936), Rumania (ERICHSEN l.c.), and Greece (ZAHLBRUCKNER 1907, SERVIT 1931 b). — Its distribution in East Europe is not exactly known. See. ERICHSEN (1940) it is found in the Crimea in Russia.

The species is recorded from several extra-European districts, but as there is no critical monograph of the whole genus, many of these statements must be regarded with a good deal of suspicion. There are trustworthy statements from N. America (sec. FINK 1935) and the Canaries (sec. ERICHSEN 1936). More dubious are records from Japan (NYLANDER 1890; specimens in herb. S belong to a sorediate species, resembling *P. flavicans* Lamy), Brazil (VAINIO 1890, not mentioned by MALME 1936), and Hawaii (TUCKERMAN 1868).

Habitat Ecology. — *P. Wulfenii* is a characteristic epiphyte on middle-aged and old beeches. Occasionally it is also met with on other deciduous trees, not seldom on oaks. Its saxicolous form seems to be rare in our districts (collected only once in Norway, cf. below). When growing on beech it belongs as a rule to the *Pyrenuletum nitidae*, where it often is met with in a somewhat more photophilous facies than *Opegrapha viridis*. It seems to prefer the southern or western sides of the trunks (cf. tab. IX). In a too sunny exposition it gives way to more photophilous lichens, e.g. *Evernia*, *Parmelia fuliginosa* var. *laetevirens* and *sulcata*, *Pertusaria amara* and *pertusa*, *Ramalina farinacea* (cf. especially analyses nos 2, 6, and 8). When reaching its optimum development, it is as a rule associated with moderately photophilous plants, as *Lecanora expallens* and *subfusca*, *Pyrenula nitida*, and *Hypnum cupressiforme*. *Opegrapha viridis* plays a less important part in this society. The extremely photophobus *Lepraria aeruginosa* is, however, seldom lacking in *Pertusaria Wulfenii* -communities, but it preferably grows in crevices where moisture remains, on mosses etc.

Of the lichens listed in tab. IX only *Buellia punctiformis* and *Candelaria concolor* (both were present only in very small fragments) are coniophilous species indicating a certain impregnation with dust from a road.

Measurements of pH (15 samples from 3 stations, viz. Sk. Oppmanna: Bokenäset, Bl. Nättraby: Skärva and Jl. Tem: Silkeborg Sönderskov; all with no traces of coniophilous lichens) gave values between 5.4 and 5.7, mean 5.5.

Affinity and Variation. — *P. Wulfenii* has some resemblance to *P. pertusa* (L.) Tuck. (syn. *P. communis* DC), one of our commonest bark lichens. There is often no difference in the colour of the thallus,

Tab. IX. Pertusaria Wulfenii - communities.

On the trunks of middle-aged — rather old *Fagus*. — 1. **Sk.** Torekov: Hallands Väderö, N. exposure. — 2. Baldringe: Nyvångsskogen, S. exp. — 3. Bara: Torup, near the castle, W. exp. — 4. Andrarum: Traneboda, W. exp. — 5. N. Vram: Vrams Gunnarstorp, E. exp. — 6. **Bl.** Ronneby: Brunnsskogen, S. exp. — 7. Nättraby: Marielund, W. exp. — 8. **Sm.** Växjö: Biskopsnäset, S. exp. — 9. **Sj.** Nöddebo: S. exp. — 10. Herfölge: Aasböje Overdrev, E. exp. — 11. **Falst.** Horbelev: Österskov, N. exp. — 12. **Fyn.** Revninge: Storskov (pr. Kerteminde), W. exp. — 13. **Jl.** Bjerning: Vesterskov (pr. Haderslev), S. exp. — 14. Sr Stenderup: Nörreskov, N. exp. — 15 Aalum: near Fussingsö, S. W. exp.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Arthopyrenia gemmata	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Bacidia rosella	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—
Buellia betulina	1	—	—	1	—	—	—	—	—	—	—	—	—	—	—
— punctiformis	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—
Candelaria concolor	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—
Cladonia ochrochlora	—	—	—	1	—	1	—	—	—	—	—	—	—	—	—
Evernia prunastri	1	1	1	—	—	3	—	1	1	—	—	1	—	—	—
Graphis scripta	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—
Haematomma coccineum	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—
— leiphaemum	—	3	1	—	1	—	—	—	—	—	1	—	—	—	—
Lecanora expallens	2	2	1	—	3	—	—	1	—	1	—	2	—	2	—
— glabrata	2	—	—	—	—	—	—	—	—	—	—	2	1	—	—
— Hageni	—	—	—	—	—	2	—	—	—	—	—	—	—	—	—
— intumescens	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—
— subfusca (coll.)	1	1	3	—	—	1	2	3	1	—	—	2	—	—	1
Lecidea olivacea	—	—	1	—	—	—	1	—	—	—	—	1	—	—	—
— quernea	—	—	—	—	—	1	—	1	—	1	—	2	—	—	—
Lepraria aeruginosa	1	1	2	2	4	1	1	1	1	2	—	1	2	3	2
Ochrolechia androgyna	—	—	—	1	—	1	—	—	—	—	—	—	—	—	—
Opegrapha herpetica	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—
— viridis	1	—	1	—	1	—	—	—	—	1	3	—	1	—	3
Parmelia fuliginosa var. laetevirens	1	1	—	—	—	1	1	1	2	—	—	—	1	1	—
— physodes	—	1	—	2	—	1	—	—	—	—	—	—	—	—	—
— saxatilis	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—
— sulcata	—	1	—	3	—	2	—	2	1	—	—	—	—	—	—
Pertusaria amara	1	2	—	2	—	3	—	3	2	4	—	—	—	1	—
— coccodes	—	—	—	1	—	3	—	—	—	3	—	—	—	—	—
— globulifera	—	—	—	—	—	—	—	—	1	—	—	1	—	—	—
— hemisphaerica	—	1	—	3	—	—	—	—	—	—	—	—	—	—	—
— leioplaca	1	—	—	—	—	—	—	—	—	—	—	2	—	—	1
— lutescens	1	—	2	—	—	—	1	1	—	1	—	—	—	—	—
— pertusa	—	2	2	1	1	2	—	1	1	1	3	3	—	1	2
— subviridis	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—
— Wulfenii	4	3	3	3	3	3	4	3	5	4	4	3	3	3	4
Phlyctis agelaea	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2
— argena	—	—	1	—	—	1	3	2	1	—	—	—	—	—	—
Pyrenula nitida	3	1	2	—	1	—	1	1	1	1	1	2	1	1	1
Ramalina farinacea	—	1	—	—	—	1	—	2	—	—	—	—	—	—	—
Sphinctrina gelasinata	—	—	—	—	—	—	—	1	—	—	—	2	—	—	—
Thelotrema lepadinum	2	—	—	—	—	—	—	—	—	—	—	—	—	1	—
Usnea hirta	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—
Dichaena faginea	1	—	—	—	—	2	—	—	—	—	—	—	—	—	—

Tab. IX. Continued.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Coccoid Chlorophyceae ...	—	+	+	+	+	—	+	+	—	—	+	—	+	—	—
Homalothecium sericeum ..	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—
Hypnum cupressiforme	1	—	**2**	**3**	3	1	—	—	1	1	—	1	1	**4**	1
Leucodon sciuroides	—	—	1	—	—	—	—	1	—	—	—	—	—	—	—
Neckera pumila	—	—	2	—	1	—	—	—	1	—	—	—	—	—	—
Orthotrichum stramineum	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—
— sp.	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—
Ulota Bruchii	—	—	—	1	—	2	—	—	—	—	—	—	—	—	—
Frullaria dilatata	—	—	2	—	—	—	2	1	1	—	—	1	—	—	1
Metzgeria furcata	1	—	—	—	2	—	1	—	—	—	—	—	—	—	—
Radula complanata	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—

P. Wulfenii being not seldom greyish instead of yellowish. But as a rule the wide, crenate, more lecanorine ostioles of *P. Wulfenii* form a distinct specific character. In dubious cases the number of spores in the asci is decisive, 8 in *Wulfenii*, 2 in *pertusa*.

In collections from S. and W. Europe *P. Wulfenii* is sometimes confused with *P. pustulata* (Ach.) Duby. This species also grows on *Fagus* and has a similar grey-yellowish colour to *P. Wulfenii* but is recognized by its much thinner thallus, KC+ orange (*P. Wulfenii* KC—) and its 2-spored asci (8-spored in *P. Wulfenii*). It is a southern species not likely to be found in our districts.

In 19th century lichenological literature *Pertusaria lutescens* (Hoffm.) Lamy was considered as a variety of *P. Wulfenii*. The former species, however, is well separated by its isidiate verrucae, soon developing into soredia and its brighter yellow colour, giving an orange reaction with $CaCl_2O_2$. It is usually sterile. It is a rather common species with a wider distribution than *P. Wulfenii* (reaching about the northern limit of the oak).

Erichsen (1936), though »nur unter Bedenken», regards the saxicolous form as a proper species, *P. rupicola* (Fr.) Harm. In fact there are few differences which might justify a specific distinction between bark and stone forms. The brighter yellow colour of »*P. rupicola*» which indeed is rather conspicuous, is sometimes also found in corticolous specimens of *P. Wulfenii* from S. Europe, and the monoserial arrangement of the spores in the asci is not constant. Erichsen points out a difference in their geographical areas, »*P. rupicola*» being more frequent or predominant in France and the Mediterranean districts. A strict geographical delimitation of the saxicolous type might be the motive of treating it as a subspecies, but as it has also been found in

Norway, I cannot give it a higher taxonomic position than a variety (var. *rupicola* Fr.)

The variations within the corticolous population are chiefly modifications or slight forms. The colour of the thallus can exceptionally be whitish (f. *lactea* Harm.) or rather often purely grey (f. *plumbea* Harm.) instead of the normal yellowish grey. F. *carnea* (Turn.) Fr. is a curious form with prominent, flesh-coloured disks of the apothecia. F. *rugosa* (Ach.) n. c. has a rather strange-looking habit with a thicker, more wrinkled thallus and often sterile verrucae. It often occurs on beeches near roads, where the trunks are impregnated with dust. Apparently it is a degenerate state, analogous to *P. pertusa* f. *viarum* (Erichs.) n. c. The asci are normally 8-spored in *P. Wulfenii*, but occasionally they can be 4-spored, f. *tetraspora* (Norm. in sched., pro var.) n. c.

10. *Pyrenula nitida* (Weig.) Ach.

Syn. *Sphaeria nitida* Weig. — *Verrucaria nitida* Ach. — Cf. further ZAHLBRUCKNER Cat. Lich. I (1922) p. 441, VIII (1932) p. 117, X (1940) p. 96, and KEISSLER in RABENHORST's Kryptogamen-Flora IX. 1:2 (1938) p. 404.

History. — This lichen was described by WEIGEL from Germany in 1772. ACHARIUS (1798 p. 17 and 18) recorded it as *Lichen populneus* (»habitat in *Populo tremula, Fago, Fraxino*»; probably only partly identical with our species) and as *L.? nitidus* (under »species in Svecia adhuc non observatae»). No exact localities from S w e d e n were published in the first two decennia of the 19th century. The oldest dated specimen in the Swedish herbaria is from 1825 (leg. G. Wahlenberg in Omberg; cf. WAHLENBERG 1826 addenda), and at the same time it was published from Femsjö (E. FRIES 1825—26). It had been distributed in 1818 in E. FRIES exs. 35 without an exact locality but probably collected at Femsjö. WAHLENBERG (l.c. p. 870) recorded its distribution briefly, »Hab. in cortice laeviori *Carpini* et *Fagi* per provincias meridionales». In all, about 25 exact localities have been published from Sweden. At present I know about 110 Swedish stations, half of which are from Skåne.

The species was recorded from N o r w a y (Larvik) by M. N. BLYTT in 1829. I know it from about 10 Norwegian stations.

In 1829 HORNEMANN reported the lichen from D e n m a r k in Flora Danica, fasc. XXXIII, plate 1447 (»in cortice *Fagi*»). The same

author (1836) stated it to be »common in Denmark and the duchies on beech and other forest-trees» (transl. fr. Dan.). As is often the case with many frequent species there are very few exact localities stated in the literature. About 100 Danish stations are known to me, but this number can easily be increased.

There is no statement from Finland and the species is hardly to be expected there.

Scandinavian Distribution (substratum *Fagus* unless otherwise stated).

Sweden.

Skåne. »Copiose ad *Fagos, Carpinos* etc.» E. Fries 1835 p. 289. Stations reported by Hellbom 1887 p. 71, B. Nilson 1902 p. 481, Alvthin 1904 p. 27 and 1912 p. 21, Erichsen 1913 p. 38, Malme 1934 p. 7 and 1935 p. 9.

Known from the following parishes: Andrarum, Baldringe, Balkåkra, Bara, Benestad, Bjäresjö, Bläntarp, Brunnby, Brösarp, Båstad, Börringe, Dalby, Fjälkestad, Fågeltofta, Färingtofta, Genarp, Gärdslöv, Halmstad, Hjärnarp, Hjärsås (Malme exs. 50), Hällestad, Högestad, Ivetofta, Kiaby (:lvö), Konga, Kågeröd, Linderöd, S. Mellby, Oppmanna, Ottarp, Riseberga, Röddinge, Sireköpinge, Skabersjö, Skarhult, Skurup, Stehag, Stenestad, Ö. Sönnarslöv, Sövde, Sövestad, Tjörnarp, Torekov, Verum, Vittsjö, N. Vram, V. Vram, Örkelljunga, Öved.

Blekinge. »Common on *Fagus*.» Hulting 1872 p. 23. — »Rather common on *Fagus*». Falk 1874 p. 20 (both transl. fr. Swed.). — Augerum. 1871 H. G. Lübeck (Ka). — Ellehol m: on *Quercus*. 1871 Hult. Hulting l.c. — Förkärla: Tromtö. 1945! (L). — Hjortsberga: Listersjöarna. 1924 DR. (Dz); Tolseboda, near Lake Sämnen. 1937! (L); Värmansnäs. 1942! (L, S). — Karlskrona: Verkö. 1871 W. Molér (G, S, U, Vä); Vämö. 1872 Falk (Ka). — Kristianopel. 1873 Falk (L, S, U). — Lösen: Ringö. 1860 H. G. Lübeck (Ka); ibm. 1871 Svanlund (L, S). — Mjällby: Hanö, on *Ulmus* and *Sorbus aucuparia*. 1871 Hult. (S) Hulting l.c. — Mörrum: on *Fraxinus*. 1871 Hult. Hulting l.c. — Nättraby: Trantorp. 1872 Svanlund (L, U); Skärva. 1872 Svanlund (Ka); ibm. 1943! (L, S); Marielund. 1945! (L, S). — Ronneby: Brunnsskogen. 1937—42! (L, S); Fornanäs. 1937! (L). — Sillhövda. 1873 Falk (L). — Sölvesborg. 1922 A. Hülphers (S); Valje. 1871 Hult. (L); ibm. 1924 DR. (Dz); ibm. 1931 Sthm (G, T); ibm. 1942! (L); Sissebäck. 1871 Hult. (G, U). — Sine loco. C. Aspegren (U) Aspegren 1823 p. 87.

Öland. Högsrum: Hallforp, on the base of a *Carpinus*. 1913 DR. (Dz).

Gotland. Kräklingbo: Torsburgen, on *Corylus*. Sthr (S) Malme 1937 p. 179; ibm, on *Corylus* (with var. *nitidella*). 1863 Hellb. (G, O) Hellbom 1871 b p. 32; ibm, on *Corylus*. 1880 Blomberg (L) (ad var. *nitidellam*).

Småland. Burseryd: Kätabo, near Bultaåsen. 1876 K. A. Th. Seth (L, S, U, Vä) Malme 1937 p. 179. — Femsjö. E. Fries (L, S), »f(requens)» E. Fries 1825

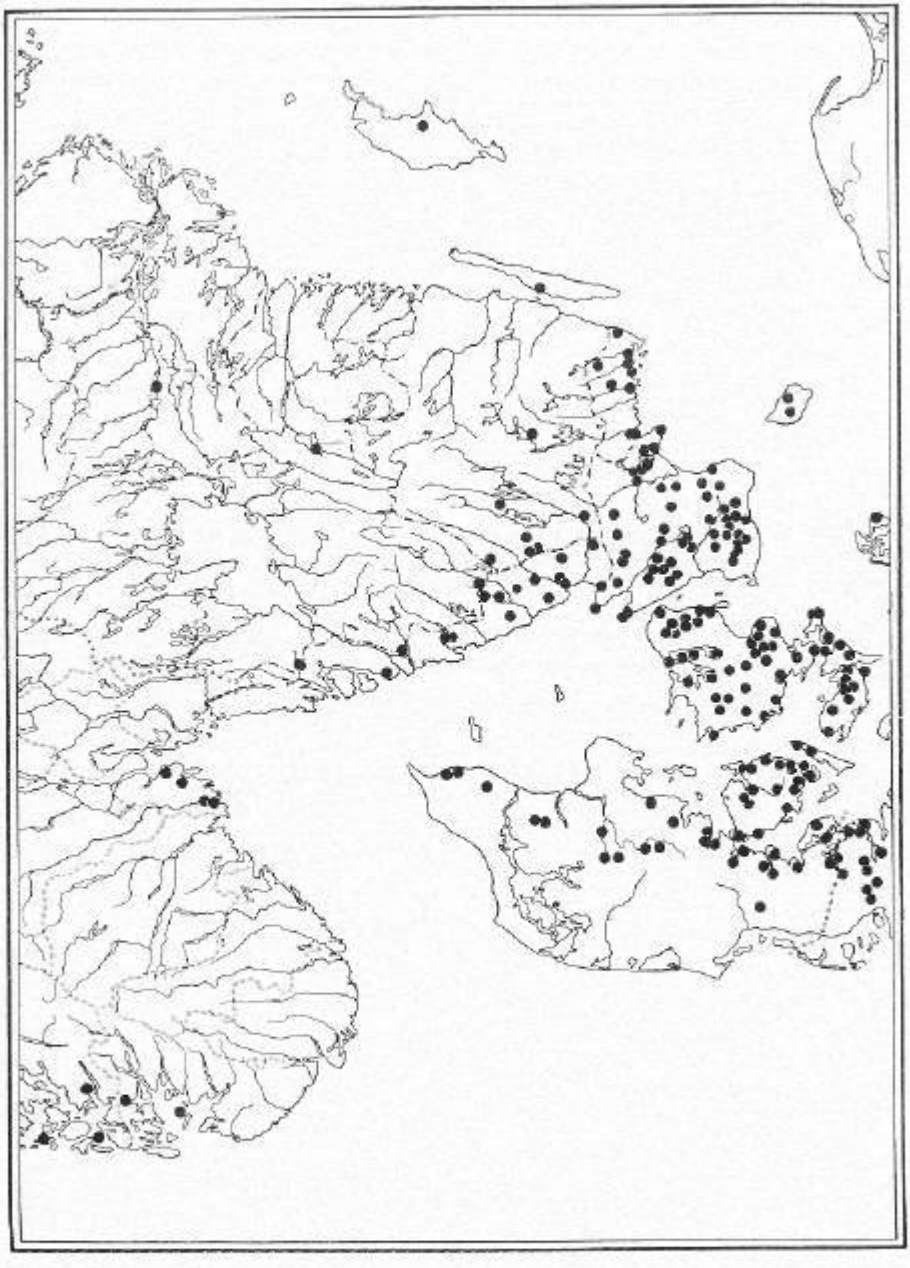


Fig. 14. *Pyrenula nitida* in Scandinavia.

—26 p. 39; ibm. Th. Fries (Vä); ibm. 1859 Blomb. (G, L, N, S); Bohult. 1851 Th. Fries (U); Hägnen. 1851 Th. Fries (U); ibm. 1926. Deg. (Ds); Älmås. 1851 Th. Fries (U); Hallaböke. 1945! (L); Skubbhult. 1945! (L). — Kärda: Åminne. 1945! (L). — Markaryd: Timsfors, near the viaduct. 1943! (L, S, U). — S. Unnaryd: Rangelsbo. 1921 Greta Sernander (Vä); ibm. 1926 Deg. (Ds, L, U). — Växjö. 1879, 80 E. Köhler (G, L, N, O, S, U, Vä); between N. and S. Bergundasjön. 1937 Hedv. (L); ibm (Biskopsnäset). 1945, 46! (L, O, S).

Halland. Abild: Arnared, 1945! (L, S). — Breared: Moshult. 1933 Sthm (G). — Enslöv: 1920, 30 A. Hülphers (Dz, S). — Fagered: Obbhult. 1926 Sthm (G); Marieberg. 1929 Hedv. (L). — Fjärås: Dal. C. J. Lindeberg (Ka); Rossared. 1945 (L). — Getinge: Fröllinge. 1885 Berg (H, L); ibm. 1945! (L, S). — Halmstad. 1896 Sthm (G). — Knäred: near Ön, rather abundant. 1936 Me (S) MALME 1937 p. 179. — Sibbarp: S. of Angryd. 1945! (L, S). — Slättåkra: Johansfors. 1929 Deg. (Ds); Spenshult. 1947! (L). — Ullared: Övre Hjärtared. 1925 Sthm (G).

Bohuslän. Hålta: Gullbringa. S. Almquist (S) MALME 1937 p. 179. — Sine loco. C. J. Lindeberg (G, S). — Sine loco (O).

Dalsland. Valbo-Ryr: Vågsäter, on one tree. 1895 Hult. (G) HULTING 1899 p. 229, 1900 p. 82.

Västergötland. Mårdaklev: Åsebol. 1923 Me (S) MALME 1924 p. 312, 1937 p. 179; Skeppshult. 1945! (L, S). — Partille: Jonsereds park. 1860 K. Fr. Thedenius (S, U); Bokedalen. 1939 Magn. (M); ibm. 1945 Magn. and! (L, S).

Östergötland. V. Tollstad: Omberg. E. Acharius? (scrips. AGRELIUS) (U); Stocklycke. 1825 G. Wahlenberg (U) WAHLENBERG 1826 p. 1075; ibm. »scarce on *Fagus* near Stocklycke» (transl. fr. Swed.). BOHMAN 1829 p. 47, 1840 p. 108; Omberg. Sthr (S); Alvastra. 1874 Theorin (L, S, U) THEORIN 1875 p. 155; ibm. 1874 J. Trybom (U); Omberg. R. Indebetou (G, S); ibm. H. F. Nerén (Vä); ibm. 1908 Hult. (G) HULTING 1925 p. 8; Alvastra. 1908, 11, 21 Me (K, L, S, MALME exs. 366) MALME 1937 p. 179; ibm. 1915 Vrang (Dz, O, S, U); V. Djurledet. 1908 Me (S) MALME 1912 p. 431; near the tourist hotel. 1944 Deg. (Ds, S).

Närke. Götlunda: Hamrarna, on *Sorbus aucuparia*. 1863 Blomb. (L, S, U) (ad var. *nitidellam*) HELLBOM 1871 p. 125, 1871 b pp. 32, 85, MALME 1937 p. 179. Sine loco. E. FRIES exs. 35. — STHR exs. 87 (»Ad corticem *Fagi* in Smolandia et Bahusia»).

Norway.

Vestfold. Andebu. 1921 Höeg (T, one minute specimen). — Brunlanes: Jordfalden. Norman (O). — Hedrum: Farriseidet. 1922 Höeg (T). — Larvik. M. N. Blytt (S) BLYTT 1829 p. 256; »in fagis». S. C. Sommerfelt (O); »Lille Bögeskoven.» 1888 Norman (O); the beech forest. 1920, 22 Höeg. (T); rather abundant in the beech forest N. of L. 1947! (L, S). — Våle: Rykåsen. 1922 Höeg (T, an almost sterile specimen).

Rogaland. Finnöy: on *Fraxinus* and *Populus tremula*. 1833 M. N. Blytt (O). — Sandeid: between S. and Vikedal, on *Fraxinus* in the W. slope. 1932 Deg. (Ds).

Hordaland. Fitjar: Husavik (on the island of Hufteren), on *Tilia*. 1937 DR. and Sant. (S). — Moster. 1915 Hav. and Lynge (O); Mosterhavn, »only collected

on a shrubby *Tilia parvifolia*, hanging over a low mountain slope on the S. side of Vetahaug» (transl. fr. Norw.). (Hav. exs. 527) Havås 1917—18 p. 13. — Skånevik: Matre, Holmedalsura, 1927 Lynge (O).

Denmark.

Sjælland. Known from the following parishes: Aarby, Birkerød, Blovstrød, Boeslunde, Braaby, Buerup, Druaby, Egebjærg, Fodby, Frederiksborg Slotssogn, Gentofte, Gersley, Gevninge, Grandlöse, Haraldsted, Haslev, Herfölge, Herlufsholm, Hillerød, Holsteinborg, Holtug, Hornbæk-Hellebæk, Højelse, Hörsholm, Jyderup, Kalvehave, Karrebæk, Lellinge, Lidemark, Lilleröd, Lyngby, Maarum, Magleby (at the Köge Gulf), Nöddebo, Præstö, Sædder, Særlöse, Skamstrup, Sorö, S:t Jörgensbjærg, S:t Peder, Sölleröd, Taarbæk, Terslöse, Tiköb, Torup, Turcby, Undlöse, Værlöse, Vallöby, Vemmetofte, Vigersted, Österegede.

Mön. Damsholte, Magleby.

Falster. Sr Alslev, Bogö, Horbelev.

Lolland. Godsted, Hunseby, Kettinge, Skörringe, Nysted, Radsted, Sandby, Torcby, Vesterborg.

Langeland. Hov K., Tranekær.

Fyn. Vr Aaby, Bregninge, Sr Broby, Egense, Husby, Jorlöse, Langaa, Middelfart, Nyborg, Odense, Ore (N. of Svendborg), Revninge, Skanrup, Svindinge, Sönderse, Tröstrup Korup, Turö, Vejstrup, Viby.

Als. Notmark, Ulkeböl.

Jylland. »Common on beech» (N. Jylland). Branth 1867 p. 88. — Aabenraa, Aalum, Aarhus, Bjerning, Dollerup, Dronninglund, Flade, Gaverslund, Gram, Haderslev, Harte, Holböl, Hoptrup, Ovsted, Rold, Skörping, Sr Stenderup, Stovby, Tem, Vejle, Nr Vilstrup, Sr Vissing, Vium, Volstrup.

Bornholm. Vestermarie: Almindingen, near Gammelborg, on *Ulmus*. 1884 Hellb. (G); Kristianshöj, on *Ulmus*. 1884 Hellb. (G). — Östermarie: Kofoedsgaard, on *Carpinus*. 1884 Hellb. (G) Hellbom 1890 p. 105.

The Scandinavian distribution of *P. nitida* coincides in general with the beech districts. The species is abundant in Denmark and Skåne, where it will be found in most beech woods with not too young trees. In Halland and the coast region of Blekinge it is also a rather common species. In the beech districts of S.W. Småland and S. Västergötland it must be characterized as rare, occurring only on old trees. Through the intense felling of the beech forests especially in the last decennia, it has become perceptably rarer than previously. It is also found on old trees in the isolated beech occurrences at Omberg, in Dalsland, and near Larvik in Norway. On the other hand I have searched for it in

vain in numerous small outcrops of wild beech in Småland, Västergötland, Bohuslän, and Östergötland. Nor is it a component of the scanty epiphytic flora of the cultivated beeches in Central Sweden. The W. Norwegian stations on other trees than *Fagus* are noticeable.

Extra-Scandinavian Distribution. — The species has a wide distribution mainly in the beech districts of Central, Western, and Southern Europe.

From Germany and Austria Lettau (1940) stated it to be »hauptsächlich an *Fagus* und *Carpinus* überall verbreitet und stellenweise in älteren Waldungen und an feuchteren Orten häufig». In the Black Forest it ascends to about 1200 m above sea level. In Switzerland the same author reported it as »nicht selten bis zu den höchsten Bergkämmen (13—1400 m)». It is also distributed in Czecho-Slovakia (Bohemia: »frequentissima . . . etiam in partibus submontanis» in some districts, sec. Hilitzer 1924; Slovakia: »praesertim in regione subalpina montis», sec. Suza 1923; several Slovakian stations recorded by Szatala 1927) and Hungary (Szatala l.c.).

In Holland it is not rare (several specimens in herb. Leyden), as well as in Belgium (De Wildeman & Durand 1898). In France it is recorded as »commun», especially on *Carpinus* and *Fagus* in most districts (cf. Flagey 1883, Harmand 1895—1899, Olivier 1897). In the British Isles it is »frequent in the Channel Islands, England and Wales, somewhat rare in Scotland and Ireland» (A. L. Smith 1926 p. 375). Its Irish distribution was reported by Knowles (1929) as »very common on trees with smooth bark in woods and plantations, chiefly in lowland districts».

In Italy Jatta (1909—1911) reported it to be »ad cortices varias praecipue *Castanearum* et *Pyrorum* . . . totam per Italiam et in insulis obvia». It has a wide area in the Balkans, e.g. in Yugo-Slavia (Szatala l.c., Servit 1929—34, v. Degen 1938), Bulgaria, ascending to 1700 m above sea level (Suza 1929, Szatala 1929 c), Rumania (Szatala 1927, Cretziou 1935), and (as var. *chlorospila*) also in Corfu in Greece (leg. Sydow, sec. Lettau l.c.).

In E. Europe it is recorded from some districts in Poland, e.g. Tatra (Motyka 1926) and the Lublin district (»Nicht häufig. Nur in Wäldern an der Stammrinde von *Fagus* und *Carpinus*», Sulma 1935). In Russia it is recorded from White-Russia (leg. Kreyer) and the Moscow district (leg. Martius), sec. Tomin 1939.

It is recorded — often as »*P. nitidella*»; cf. below — from various districts in Africa (e.g. Algeria, Morocco, Tanganyika, Port Natal, the Transvaal, and the Cape Province). Stations are also known from the Azores, the Cape Verde Islands, the Island of St. Thomas in the Guinea Gulf, and Réunion.

In Asia it is reported from India, Ceylon, French Indo-China, China, and Japan, and further from Java and the Andaman Islands.

It has a wide distribution in the temperate districts of N. America (»on trees, throughout the United States», sec. Fink 1935; several stations from the provinces of Quebec, Ontario, and British Columbia in Canada, sec. Macoun 1902). It has also been recorded — several statements doubtful — from various subtropical and tropical American districts (Mexico, Colombia, Guiana, Peru, Bolivia, Chile) as well as from the West Indies.

The species is also reported from New Zealand and from several islands in Oceania (Hawaii, Tahiti, New Caledonia).

Several extra-European records refer probably to other species of this large genus.

Habitat Ecology. — *Pyrenula nitida* is perhaps the most characteristic component of the epiphytic vegetation of the beech in the southern parts of the Scandinavian beech districts, though it is not restricted to *Fagus*. It is also often met with on *Carpinus*. Sometimes it is found on other deciduous trees with smooth bark, e.g. *Corylus*, *Fraxinus*, *Sorbus aucuparia*, and *Tilia* (young trees). Exceptionally it is also recorded from trunks of *Acer*, *Alnus*, *Populus tremula*, *Quercus*, and *Ulmus*. There is no statement from coniferous trees in our districts, but in Central Europe it is found on *Abies* (LETTAU 1940). Neither in our countries nor elsewhere, has it been recorded as saxicolous.

P. nitida is often a dominant lichen on beech trunks, under favourable conditions forming characteristic societies. As mentioned previously (p. 27) it seems appropriate to treat these and related societies as a special union, *Pyrenuletum nitidae*, where our species is an index species (cf. further under *Bacidia rosella*, *Lecanora glabrata*, *Opegrapha viridis*, *Pertusaria Wulfenii*, *Thelotrema lepadinum*, *Catinaria Laureri*, *Enterographa crassa* and *graphidioides*, *Pertusaria velata*, and *Graphis elegans*). As to its light requirement *P. nitida* takes an intermediate position in relation to other typical epiphytic lichens growing on beech. It is more photophilous than *Opegrapha viridis* but is less tolerant towards illumination than *Lecanora glabrata* and *Pertusaria Wulfenii*. THEORIN (1875 p. 155) recorded it as collected in Omberg »on the northern and shady sides of the beeches» (transl. fr. Swed.). In my analyses (tab. X) the northern exposure also seems to be the most favourable, but too far-reaching conclusions cannot be drawn from this fact, partly because the statistical material is too small, and partly because the degree of illumination often depends more on the density of the wood than on the exposure to a certain cardinal point. It may be pointed out that in the three analyses (nos 10, 12, and 14) from south sides of trunks, decidedly photophilous lichens (such as *Evernia*, *Parmelia furfuracea*, *physodes*, and *sulcata*) were almost complete lacking. The occurrence of rather large quantities of the two photophilous lichens *Pertusaria amara* in no. 12 and *P. pertusa* in nos 12 and 14, is, however, noteworthy. These three trunks were all subject to only diffuse illumination. The most characteristic components in *Pyrenula nitida* -societies are photoneutral (at least in comparison with the scanty

Tab. X. Pyrenula nitida - communities.

1 on a middle-aged *Fraxinus*, 2—20 on middle-aged — old *Fagus*. — 1. **Sk.** Fågeltofta: Kronovall, N. exposure. — 2. Genarp: Häckeberga, E. exp. — 3. Sövestad: Krageholm, E. exp. — 4. Sövestad: Vistorp, N. exp. — 5—7. Torekov: Hallands Väderö, all N. exp. — 8. **Bl.** Nättraby: Skärva, S. W. exp. — 9. Sölvesborg: Valje, N. E. exp. — 10. **Sm.** Markaryd: Timsfors, S. exp. — 11. Växjö: Bokhultet, W. exp. — 12. Femsjö: Skubbhult, S. exp. — 13. **Hl.** Slättåkra: Spenshult, W. exp. — 14. **Vg.** Partille: Bokedalen, S. W. exp. — 15. **Vestf.** Larvik, E. exp. — 16. **Sj.** Lidemark: Tangeröd, N. exp. — 17. Nöddebo, S. exp. — 18. **Mön.** Magleby: Möns Klint, E. exp. — 19. Ibm, W. exp. — 20. **Jl.** Volstrup: Sæbygaard Skov, W. exp.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Arthonia radiata ..	**3**	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—	—	—	—	—
Arthopyrenia gemmata	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—
Bacidia luteola	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—
— rosella	—	—	—	—	—	—	—	—	—	1	3	—	—	—	—	—	—	—	—	—
Buellia betulina ...	1	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—
Catillaria Griffithii	—	—	—	—	—	3	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Catinaria Laureri ..	—	—	—	—	—	—	—	—	1	—	—	1	—	—	—	—	—	—	1	—
Gladonia ochrochlora	—	—	—	1	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—
Evernia prunastri..	—	1	—	2	1	—	1	—	—	—	—	1	—	—	—	—	—	—	—	—
Graphis scripta ...	**4**	—	1	—	1	1	—	—	—	1	—	—	3	—	1	1	1	—	—	—
Haematomma coccineum	—	1	—	—	—	—	—	—	4	—	1	—	—	—	—	—	—	—	—	—
— leiphaemum ...	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Lecanora expallens	—	—	—	—	1	1	2	—	—	—	—	—	—	—	—	—	—	—	—	—
— glabrata	—	—	—	—	3	3	2	1	—	3	—	2	1	2	1	—	—	—	2	—
— intumescens ...	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	3	1	—
— subfusca (coll.) ..	1	—	1	—	1	—	1	—	1	2	1	1	—	1	—	1	1	2	1	—
Lecidea olivacea ..	—	—	—	—	—	1	—	1	1	1	—	—	—	1	—	—	—	—	—	—
Lepraria aeruginosa	—	2	3	3	1	—	1	—	—	1	1	1	2	2	—	1	1	1	1	3
Opegrapha atra ...	—	—	—	—	—	—	—	—	1	—	—	—	—	1	—	—	—	—	—	—
— herpetica	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
— subsiderella	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—	—
— varia	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—
— viridis	—	—	1	—	1	2	1	1	—	1	1	—	—	1	—	2	4	—	—	—
Parmelia fuliginosa var. laetevirens	—	1	1	1	1	—	1	—	1	—	—	—	—	1	—	—	—	—	1	1
— furfuracea	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—
— laciniatula	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
— physodes	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
— sulcata	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—
Pertusaria amara ..	—	3	1	1	1	—	1	—	1	—	1	3	—	—	—	—	—	—	—	1
— coccodes	—	2	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—
— globulifera	—	—	—	—	—	—	—	—	2	—	1	—	—	—	—	—	—	—	—	—
— hemisphaerica ..	—	—	—	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
— leioplaca	1	—	—	—	—	2	1	—	—	—	—	1	2	2	4	—	—	—	—	—
— leprarioides ...	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—
— lutescens	—	—	—	—	—	—	1	—	—	1	—	—	—	—	—	—	—	—	—	—
— pertusa	—	1	1	—	1	1	—	—	2	—	1	3	2	1	—	3	3	—	2	1
— suhviridis	—	1	—	3	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—
— Wulfenii	1	2	1	3	—	—	4	—	—	3	—	2	—	2	—	2	—	—	—	1
Phlyctis argena ...	1	2	3	1	—	—	—	2	1	3	2	2	3	—	2	—	2	—	—	—
Porina carpinea ...	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3	—	—	—	—	—

Tab. X. Continued.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Pyrenula nitida ...	**3**	**4**	**5**	**4**	**5**	**4**	**3**	**5**	**4**	**3**	**4**	**4**	**4**	**4**	**4**	**5**	**4**	**5**	**5**	**5**
Ramalina farinacea	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—
Sphinctrina gelasinata	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Thelotrema lepadinum	—	—	—	—	—	—	2	—	—	1	—	—	—	—	—	—	—	—	—	—
Dichaena faginea ..	—	—	—	2	1	1	1	—	—	—	2	—	1	—	—	—	1	—	—	—
Coccoid Chlorophyceae	—	—	—	—	+	—	—	—	—	—	—	—	—	—	+	—	—	—	—	+
Antitrichia curtipendula	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—
Hypnum cupressiforme	—	2	2	4	—	—	1	2	1	—	—	2	3	2	—	1	—	—	—	—
Isothecium myurum	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—
Leucodon sciuroides	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—
Neckera pumila ...	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—
Orthotrichum striatum	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—
Ulota Bruchii	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
— crispa	—	—	—	—	—	—	—	—	—	—	—	—	3	—	—	—	—	—	—	—
Frullania dilatata ..	—	—	—	1	—	—	—	1	—	3	—	1	3	1	—	—	—	—	—	—
Metzgeria furcata ..	1	—	1	—	—	—	1	1	—	—	—	—	2	1	—	—	—	—	—	—
Porella platyphylla	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—
Radula complanata	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

light generally present in beech woods) or slightly photophilous species as *Lecanora glabrata* and *subfusca*, *Parmelia fuliginosa* var. *laetevirens*, *Pertusaria amara*, *pertusa*, and *Wulfenii*, *Phlyctis argena*, and *Hypnum cupressiforme*. Some pronouncedly photophobus lichens (*Lepraria aeruginosa*, *Opegrapha viridis*) are also rather regularly met with, but as a rule they are present in rather small quantities.

The lichen cannot endure impregnation with dust containing nitrogenous compounds and is almost never found on trees near roads, farms etc. As may be gathered from tab. X there are hardly any coniophilous lichens present in *Pyrenula nitida*-societies (only *Parmelia laciniatula*, *Pertusaria subviridis*, and *Ramalina farinacea* listed). The species is, however, much more frequent in the eutrophic »meadow beech woods» in Skåne and the Danish Islands than in the oligotrophic »heath beech woods» in other parts of our district, but this fact is probably due more to climatic than to edaphic factors (cf. Chapter VI).

Measurements of pH from 3 stations (Sk. Dalby and Bosjökloster, and Vestf. Larvik; 10 samples from each; no traces of coniophilous

lichens present) gave values between 5.2 and 5.7. The Scanian samples which were taken from stations in the relative vicinity of roads, had an average pH of 5.6; the Larvik samples which were taken from the depth of the forest, had 5.3 on the average.

When *P. nitida* is growing on trees other than *Fagus*, its sociology must naturally be somewhat different. The least difference will be found on *Carpinus*, the bark structure of this tree being about the same as that of *Fagus*. An analysis of a *P. nitida*-community on *Fraxinus* is given in tab. X: 1. The species constellation is about the same as on *Fagus*, but the prominent part played by *Arthonia radiata*, *Graphis scripta*, and *Opegrapha herpetica*, which are characteristic of the *Opegraphetum herpeticae* covering young trunks of *Fraxinus*, must be emphasized.

Affinity and Variation. — There is a considerable variation within this species. The colour of the thallus normally ranges from olive-green to olive-brown, as a rule corresponding to different illumination but partly also due to the substratum as stated already by E. FRIES (1835 p. 289): »in *Fago* crusta saepe fusca, in *Carpino* laete virens». Extreme modifications are f. *virens* Serv. & Nadv. (thallus greenish; common on shady stations), f. *flavescens* (Malbr.) Zahlbr. (thallus yellowish; mostly an age phenomenon,[1] rather rare in our districts), and f. *elaeodes* (Leight.) A. L. Sm. (»thallus dark blackish or purplish brown, resembling a diffuse dark oily stain», sec. A. L. SMITH; not uncommon). Occasionally the brown colour can be bleached to greyish or almost white. As a rule such specimens show an abnormal appearance, but they have been confused with *P. laevigata* (Pers.) Arn., a rare species, still little known in Scandinavia. This species — syn. *P. glabrata* (Ach.) Mass. — has a smooth, greyish-whitish thallus (somewhat resembling *Arthopyrenia gemmata*) and a quite different anatomy of the perithecia (a medial columella rising from the hypothecium). To the two Swedish records of *P. laevigata*, I can add three unpublished Norwegian stations. Its total Scandinavian distribution known at the present is the following:

Sweden.

Gotland. Kräklingbo: Torsburgen, Tjängvide lucka, on *Corylus*, together with *Graphis*, rather scarce, 1943 Deg. (Ds) DEGELIUS 1944 p. 37.

Västergötland. Örby: Hult, on *Corylus* in a spruce wood, 1944 Ahlner (Ar, Ds, U) AHLNER 1945 p. 117.

[1] As pointed out by KEISSLER, old herbarium specimens often turn this colour!

Norway.

Vestfold. Hedrum: S.W. of Forstvedt, on *Fagus*, 1922 Höeg (T as *P. nitida*). [A specimen from Brunlanes: Jordfalden, Norm. (O as *P. glabrata*) is *Arthopyrenia gemmata*.]

Aust-Agder. Arendal: Vestre Tromöya, 1918 Lynge (O as *P. nitida*). — Dyvåg: Lyngör, Gloppe, 1918 Lynge (O as *P. nitida*).

Rogaland. Finnöy: on *Populus*, 1833 M. N. Blytt (O as *Verrucaria glabrata*).

It is far more difficult to judge the taxonomic value of the variation in the size of the perithecia. Scandinavian lichenologists, as well as several German authors (SANDSTEDE, LETTAU, ERICHSEN), have treated the forms with small perithecia (0.2—0.4 mm in diam.) as a proper species *P. nitidella* (Flk.) Müll. Arg. — syn. *Verrucaria nitida* var. *nitidella* Flk.: *P. dermatodes* (Borr.) Schaer. — differing from *P. nitida* (perithecia 0.5—c. 1 mm in diam.). Already NYLANDER (1861) pointed out that there is no anatomical difference (as to spores etc.) between *nitidella* and the type (»non differens nisi apotheciis minoribus»). Subsequently A. L. SMITH (1926) and KEISSLER (1938) especially have ranked it as a variety, the former certainly with hesitation (»in extreme forms it represents almost a specific divergence from the type»). On the other hand LETTAU (1941) emphasized its specific value [»eine von der vorigen (*nitida*) durchaus getrennte und fast immer makroskopisch leicht zu unterscheidende Art»]. It must be admitted that forms with small perithecia (not prominent and even immersed in the thallus) and a greenish-olive thallus give the impression of a distinct species. In my opinion, however, its conspicuous appearance is principally due to the substratum, *Corylus, Fraxinus*, or *Sorbus*. Specimens with small fruits growing on *Fagus* (e.g. from Sk. Ö. Sönnarslöv: Maltesholm) considerably approach typical *P. nitida*. Intermediate states between the two types seem to occur especially in the northernmost and easternmost Swedish localities of the species. Specimens in herb. L from Gtl. Torsburgen, on *Sorbus*, and Nrk. Götlunda, on *Corylus* (both leg. Blomberg) with perithecia 0.4—0.5 mm in diam. are not with certainty referable to either of the two types. From Torsburgen there are, however, several other collections of a typical *nitidella*. This variation cannot be considered as a mere modification, as there are specimens (e.g. from Sk. Färingtofta) where the two types grow together without transitional stages. Undoubtedly the size of the perithecia is due to genetical factors, but as no reliable line of demarcation can be drawn between forms with large and forms with small perithecia, I must regard the latter ones as a variety, var. *nitidella* (Flk.) Schaer.

The Scandinavian stations of var. *nitidella* are as follows:

Sweden.

Skåne. Benestad: Örups almskog, on *Carpinus*. 1915 N. Askelöf (Dz). — Brunnby: Kullen, V. of Svartehäll, on *Quercus*. 1934 Sant. (S); ibm. Käringmalen, on *Fraxinus*. 1940! (A, S, L). — Dalby: D. Söderskog, on *Fraxinus*. 1934 Me (S) Malme 1934 p. 7; ibm. 1936—47! (A, Ds, L, U); ibm. 1937, 43 Deg. (Ds). — Färingtofta: Djupadal, on *Carpinus* (with the main type). 1942! (L). — Halmstad: Duveke, on *Fagus* and *Fraxinus*. 1893, 94, 99 Alvthin (G, L) Alvthin 1904 p. 27. — Ottarp: Bälteberga, on *Fraxinus*. 1900—03 Alvthin (Dz, G, H, L, O, S, U) Alvthin l.c.; ibm. 1938—46! (A, L, S). — Ö. Sönnarslöv: Mattesholm, on *Fagus* and *Fraxinus*. 1944! (L, S, U).

Öland. Sine loco: on *Corylus* and *Fagus*. 1863 Hellb. (G).

Gotland. Kräklingbo: Torsburgen, N.E. part, on *Corylus*. 1853 Lönnroth (Dz, U) Lönnroth 1858 p. 8; ibm. 1860 J. E. Zetterstedt (U); ibm (with the main type). 1863 Hellb. (O); ibm, Tjängvide lucka, rather scarce on *Corylus*. 1943 Deg. (Ds) Degelius 1944 p. 37.

Västergötland. Medelplana: near Hjälmsäter, on *Fraxinus*. 1945 Deg. (Ds); between Hällekis and Mörkeklev, on *Fraxinus*. 1945 Deg. (Ds, U); S. of Mörkeklev, on a small stump. 1945 Deg. (Ds); Råbäcks munkäng, on *Corylus*. 1922 Deg. (Ds).

Bohuslän. Romelanda: Lysegården. 1925 Sthm (G).

Denmark.

Sjælland. Gentofte: Charlottenlund, on *Fraxinus*. 1867 A. Benzon (K as *P. nitida*) Christiansen 1947 p. 183.

Lolland. Toreby: Fuglsang Storskov, on *Fraxinus*. 1943 Chr. (K, L) Christiansen l.c.

Fyn. Middelfart: Hinsgavl, on *Fraxinus*. 1946! (L).

Jylland. Bronager: Kobbelskov, on *Fraxinus*. 1913 Er. (in litt.) — Hadersley: near H. Dam. 1947 Chr. (K). — Hammeley: Pamhule Skov, on *Carpinus*. 1947 Chr. (K, L) — Hostrup: H. Skov, on *Fagus*. 1913 Er. (in litt.). — Löjt K.: Genner Bugt, on *Fagus*. 1913 Er. (in litt.). — Skive: Krabbesholm, on *Corylus*. Branth (K, U) Branth 1867 p. 88, Branth & Rostrup 1869 p. 259.

Bornholm. Rö: Dynddalen, on *Fraxinus*. 1935 Deg. (Ds, U, Vä) Degelius 1936 b p. 427.

11. *Thelotrema lepadinum* Ach.

Syn. *Lichen lepadinus* Ach. — Cf. further Zahlbruckner Cat. Lich. II (1924) p. 620, VIII (1932) p. 246, Lettau Monogr. Bearb. einiger Flechtenfam. (1932) p. 81, and Gallöe Nat. Hist. of Danish Lichens V (1936) p. 97, plates 111—113.

History. — This lichen was described by Acharius in 1798 as *Lichen lepadinus* from Sweden (»habitat ad corticem *Ulmi*») and

subsequently (1803) referred by him to the genus *Thelotrema*. The first exact Swedish locality was published by E. FRIES 1825—26 (Femsjö in Småland). In Flora Svecica (1826) WAHLENBERG recorded its Swedish distribution: »Hab. in cortice *Carpini* passim et hinc etiam *Fagi* rarius per provincias meridionales exteriores». There are about 25 Swedish stations published in the literature. In the following list about 90 localities are enumerated from this country.

There was no locality from Norway recorded in the literature until HAVÅS (1917—18) published it from Hordaland, but it had been collected already by M. N. Blytt at Larvik in the twenties of the 19th century. I know 18 Norwegian stations.

From Denmark it was recorded in 1836 by HORNEMANN as growing »on the bark of deciduous trees» (transl. fr. Dan.). The first exact Danish station was published by BRANTH (1867). There were hitherto only 7 precise localities recorded in the literature. I know about 25 Danish stations.

The first (and still only) record from Finland derives from W. NYLANDER (cf. below).

Scandinavian Distribution.

Sweden.

Skåne. »Ad *Fagi, Quercus* etc. truncos». E. FRIES 1835 p. 288. — Andrarum: Hägnaden, on *Quercus* by the road. 1946! (L, S). — Degeberga: Kyllingaröd, on *Fagus*. 1940! (L, S). — Hjärsås: Immeln. 1871 S. Almquist (S); Gyvik. 1890 Me (L, S); Skarvik. 1891 Me (S); near the point 32.7, on *Fagus*. 1942! (L). — Loshult: Boställsskogen, on *Picea*. 1901 Alvthin (H, L, S). — Oppmanna: Bokenäset, on *Fagus*. 1943 Deg. (Ds, S). — Riseberga: Skäralid. 1916 Sthm (G); ibm, on *Alnus* and *Fagus*. 1940, 46! (L, O, S). — S. Rörum: Kvesarum, Röstevång, on *Fagus*. 1900 Alvthin (L, U). — Tjörnarp: on *Fagus*. 1916 Me (S). — Torekov: Hallands Väderö, in the S. forest, on *Quercus*. 1884 Hellb. (G, S) HELLBOM 1887 p. 49; ibm, on *Quercus*. 1945! (L, S). — Träne: N.E. of Ovesholm, on *Fagus*. 1946! (L, S). — Vittsjö: Boalts böke, rather abundant on *Fagus*. 1945, 47! (L, S). — V. Vram: on *Fagus*. 1890, 91 Me (S). — Örkelljunga: N. of Ö. Spång, on *Fagus*. 1943! (L). — Örkened: Nyteboda, on *Picea*. 1890 Me (L, S).

Blekinge. »Common on trees (*Quercus, Fagus, Acer, Picea*) in the interior parts of the province, rare in the coastal district» (transl. fr. Swed.). FALK 1874 p. 19. — Asarum. 1879 Svanlund (L, U). — Bräkne-Hoby. 1873 Falk (Ka, U); Runamo, on *Fagus*. 1871 Hult. HULTING 1872 p. 14. — Eringsboda: on *Picea*. 1873 Falk (L, S). — Gammalstorp: Ryssberget, on *Picea*. 1871 Hult. HULTING l.c. — Hjortsberga: Värmansnäs, on *Fagus*. 1924! (L, S). — Karlskrona: Vämö. Falk. FALK l.c. — Kristianopel. 1873 Falk (L); ibm. 1879 Svanlund (B); Fågelmara, on *Fagus*. 1872 Svanlund (L, S, U, Vä); Boabäcken. 1935 Sthm (G); near the railway station Fågelmara. 1935 Sthm (G, O). — Ronneby: Stensjömålaåsen, on *Fagus*.

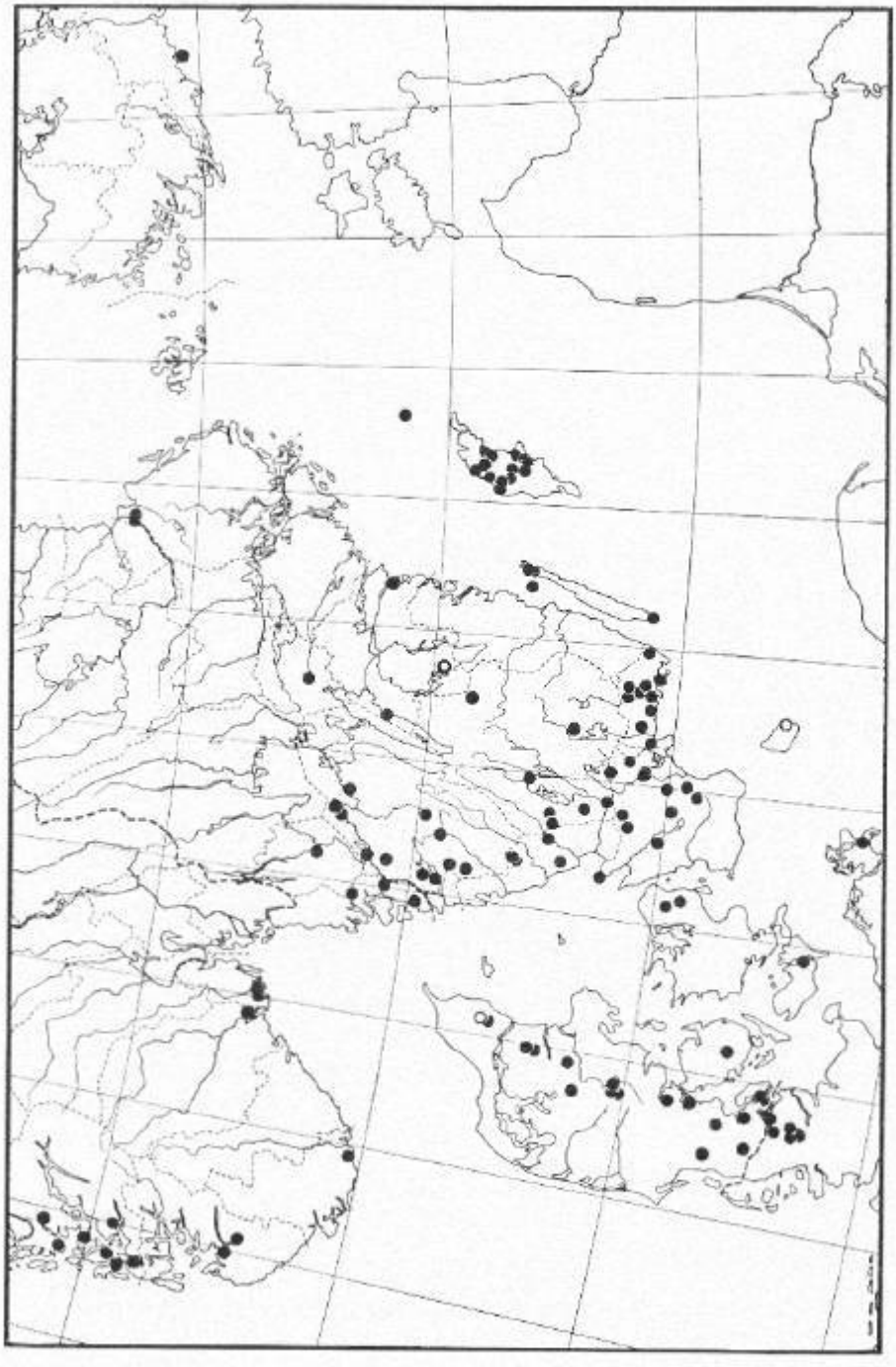


Fig. 15. *Thelotrema lepadinum* in Scandinavia. Open circles=dubious, extinct, or not exactly indicated occurrences.

1937! (L); Brunnsskogen, scanty on *Fagus*. 1942, 47! (L, S). — Rödeby: on *Quercus*. 1873 Svanland (Ka, L, S, Vä). — Sillhövda: on *Fagus*, *Quercus*, and *Picea*. 1873 Falk (B, Dz, Ka, L, O, S, U). — Tving. 1873 Falk (Ka). — Sine loco, ASPEGREN 1823 p. 87.

Öland. Böda: the crown forest. 1867 J. E. Zetterstedt (U); ibm, on *Quercus* and *Picea*. 1940 Deg. (Ds); Skäftekärr, on *Picea*, *Betula*, and *Populus*. 1912 DR. (Dz). — Ås: Ottenby lund, on *Quercus*. 1853 M. M. Floderus and W. Stenhammar (Dz, N, U) FLODERUS 1854 p. 166; ibm, on *Quercus*. 1912 DR. (Dz, S, Vä).

Gotland. Alskog: Svedje, on *Sorbus*. 1918 Me (S). — Ardre: Tviburg, on *Picea*. 1943 Deg. (Ds) DEGELIUS 1944 p. 40. — Boge: W. of Västers, on *Quercus*. 1943 Deg. (Ds, S) DEGELIUS l.c. — Bro: Ytlings, on *Picea*. 1893 (L); Stenstu, on *Pinus*. 1893 (S); Granar, on *Picea*. 1911 (S). All T. Vestergren. — Bäl: S.W. of Grane, on *Quercus*. 1947 B. Pettersson (Pn). — Fårö: Gotska Sandön, W. part of Stora Idemaren and Lilla Idemaren, both on *Quercus*. 1941 B. Pettersson (Pn). — Etelhem: Tänglings myr. 1829 Myrin (Ka); near Västringe, on *Picea*. Lönnroth. LÖNNROTH 1858 p. 5. — Kräklingbo: Torsburgen. 1857 Hellb. (G); ibm, on *Picea*. 1880 Blomb. (L); ibm. 1889 O. Hellbom (G); ibm, on *Picea*. 1918 Me (B, S); ibm, the northern point, common on *Corylus*, *Juniperus*, and *Picea*. 1932 Deg. (Ds, U, Vä). — Lummelunda: Kinners. 1857, 63 Hellb. (G, L). — Stenkumla: Myrsjö. 1869 Laurer (U). — Visby: at the harbour. 1889 R. Matsson (G). — Vänge: between Kyrkjuves and Skogs, on *Picea*. Lönnroth. LÖNNROTH l.c. — Västerhejde: Fridtorp, on *Picea*. 1918 Me (S); Högklint. 1917 Me (S). — Väte: Västerväte. 1934 B. Pettersson (Pn). — Some of the Gotland stations published by DEGELIUS (1936 p. 65).

Småland. Femsjö: f(requens). E. Fries (L, S, U) E. FRIES 1825—26 p. 38; ibm. 1851 Th. Fries (L, N, S, U); ibm, on *Quercus* and *Fagus*. 1859 Blomb. (G, L, O, S, U); Bohult, on *Fagus*. 1851 Th. Fries (U) TH. FRIES 1852 p. 32; Hallaböke, on *Fagus*. 1945! (L, S); Skubbhult, on *Fagus*. 1945! (L). — Hult: Skurugata, on *Salix caprea*. 1933 Deg. (Ds) DEGELIUS 1933 p. 516. — Kärda: Åminne, on *Fagus*. 1945! (L). — Markaryd: Timsfors, by the viaduct, on *Fagus*. 1943, 47! (L, S). — Misterhult: island of Jungfrun, on *Quercus*. 1914 DR. (Dz, M, S, U). — Torpa: Rånköp, on *Quercus*. 1943! (L, S). — S. Unnaryd. 1851 Th. Fries (U); Rangelsbo, on *Fagus*. 1921 Greta Sernander (Vä). — Växjö. 1880 E. Köhler (B, H, L, M, S, U); Bokhultet, on *Fagus*. 1937 Hedv. (L); ibm, on *Fagus*. 1945! (L).

Halland. Fagered: Hårsared. 1926 Sthm (G); Obbhult. 1926 Sthm (G, M, O); Marieberg, on *Fagus*. 1929 Deg. and Hedv. (Ds, L). — Getinge: Fröllinge, on *Fagus*. 1885, 85 Berg (H, Ka, L) (»f. sporis maximis») BERG 1890 p. 172. — Torup: S. of T., on *Fagus*. 1929 Deg. (Ds).

Bohuslän. Hjärtum: several stations, on *Quercus*, *Corylus*, *Sorbus aucuparia*, *Picea*. 1935—37 Hedv. (Ds, G, L); Stora Vektor. 1940 Magn. (M, S) MAGNUSSON 1946 p. 213. — Jörlanda: Ranebo, on *Tilia*. 1945 Magn. (M) MAGNUSSON l.c.

Dalsland. Skållerud: Upperud, scanty on *Alnus* and *Tilia*. 1870 Hult. (S, U) HULTING 1900 p. 74. — Valbo-Ryr: Vågsäter, very common on *Fagus*, also on *Picea*, *Quercus*, *Sorbus aucuparia*, *Betula*, *Alnus*. 1870, 95 Hult. (G, L, S, U, Vä) HULTING 1899 p. 236 and l.c.; ibm. 1927 S. Bergström (G); ibm, on *Fagus*. 1928 Magn. (M). — Sine loco. 1870 Hult. (T).

Västergötland. Björketorp: Hindås, on *Picea*. 1915 Magn. (M) Magnusson 1919 p. 77. — Bredared: Vemmenhult, on *Alnus* and *Picea*. 1941 Ahlner (Ar) Hasselrot 1945 p. 126. — Gärdhem: Velanda, on *Quercus* and *Alnus*. 1944 Magn. (L, M, S). — Lerum: Härsåsen, on *Quercus* and *Picea*. 1915 Magn. (M). — Medelplana: Hällekis, abundant on a young *Fagus*. 1945 Deg. (Ds, U). — Od: Mållungen, on *Fagus*. 1904 Hult. (G) Hulting 1912 p. 431; ibm. 1932 Hasselrot (Ht). — Otterstad: Läckö, Djurgården, 1863 Graewe (L, U). — Ruckeby: Degeberg, S. J. Lindgren (U). — Sätila: E. of Dala, near Lake V. Ingsjön, on *Sorbus aucuparia* (abundant) and *Quercus*. 1937 Deg. (Ds). — V. Tunhem: Hunneberg, several stations on *Quercus* and *Ulmus*. 1932 Sant. (L, S). — Vänersnäs: Halleberg. 1893 Sthm (B, G, L, S); ibm, on *Quercus* and *Picea*. 1915 Me (L, O, S); ibm, several stations on *Quercus*, *Picea*, and *Populus tremula*. 1927 Deg. and Hasselrot (Ds, Ht) G. Nilsson (Degelius) 1929 p. 104. — Östad: Ramsjön, on *Betula*. 1940 Magn. (M).

Östergötland. Skällvik: Stegeborg, on *Populus tremula*. 1946 B. Hardal. — V. Tollstad: Omberg, 1870 R. Indebetou (S); ibm, on *Fagus*. 1908 Hult. (G); ibm, on *Quercus* and *Sorbus aucuparia*. 1915 Me (K, L, M, S, U, Malme exs. 517) Malme 1909 p. (81); ibm, Västra Väggar, on *Quercus*. 1873 Theorin (L, S) Theorin 1874 p. 9, 1875 p. 150; ibm, near Elvarum. 1888 Me (L, S); ibm, Måkebergen and Grytsbergen. 1908 Me (S); ibm, above Mullskräerna. 1915 Vrang (M, S). — Sine loco. »Ydre». Sthr (S).

Närke. Hallsberg: Gropdalen, on *Picea*. 1870 Hellb. (B, G, L, U) Hellbom 1871 p. 49, 1871 b p. 55; ibm, on *Corylus*, *Sorbus aucuparia*, *Tilia*, and *Picea*. 1888, 90, 1913 R. Sernander (Vä) Sernander 1886 p. 147, 1914 p. 93, 99.

Uppland. Västland: N. of Alhavet, on Alnus. 1942 Ahlner (Ar, U). — Älvkarleby: Storön in the Dalelf, on *Alnus*. 1942 Ahlner (Ar).

Sine loco. E. Fries exs. 38. — Sthr exs. 177 (»Ad corticem *Quercus* in Gottlandia et Jugo montano Omberg, Ostrogothiæ»).

Norway.

Vestfold. Brunlanes: Solum, on dead *Picea*; Solumtjern, on *Quercus*; between Sletholt and Solumtjern, on *Acer*. All 1923 Höeg (T). — Hedrum: near Hallingsdalen, on *Fagus*. 1921 Höeg (T) Höeg 1923 p. 172. — Larvik: on *Fagus*. M. N. Blytt (O); ibm, Lynge, Höeg l.c.

Telemark. Eidanger: Skjegge, on *Acer*. 1923 Höeg (T).

Vest-Agder. Sögne: Lindlien, N.W. of the lake, on *Tilia*. 1947 Ahlner (Ar, O, U).

Rogaland. Forsand: Dirdal, the hill near the steamer landingstage, on *Tilia*. 1932 Deg. (Ds); the hill W. of Dirdal, on *Sorbus aucuparia*. 1947 Deg. (Ds); Frafjorddalen, Nesure (N.W. end of Molaugsvatn), on *Tilia*. 1947 Deg. (Ds).

Hordaland. Os: Syfteland. 1919 Lynge (O, T). — Moster. 1915 Hav. and Lynge (O); Håvik. 1910 Hav. (B); Mosterhavn, very rare on the bases of old or dead deciduous trees, especially *Sorbus aucuparia*. Hav, Havås 1917—18 p. 16. — Samnanger: between Gaupholm and Tysse, rather abundant on *Quercus*. 1947 Ahlner (Ar, U). — Skånevik: Matre, Holmedalsura. 1927 Lynge (O). — Stord: near Kårevik, on *Quercus*. 1910 Hav. (K, M, Hav. occ. exs. 88) Höeg l.c. — Sveio: Drange, on *Betula*. 1947 Ahlner (Ar). — Tysnes: Sunde, near Loksund, on *Corylus*. 1910 Hav. (B).

Denmark.

Sjælland. Lilleröd: on *Fagus*. 1870 Grönlund (K) Lange 1872 p. 252. — Nödebo (?): Grib Skov, 1869, 70 Chr. Grönlund (K, L, U) Flora Danica, fasc. XLVIII, tab. 2878 (1857, text 1871); N.E. of Hilleröd, on *Fagus*. 1939! (L, S). — Sine loco. Ex herb. Liebmann (K) Branth & Rostrup 1869 p. 212.

Lolland. Toreby: Fuglsang Storskov, on *Quercus*. 1943 Chr. (K, L).

Fyn. Sr Broby: N. of B., on *Fagus*. 1946! (L, S).

Als. Ulkeböl: Sönderskov (pr. Sönderborg), on *Acer*. 1939! (L, S).

Jylland. »Common in woods on sterile ground in the central and western parts of the peninsula» (transl. fr. Dan.). Branth & Rostrup l.c. — Aalum: S.W. of Fussing Sö, on *Fagus*. 1947! (L). — Dollerup: Hald, on *Quercus*. 1881 Rostrup (K). — Dronninglund: D. Storskov, on *Fagus*. 1947! (L). — Ensted: Agesö (»Aagsee»), near Eliselund, on *Fagus* and *Quercus*. 1913 Er. (K). — Frøer: Frøer Purker, on *Fagus*. 1920 Gallöe. Gallöe & Hauch 1925 p. 170. — Gaverslund: Munkebjærg, on *Fagus*. 1939, 46! (L, S). — Gram: near the mansion, on *Fagus*. 1941 Er. (sec. Gelting in litt.). — Hammelev: Pamhule Skov, on *Quercus* and *Corylus*. 1947 Chr. (K, L). — Hoptrup: Pamhule Skov, on *Alnus*. 1947 Chr. (K, L). — Løgumkloster: Draved Skov, on *Betula*. Branth (K). — Rold: S. part of R. Skov, on *Fagus*. 1947! (L). — Rye: Himmelbjærget (K, S) and Rye Skov (B, K, S), both on *Fagus*. 1887 J. Jeppesen. — Silkeborg Landdistrikt: Kobskov, on *Fagus*. 1920 Gallöe. Gallöe & Hauch l.c. — Skörping: Buderupholm, on *Fagus*. 1870 Branth (G, K, L, U); Rold Skov, on *Fagus*. 1920 Gallöe. Gallöe & Hauch l.c., Gallöe 1936 p. 97. — Sr Stenderup: Nörreskov, on *Fagus*. 1946! (L). — Tem: Sönderskov (S. of Silkeborg), on *Fagus*. 1946, 47! (K, L, S). — Sr Vissing: Addit Skov. 1871 E. Rostrup (K). — [Ör Vraa: Ormholt, on a branch of *Fagus* in a bog (subfossil), Branth. Branth 1867 p. 83, Branth & Rostrup l.c.]

[Bornholm. Ibsker: Frennegaards Skov. Leg.? Hellbom 1890 p. 67. Searched for in vain by Hellbom on this station.]

Finland.

Nyland. Helsingfors: Mjölö, on *Picea*. 1850 W. Nylander (H) W. Nylander 1861 p. 165, Räsänen 1939 p. 179.

The Scandinavian distribution of *Thelotrema lepadinum* affords some problems. Degelius (1935 p. 200) counted it with the oceanic lichens. It is evident that it has a pronouncedly southwestern tendency in our districts, but it has no decided maximum in western Norway, nor in western Småland and the inner parts of Halland. Undoubtedly it is a southern species with its main Scandinavian distribution concentrated in the beech districts though it is by no means an exclusive beech epiphyte. There is a certain resemblance with the area of *Pyrenula nitida*, yet it is remarkable that *Thelotrema* is rare or lacking in the Danish Islands and in Southern Skåne. It is obvious that it avoids the eutrophic »meadow beech forests» and prefers the mesotrophic »heath

beech forests» in Jylland, Northern Skåne, and Blekinge. It is rather common on various kinds of trees in Gotland and has scattered occurrences in the Vener-Vetter district.

Gropdalen in Närke was for a long time considered as its northernmost Swedish occurrence. This valley has a very sheltered position, and it shows an interesting phanerogamic vegetation with a southern and suboceanic tendency (vide SERNANDER ll.cc.). Therefore the two stations in N. Uppland found by AHLNER are of considerable interest. Their isolated situation from the other Swedish occurrences cannot be due to insufficient investigation, as Uppland, Södermanland, and Närke belong to our lichenologically best known provinces. It is a striking fact that the Uppland stations are situated near the Dalelf in the neighbourhood of the waterfalls of Untra and Älvkarleby. They form interesting parallels to the isolated northern occurrence of *Pertusaria hemisphaerica* at Ristafallet in Jämtland (cf. literature cited under this species). The occurrence of some southern phanerogams at the northernmost *Thelotrema* stations, viz. *Festuca altissima* (Gropdalen and Älvkarleby) and *Cuviera europaea* (Älvkarleby), is also noticeable.

The Norwegian localities are concentrated in the Vestland and the beech district near Larvik.

Extra-Scandinavian Distribution. — *Thelotrema lepadinum* is a nearly cosmopolitan plant with a wide distribution chiefly in temperate and subtropical districts.

In Germany it is spread over the whole country, »zerstreut bis stellenweise häufig» (LETTAU 1932). In the N.W. German lowland, ERICHSEN (manuscr.) stated it as »wohl in keiner grösseren Waldung fehlend». In Silesia, it is »an Baumrinden der Bergregion, besonders der Fichten und Tannen nicht selten» (STEIN 1879). It is no rare species, chiefly on *Fagus* and *Abies*, in the mountains of S. Germany (Thuringia, Black Forest, Wurtemberg, Bavaria, see. LETTAU 1941). It is also distributed in Austria and Switzerland, in the alpine valleys reaching an altitude of about 1500 m above sea level (LETTAU 1932, 1941). There are many stations recorded from Czecho-Slovakia (HILITZER 1924, 1926, SUZA 1930, SZATALA 1930). SZATALA (l.c.) quoted no record from Hungary in its post-war delimitation.

In Holland it is a common species, especially on *Fagus* (sec. herb. Leyden). In France HARMAND (1913) stated it to grow »sur les vieilles écorces, très rarement sur le bois. Commun dans les forêts des montagnes; rare dans la plaine». In the British Isles SMITH (1918) reported it as »general and common in England, apparently rare in Scotland and Ireland». Sec. KNOWLES (1929), however, it is »general and common on the smooth bark of trees, chiefly oak, birch and holly».

Some few stations are known from Portugal (TAVARES 1945 b). There are also some records from the mountains of Spain (DEL AMO 1870). In Italy,

JATTA (1909—11) reported it as occurring »ad cortices in provincia Veronensi et in Etruria». In the Balkans there are records from Yugo-Slavia, especially Dalmatia (SERVIT 1929, SZATALA 1930, v. DEGEN 1938), and Rumania (SZATALA l.c.).

In Eastern Europe stations are known from Polonia (Tatra, MOTYKA 1926) and Russia (Central Russia and the Baltic States, sec. ELENKIN 1907, White-Russia, sec. TOMIN 1939, and Gagry in the Caucasus, leg. Savicz, herb. S).

Its extra-European distribution is mainly restricted to maritime and oceanic districts. »Aus den Tropen ist sie nur von wenigen Fundorten bekannt» (REDINGER 1936). Some of the records in the literature are probably not reliable and are to be referred to others of the numerous species of *Thelotrema* described from the tropics.

In Africa it is recorded from the Cape and it has also been collected in the Azores.

From Asia I know only one statement, from Ceylon.

It has been reported from Australia. In New Zealand it is probably no rare lichen (quite typical specimens, leg. S. Berggren, in herb. S).

It has a wide area in N. America, reported from Canada (Labrador, Newfoundland, Arctic America, Ottawa, and Vancouver Island, sec. MACOUN 1902) and U.S.A. (New England, S. Carolina, Florida, Louisiana, California, Oregon, and Washington, sec. FINK 1935). — In S. America it is reported from Brazil and Chile (as far to the south as Tierra del Fuego).

It is also known from Pacific districts, e.g. Hawaii and the Juan Fernandez Islands (»stimmt mit der europäischen Pflanze völlig überein», sec. ZAHLBRUCKNER 1920).

Habitat Ecology. — *Thelotrema* prefers the trunks of old trees, preferably *Fagus*, *Quercus*, and *Picea*, but also various kinds of other deciduous trees. In our districts it was never collected on lignum and only once (at Höle in Rogaland) on rocks [f. *rupestre* (Turn.) Cromb.]. This form is also recorded as rare in Central Europe (sec. LETTAU 1932).

It belongs, as a rule, to the epiphytes of dust-free tree-trunks in forests, only exceptionally found on slightly eutrophiated bark near roads. My analyses (tab. XI) contain only records from beech trunks, where it is sometimes a member of a somewhat photophilous, but hygrophilous facies of the *Pyrenuletum* of the heath beech forests. Photophilous macrolichens (as *Evernia*, *Parmeliae*, and *Ramalinae*) can be present in its company, while a considerable amount of mosses (mainly *Hypnum cupressiforme*, often with the muscicolous lichen *Lepraria aeruginosa*) contribute to the retaining of humidity on the trunks.

Measurements of pH from 3 such *Thelotrema*-communities on beech trunks (Sk. Vittsjö, Sm. Markaryd and Jl. Tem: Silkeborg Sönderskov; in toto 15 samples) showed values between 5.3 and 5.8 (mean 5.5).

Affinity and Variation. — Our species is a characteristic lichen with a rather small variation. Of the variations recorded by ZAHLBRUCKNER

Tab. XI. Thelotrema lepadinum - communities.

On the trunks of old *Fagus*. — 1—2. **Sk.** Vittsjö: Boalts böke, S. exposure. — 3. **Bl.** Ronneby: Brunnsskogen, N. exp. — 4. **Sm.** Femsjö: Hallaböke, S. W. exp. — 5. Markaryd: Timsfors, S. exp. — 6—7. Ibm, W. exp. — 8. Växjö: Bokhultet, W. exp. — 9. **Jl.** Sr Stenderup: Nörreskov, N. exp. — 10. Tem: Silkeborg Sönderskov, E. exp.

	1	2	3	4	5	6	7	8	9	10
Buellia betulina	—	2	—	—	—	1	—	1	—	—
Catinaria Laureri	—	—	—	—	—	—	—	—	—	1
Cladonia ochrochlora	1	—	—	—	—	—	1	—	—	—
Evernia prunastri	—	1	—	1	1	—	—	1	—	—
Graphis scripta	—	—	—	—	—	—	—	1	—	—
Haematomma coccineum	—	—	3	—	—	—	—	—	—	—
Lecanora expallens	—	—	—	—	3	1	—	—	2	—
— glabrata	1	—	1	—	2	—	—	—	—	—
— subfusca (coll.)	—	—	—	1	—	—	—	—	—	1
Lecidea cyathoides var. corticola	1	—	—	—	—	—	—	—	—	—
— quernea	—	—	1	—	1	—	—	—	—	—
Lepraria aeruginosa	1	2	2	2	2	4	2	1	3	2
— candelaris	—	—	1	—	—	—	—	—	—	—
Opegrapha viridis	—	—	1	—	—	—	—	—	—	1
Parmelia fuliginosa var. laetevirens	—	1	1	1	—	—	—	1	1	—
— physodes	—	2	—	1	—	—	—	1	—	—
— saxatilis	—	1	—	—	—	—	—	—	—	—
— sulcata	1	1	—	—	—	—	—	2	—	—
Pertusaria amara	1	—	1	1	—	—	—	2	1	—
— coccodes	—	—	3	—	—	—	—	1	—	—
— hemisphaerica	—	—	1	—	1	—	—	—	—	1
— maculata	2	—	—	—	—	—	—	—	—	—
— pertusa	2	2	—	1	1	—	—	2	1	2
— Wulfenii	—	—	—	—	1	—	—	—	2	2
Phlyctis argena	—	1	3	1	1	—	1	1	—	—
Pyrenula nitida	—	—	1	3	2	—	1	2	1	1
Ramalina farinacea	—	—	—	—	—	—	—	1	—	—
Sphinctrina gelasinata	—	—	—	—	—	—	—	1	—	—
Thelotrema lepadinum	4	5	3	5	5	4	4	4	3	3
Coccoid Chlorophyceae	—	+	—	—	—	—	—	—	+	+
Antitrichia curtipendula	—	—	—	1	—	—	—	—	—	—
Hypnum cupressiforme	5	3	1	2	3	3	4	1	4	3
Frullania dilatata	1	—	1	2	1	—	—	—	—	—

(l.c.) var. *scutelliforme* is a mere age state with a thicker margo thallinus and a more widened disk, hardly worth a name. Var. *sorediatum* Schaer., which is said to have its apothecia transformed into soredia, is very dubious. No Scandinavian *Thelotrema* specimen seen was sorediate. F. *corylí* Suza has a rather peculiar habit, according to specimens from Borzava in Czecho-Slovakia, leg. Nadvornik (herb. S), and from the Flensburg district, leg. Erichsen (herb. K). It has a thin smooth thallus

and very small, scattered apothecia, but the internal morphology (form and size of the spores etc.) is quite the same as in the type and it is probably only caused by the somewhat unusual substratum, the bark of *Corylus*. — *Ocellularia suecica* described by MAGNUSSON (1937 p. 125) from Hjärtum in Bohuslän (first found by B. Hedvall) and distributed in MAGN. exs. 230 (also grown on *Corylus*) is externally not distinguishable from this f. *coryli*. Its spores are, however, far smaller than in the *Thelotrema* form (according to my measurements on several specimens in herb. L. leg. Hedvall, 25—30×7—10 μ) with only transverse septa, while *Thelotrema* has far larger, muriform spores (40—120×10—25 μ). Its relations to *Thelotrema* must be subject to further investigations in the field, but according to the present principles of lichen taxonomy it seems necessary to regard it as a proper species.

12. *Usnea florida* (L.) Wigg.

Syn. *Lichen floridus* L. — *Usnea barbata* (L.) Fr. var. *florida* (L.) Fr. — Cf. further ZAHLBRUCKNER Cat. Lich. VI (1930) p. 565, TH. FRIES Lich. Scand. I (1871) p. 15, MAGNUSSON Flora över Skand. busk- och bladlavar (1929) p. 101, and MOTYKA *Usnea* Monogr. (1936) p. 236.

History. — Of the species treated in the present work *Usnea florida* is the only one, which was known by LINNAEUS. In Hortus Cliffortianus (1737) he described a »Lichen caule ramoso solido, foliis setaceis, receptaculis maximis orbiculatis peltatis foliis radiatis. . . . Crescit in *Fagis* per Smolandiam, Scaniam, Germaniam, Angliam etc.». The same lichen was recorded in Flora Svecica (1745) as »L. filamentosus ramosus erectus, scutellis radiatis. . . . Hab. in Smolandiae et Scaniae Fagetis». In Species plantarum (1753) it got the binomial name *Lichen floridus* with the »locum natale»: »Habitat in Europae fagetis». The works of ACHARIUS contain no further details as to its occurrence in S w e d e n. With E. FRIES's Lichenographia Europaea reformata (1831) a period of confusion began in the taxonomy of *Usnea*. According to the idea of regarding most sorediate lichens as »formae Variolarioideae» of fertile species, he included *Lichen comosus* Ach. as a synonym of his *Usnea barbata* a. *florida*. The same opinion is met with in TH. FRIES's Lichenographia Scandinavica (1871). Several of the subsequent records of *U. florida* by Scandinavian lichenologists refer to *U. comosa* or to other sorediate species. Half a century later DU RIETZ and LYNGE undertook a revision of the Scandinavian *Usneae*, some results of which were published in 1921 (DU RIETZ 1921 b p. 176, LYNGE 1921 p. 230). They

retained *U. florida* in the sense of LINNAEUS and ACHARIUS, regarding all sorediate forms as proper species. MOTYKA in his monograph of the genus *Usnea* (1936—38) delimited our species in the same way. He had seen most of the material preserved in the Scandinavian herbaria and enumerated several stations, but as many names of places and collectors are terribly misspelt, a complete list of the Scandinavian localities at present known may be justified. I know the species from about 20 Swedish stations, most of them old collections.

In Norway the species was first collected by M. N. Blytt in 1839. According to our present knowledge, about 18 stations are known from Norway, most of them recorded by LYNGE and MOTYKA (ll.cc.).

The lichen was recorded in 1767 from Denmark (»in Fagetis») by O. F. MULLER and later (1797) with a quite typical figure in Flora Danica VII, tab. 1189, with the text by J. VAHL »Vulgaris in sylvis Holsatiae, in Dania rarius cum fructificatione inveni». The few works on Danish lichens in the 19th century (chiefly HORNEMANN 1836, BRANTH & ROSTRUP 1869) contain few trustworthy statements of *U. florida*, as it was not kept apart from sorediate species. Only two exact Danish stations, confirmed by specimens in the herbaria, are known to me.

The species is not known from Finland.

Scandinavian Distribution.

Sweden.

Skåne. *Lich. floridus* L. erectus, apoth. maximis s. forma typica copiosa in fagetis». E. FRIES 1835 p. 255. — Hjärsås: Immeln. 1890 Me (S). — [Torekov: Hallands Väderö, on *Fagus*. 1884 Hellb. HELLBOM 1887 p. 24. No specimen seen.]

Blekinge. [Bräkne-Hoby: Mörtjuk, Runamo, c. fr. 1871 Hult. HULTING 1872 p. 9. No specimen.] — Jämshög: Haraldsjömåla. 1887 P. Dusén (L, S) MOTYKA l.c. — [Nätraby: on *Betula*. 1872 Svanlund (L = *U. comosa*) FALK 1874 p. 7.] — Ringamåla: Härnäs, on *Betula*. 1894 J. F. v. Bergen (G). — Sillhövda: Holmsjö. 1879 Falk (L). — Sine loco. ASPEGREN 1823 p. 82.

Småland. Asa: on *Betula*. 1933 Sant. (v. *floridula*) (Ds). — Burseryd: Åsberg, 1875, 76, 83 K. A. Th. Seth (G, H, Ka, L, S, U) MOT. l.c. — Femsjö. E. FRIES 1825—26 p. 31; ibm. 1851 Th. Fries (L, N, S, U) TH. FRIES 1852 p. 34; Arvaberget (U), Bohult, Hägnen (U), Råknen (U), and Yaberg (U). 1851 Th. Fries. TH. FRIES l.c. MOT. l.c.; sine loco. 1859 Blomb. (L); Råknen, on *Betula*. 1859 Blomb. (L). — Fågelfors. 1888 Berg (L). — Hjorted. 1915 Vrang (U, S) MOT. l.c. — Kärda: Åminne, on *Fagus*. 1945! (L). — Odensjö. 1851 Th. Fries (S, U, RABENHORST exs. 549); ibm, on *Fagus*. 1859 Blomb. (L); ibm. 1859 L. Rydeman (G, S) MOT. l.c. — Stenbrohult (?): »ad Stenbrohultum». F. Ehrhart (EHRH. exs. 148) MOT. l.c. — S. Unnaryd. 1859 Blomb. (S). — Växjö. 1867 G. Johansson

(v. *floridula*) (G, L, S, U); »in viciniis urbis Växjö». 1913 J. A. Z. Brundin (Malmé exs. 377) Mot. l.c.; Biskopsnäset. 1900 G. A. Ringselle (B, L) Mot. l.c.; ibm. on *Betula*. 1930 S. and G. Cedergren (L); on *Fagus*. 1937 Hedv. (L, U); ibm. on the stems and twigs of *Fagus*, rather abundant. 1945, 46! (L, S). — Sine loco. »Ad ramos arborum in Smolandia occidentali». Sthr exs. 61.

Halland. Ullared: Espenäs. 1898 G. A. Ringselle (v. *fagofila*) (B, G, L, N) Mot. l.c.

[Bohuslän. Naverstad and Ödsmål. Magnusson 1919 p. 90. Refers to *U. comosa*.]

[Dalsland. Laxarby (?): »Ortschakoffsberget» (=Oxakoff on the map), c. fr. Hult. Hulting 1900 p. 32. No specimen.]

Östergötland. »In territoriis Kindae et Ydrae». Sthr (S) Degelius 1944 c p. 432. — [Risinge: Häradstorp, on *Betula*. F. O. Westerberg, Hulting 1925 p. 70. No specimen.]

Uppland. Funbo: Hovgården, near the E. side of Lake Trehörningen, some hundred m N. of H., at least 60 specimens, on *Acer*. 1943 E. Åberg (Ds, U); ibm. 1944 Deg. and Gell. (+v. *floridula*) (Ds) Degelius l.c.

[Dalarna. Sine loco. Leg.? (L, a typical specimen). A dubious record.]

Sine loco. E. Fries exs. 120.

Norway.

Akershus. Frogn: Håöya, on *Tilia*. 1937 Per Størmer (O).

Vestfold. Andebu: Enden, on *Fagus* and *Picea*. 1921 Höeg (T); between Skorge and Gjerstad, on *Fagus*. 1921 Höeg (T) Mot. l.c.; ? Arendal. Ex herb. M. N. Blytt (O). (The statement »Arendal» ap. Lynge 1921 p. 229 is rather referable to the village A. than to the town A. in Aust-Agder.) — Brunlanes: Panlervand, on *Alnus*. 1880, 88 Norman (B, O, U, T) Lynge l.c., Mot. l.c.; Jordfalden, Norman Lynge l.c.; Sky, on *Fagus*. 1922 Höeg (T); near Tildremyren, on *Fagus*. 1922 Höeg (T); Kroksengen, on *Quercus*. 1923 Höeg (T) Mot. l.c.; S.E. of Eikedalen, on *Fagus*. 1923 Höeg (T); between Eikedalen and Ulsbak, on *Fagus*. 1923 Höeg (T). — Hedrum: on *Fagus* and *Pinus*. 1921, 22 Höeg (T) Lynge l.c.; between Dammen and Eidspjeld, on the twigs of *Fagus*. 1918, 21 Höeg (v. *fagofila*) (O, T) Mot. l.c.; Eidspjeld, on *Fagus*. 1921 Höeg (T); N.E. of Hallingsdalen, on *Alnus*. 1921 Höeg (v. *floridula*) (T); Åklungen, the road to Steindal, on *Betula*. 1919 Höeg (v. *fagofila*) (O) Lynge l.c., Mot. l.c.; Dammen, on *Fagus*. 1925 Höeg (T). — Holmestrand: on *Tilia*. 1839 M. N. Blytt (O) Lynge l.c.

Telemark. Eidanger: Nedre Kokkersvoll. Norman (B) Mot. l.c. — Solum: Holtankollen. 1899 Hoch (v. *fagofila*) (B, O) Lynge l.c., Mot. l.c.

Denmark.

Jylland. Dollerup: Bækkelund. 1883 C. A. Gad (K as *U. barbata*); Hald Egeskov. 1866 C. A. Feilberg (K); ibm. 1887 W. Taussing (K, L) Branth & Rostrup 1869 p. 157 (as *U. barbata*). — [Tem: Silkeborg Vesterskov, on *Betula*, c. fr. Fr. J. Mathiesen. Mathiesen 1922 p. 460. »Specimens somewhat sorediate» (transl. fr. Dan.). Probably *U. comosa*.] — Sine loco. »Hanherred». C. M. Poulsen (K as *U. barbata*) Branth & Rostrup l.c.

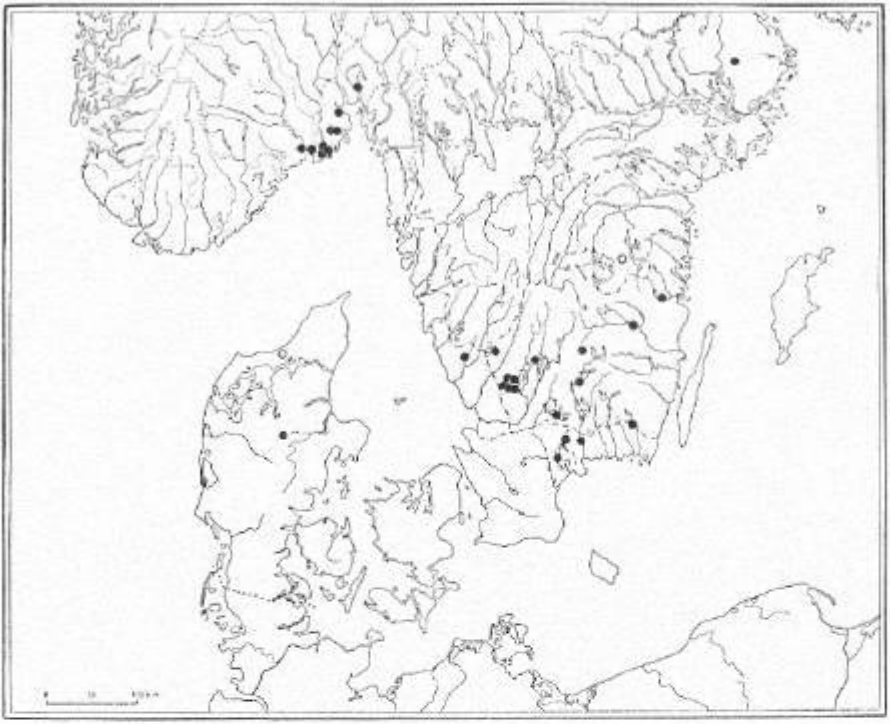


Fig. 16. *Usnea florida* in Scandinavia. Open circles = stations not exactly indicated.

The present Scandinavian area is probably only fragments of an earlier distribution over the whole beech district. It was apparently a common species in the beginning of the 19th century (»apoth. maximis s. forma typica copiosa in fagetis« sec. E. FRIES 1835), but the degeneration of the epiphytic flora of the beech forests under the influence of human activity (increasing habitation and rational forestry) has made it rare, especially in Skåne, the Danish Islands, and S. Jylland (cf. *Thelotrema lepadinum*). Its chief distribution is now concentrated in the heath beech forests in Jylland (not collected in the present century), S.W. Småland, and the Larvik district in Norway. Its lack in the rather well-investigated provinces Bohuslän, Dalsland, and Västergötland is remarkable. The newly detected station near Upsala is an interesting northern extension of its Swedish range.

Extra-Scandinavian Distribution. — *U. florida* has a wide area in Central, Western, and Southern Europe. Many earlier statements in the

literature are not reliable, as they include several other species. MOTYKA (l.c.) examined the collections preserved in the leading European herbaria and enumerated a considerable number of stations. For detailed information I refer to his monograph.

In Germany there are very few stations known from the lowland, its chief area being restricted to the mountain districts in the South (Silesia, the Harz, Thuringia, Baden, and Bavaria). Several stations are recorded from Switzerland, Czecho-Slovakia, Austria, and Hungary. Its disappearence from the forests is obvious also in Central Europe. (»Wuchs früher an Waldbäumen hier und da, ist aber gegenwärtig nur noch selten zu finden», sec. ANDERS 1935.) It seems to be common in most parts of France, as MOTYKA listed a considerable number of stations. In the British Isles A. L. SMITH (1918) stated it to be »general and not uncommon in Great Britain, but more frequent and fruiting more freely in the Southern tracts, rare in the Channel Islands». No locality is cited from Ireland.

Its South-European distribution is probably rather restricted. In Portugal it is »widely spread at least North of River Tejo» (TAVARES in litt.). MOTYKA also recorded it from Spain. It is stated from some few localities in N. Italy. In the Balkans MOTYKA enumerated several stations in Yugo-Slavia and Rumania. The only records from E. Europe are from S. Poland (MOTYKA).

Outside Europe it is found in small areas in Asia (Asia minor, Caucasia and Transcaucasia) and Eastern N. America.

Tab. XII. Usnea florida - communities.

On small branches of *Fagus*. — 1—4. **Sm.** Växjö: Biskopsnäset. — 5—8. Kärda: Åminne.

	1	2	3	4	5	6	7	8
Alectoria jubata	—	—	+	—	+	—	—	—
Cetraria chlorophylla	—	—	—	—	—	—	+	—
— glauca	+	—	+	—	+	—	+	+
Evernia prunastri	—	+	—	—	+	+	+	—
Lecanora subfusca (coll.)	+	+	+	+	—	+	+	+
Parmelia furfuracea	—	—	—	+	—	+	—	+
— physodes	+	+	+	+	+	+	+	+
— subaurifera	+	+	+	+	+	+	+	—
— sulcata	+	+	+	+	+	+	+	+
— tubulosa	+	—	—	+	—	+	—	+
Pertusaria amara	+	—	—	—	—	+	+	+
Phlyctis argena	—	+	—	+	—	+	—	—
Usnea comosa	+	+	+	—	+	—	+	+
— florida	+	+	+	+	+	+	+	+
Coccoid Chlorophyceae	—	—	—	—	—	—	—	+

Habitat Ecology. — *Betula* and *Fagus* seem to be the commonest substratum of *U. florida* in our districts. Occasionally it has also been collected on *Acer, Alnus, Quercus, Tilia,* and *Picea*. When growing on *Fagus* it is often met with on small branches in the crowns of the trees.

On the two localities where I have studied its ecology, it grew in this manner as a component of a rather photophilous community with *Cetraria glauca*, *Evernia prunastri*, and several *Parmeliae* (cf. tab. XII).

5 pH samples from the Växjö station gave values between 5.2 and 5.5, mean 5.3.

Affinity and Variation. — *U. florida* is a well defined species, differing from *U. comosa*, with which it has often been confused, by its erect habit, its greyish green (not yellowish) colour, its densely fibrillose branches covered with scabrid papils (never sorediate), and its always developed large apothecia, often covered with radiate cilia in the margin.

MOTYKA divided our species into several subspecies, of which ssp. *euflorida* (the main type), ssp. *floridula*, and ssp. *fagofila* were recorded from N. Europe. There are only minor differences between the two last-mentioned types and the main type, and as they are not separated as to their distributional areas they should not be regarded as subspecies (cf. DU RIETZ 1930 p. 334). In my opinion, they are better treated as varieties. Var. *floridula* (Mot.) n. c. has a rather striking habit with irregularly branched thallus and also the apothecia margined with cilia of very varying length and thickness. Var. *fagofila* (Mot.) n. c. has a more greenish colour and thicker, not distinctly papillate branches.

D. The *Parmelia laciniatula* Group.

13. *Arthonia impolita* (Ehrh.) Borr.

Syn. *A. pruinosa* Ach. — Cf. further ZAHLBRUCKNER Cat. Lich. II (1924) p. 54, S. ALMQUIST Monogr. Arth. Scand. (1880) p. 22, and REDINGER in RABENHORST's Kryptogamen-Flora IX. 2:1 (1937) p. 91.

History. — This species was described (as *Lichen impolitus*) from Germany by FR. EHRHART in 1793. It was recorded from Sweden by ACHARIUS in 1798 (»in rupibus et saxis») but later (1803) he referred this statement to *Parmelia glaucoma* (=*Lecanora rupicola*). In 1808 ACHARIUS gave the first correct Swedish record of our species (»on the bark of old oaks, probably rare», transl. fr. Swed.). The oldest Swedish specimen with an exact locality is from Reften near Lund (leg. E. Fries, year not stated). Several not trustworthy records have been published (cf. below). At present I know 33 Swedish stations verified by specimens in the herbaria.

Our species was published from Denmark in 1829 as *Parmelia impolita* in Flora Danica, vol. XI, tab. 1950 with the note »In cortice *Quercus* leg. J. Vahl». Hornemann (1836 p. 545) stated it to grow »on the trunks of deciduous trees, especially on oaks». Branth & Rostrup (1869) gave a somewhat more precise statement: »Probably rather frequent, but found here and there in S. Sjælland and Fyn». (Both transl. fr. Dan.). The following list contains 25 Danish stations, only some few of them previously recorded in the literature.

There are no records from Norway and Finland.

Scandinavian distribution (substratum *Quercus* unless otherwise stated).

Sweden.

Skåne. »In omnibus Scaniae quercetis». E. Fries 1831 p. 184. — »Ad quercus vetustas etc. copiose». E. Fries 1835 p. 268. — Allerum: Kristinelund. 1903 Alvthin (Dz, L, S, all as *Lecanactis amylacea*). — Bara: Torup. 1946! (L, S). — Benestad: Örup, near the castle. 1942 Deg. (Ds, U). — Bjäresjö: Bergsjöholm. 1945! (L, S). — Bosjökloster: near the youth hostel and in the mansion park. 1947! (D, L). — Brunnby: Haga (near Arild), on *Quercus* and *Ulmus*. 1911 Er. Erichsen 1913 pp. 28, 41. — Börringe: W. of Börringekloster. 1943 Deg. (Ds, L, S, U). — Fjälkestad: Nils Jeppstorp. 1944! (L, S, U). — Genarp: Häckeberga. 1945! (L, O, S). — Hörby (?): between H. and Fulltofta. Malme (S) Malme 1895 p. 143. — Kinby: Plageboda, at the road-side. 1943 Deg. (Ds, L, S, U); ibm. 1947! (L). — Kropp: Rosendal, on old *Ulmus*. 1943! (L). — S. Sandby: Refsen. E. Fries (U) S. Almquist 1880 p. 23. — Ö. Sönnarslöv: Maltesholm. 1939 Deg. (Ds); ibm. 1944, 47! (L, S, U). — Sövestad: Krageholm. 1890 Berg (L as *Lec. amylacea*); ibm. 1943! (L, S). — Torekov: Hallands Väderö. 1884 Hellb. (G, H, L, M, S, U; mostly as *Lec. amylacea*). Hellbom 1887 pp. 18, 68; ibm. 1893 Alvthin (G, L, U as *Lec. amylacea*); ibm. Vrang Rediger 1937 p. 94; ibm. 1944! (L). — Tosterup: Tosterupsskogen. 1945! (L, S). — N. Vram: Vrams Gunnarstorp. 1946! (L, S). — Österslöv: Ekestad. 1916 Vrang (S). — Sine loco. E. Fries exs. 202.

Blekinge. Ellehom. 1871 Hult. (G, L as *Lec. amylacea*) Hulting 1872 p. 21. — Förkärla: Tromtö. 1946! (L, O, S). — Karlskrona: Vämö. 1873, 74 Falk (Ka, L, S as *Lec. amylacea*); ibm. 1872—78. Svanlund (B, Ds, Dz, H, L, S, U as *Lec. amylacea*). — Listerby. 1873 Falk (Ka as *Lec. amylacea*). — Mjällby: Hanö. 1871 Hult. (U) Hulting l.c. — Nättraby: Skärva. 1947! (L). — Ronneby: Fornanäs. 1946! (L). — Sölvesborg: Valje. 1931 Sthm (G, M, O). — Ysane: Sunnansund, at the roadside. 1916! (L).

Öland. »Grows on oak in two forms» (transl. fr. Swed.). Floderus 1854 p. 169 [i.e. including also *Lepraria decolorans* (= *Arthonia d.*), cf. below]. — [Böda. 1853 Flod. and W. Stenhammar. Floderus l.c., Chr. Stenhammar 1858 p. 122. No specimen seen.] — Högby. 1853 Flod. and W. Sthr (S, U) S. Almquist l.c. — Högsrum: Ekerum. 1853 Flod. and W. Sthr (U) S. Almquist l.c. — [Ås: Ottenby.

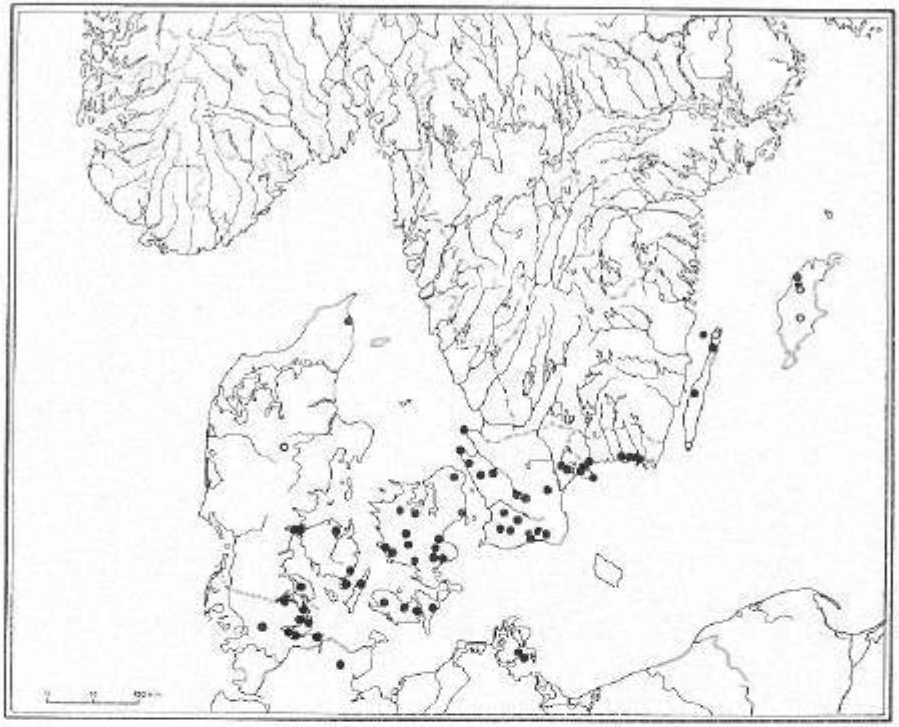


Fig. 17. *Arthonia impolita* in Scandinavia. Open circles = dubious records within the Scandinavian area (not verified by specimens).

1853 Flod. and W. Sthr. FLODERUS l.c., CHR. STENHAMMAR l.c. No specimen seen.] — S i n e l o c o. Flod. (L, U), W. Sthr (S).

Gotland. [Etelhem. 1855 Sthr. — Lokrume: Grausne (»Grunsne»). 1855 Sthr S. ALMQUIST l.c. No specimens seen.] — L u m m e l u n d a: between Kams and L. 1855 Sthr. STENHAMMAR l.c.; Kams. 1857 Sthr (S); ibm. 1857 Blomb. (L). — M a r t e b o. 1855 Sthr (S) STENHAMMAR l.c. — S i n e l o c o: »Ad corticem *Quercus* in Gottlandia». STHR exs. 147.

Småland. M i s t e r h u l t: Jungfrun. Southern oak forest. 1914 DR. (Dz).

[Östergötland. Häradshammar: Yxnö. Sthr. HULTING 1925 p. 13. A specimen in S is *Lepraria decolorans;* cf. S. ALMQUIST 1880 p. 24.]

[Dalsland. Skållerud: Håverud. A. G. Kellgren. HULTING 1900 p. 79. No specimen seen; *L. decolorans*?]

[Närke. Götlunda: Hamrarna. 1867 Alb. Blomberg (B, G, L, N, O, U) HELLBOM 1871 p. 111. Refers to *A. byssacea* (cf. BLOMBERG 1895 p. 105).]

Denmark.

»Here and there in S. Sjælland and Fyn» (transl. fr. Dan.). BRANTH & ROSTRUP 1869 p. 246.

Sjælland. Bjærgsted: the road to Jyderup, 1946! (L, S). — Boeslunde: Espe, Branth (S). — Brnaby: Gisselfeld, in the mansion park, 1946! (L, S). — Esbönderup: W. of Esrum, 1946! (L). — Fodby: Bösseväange (pr. Næstved), J. Jeppesen (S) REDINGER 1937 p. 95. — Grandlöse: Dragerup Skov, 1946! (L, S). — Köbenhavn (?): »Fl. Hafn.» Ex herb. Liebmann (K). — Köge, 1887 W. Taussing (S). — Skælskör, Branth (K). — Sorö: at the road to »Parnassen», 1946 (L, S). — Tureby K: near the high road, 1947! (L). — Tystrup: Tasemölle, Branth (K, L, U). — Vemmetofte: V. Vesterskov, 1946!

Falster. Sr Alslev: the road to Corselitze, 1946! (L).

Lolland. Halsted: Juellinge Dyrehave, 1871 Rostrup (K). — Hunseby: Knuthenborg, in the mansion park, 1946! — Toreby: Fuglsang Storskov, 1943 Chr. (K). — Sine loco, E. Rostrup. LANGE & MORTENSEN 1877—79 p. 176.

Langeland. Tranekær: the road to Ansö, 1946! (L, S). — Sine loco, Rostrup. LANGE & MORTENSEN.

Fyn. Bregninge (in Taasinge): Troense, 1889 J. Jeppesen (K). — Middelfart: Fænö, Rostrup. S. ALMQUIST 1880 p. 23; Hinsgavl, 1872 Rostrup (K) S. ALMQUIST l.c.; between H. and the town, 1917! (L). — Norup: Hofmansgave, Ex herb. Liebmann (K). — Sine loco, Rostrup. LANGE & MORTENSEN l.c.

Als. Augustenborg: the mansion park, Er. ERICHSEN 1928 p. 78.

Jylland. »N. Jylland», Branth. LANGE & MORTENSEN l.c. — Elling: Lerbæk Skov (pr. Frederikshavn), 1875 Branth (K). — [Vium: Marsvinslund, Branth. BRANTH 1867 p. 87: »A form probably belonging to this species» (transl. fr. Dan.). No specimen seen.]

Considering the Swedish area of *A. impolita*, one might suggest a south-eastern type of distribution. This is contradicted, however, by the fact that it has its chief extra-Scandinavian distribution in Central and Western Europe. We might have expected it in the Swedish West coast districts, in S. Norway, and at more stations in N. Jylland, as suitable localities (old oaks) are not quite lacking in these tracts.

Extra-Scandinavian Distribution. — The species is rather common at lower levels in the central and western parts of Europe.

It is found in the whole of Germany, but it is especially common in Schleswig-Holstein and Oldenburg (REDINGER l.c., SANDSTEDE 1912, ERICHSEN 1928). In the higher parts of S. Germany it is less frequent. Sec. KREMPELHUBER (1861) it is unknown from Bavaria, but it has been collected at several places in Baden, ascending to c. 350 m (LETTAU 1941). According to REDINGER it is lacking in Austria and Switzerland. It is unknown from the present Hungary; the 3 stations recorded by SZAFALA (1930) are situated in Czecho-Slovakia.

In Holland it is known from several stations (sec. herb. Leyden) and it is also recorded from Belgium (DE WILDEMAN & DURAND 1898). In W. France it is »commun sur les écorces rugueuses et particulièrement sur les vieux chênes» (OLIVIER 1897). It is less frequent in E. France; from Lorraine (HARMAND 1895—99) and Franche-Comté (FLAGEY 1883) it is reported as »rare». In the British Isles,

it is »frequent in England, recorded also from Wales and Ireland» (A. L. SMITH 1926). In Ireland it occurs »on old oaks, ivy, elm, yew and lime» (KNOWLES 1929).

Its distribution in S. Europe is less exactly known. In Portugal there are »very few localities, but probably it is no rare species» (TAVARES in litt.). From Italy JATTA (1909—11) recorded it as »ad truncos varios totam per Italiam frequens et in insulis», probably a rather exaggerated statement considering the few stations available in the literature and in the herbaria. From the Balkans it is recorded from Bulgaria (»supra saxa eruptiva . . . supra Backovo», sec. SZATALA 1930 b) and Corfu in Greece (sec. REDINGER l.c.).

I know only one record from E. Europe, viz. Ukraine: »in wooded districts» (translated from Russian), sec. OXNER 1937.

A station from Morocco is recorded by WERNER 1936.

In the United States of N. America it is known from Washington and California on the Pacific coast (FINK 1935).

A statement from New Zealand (HOOKER 1867) deserves a renewed investigation.

Habitat Ecology. — The substratum of *A. impolita* is very uniform in our districts: the rough bark of old oaks (only exceptionally recorded from elms). In Scandinavia it was never recorded as lignicolous or saxicolous, as stated from Germany (SANDSTEDE, ERICHSEN ll.cc.).

It prefers the shadowy sides of the trunks. It cannot compete with photophilous macrolichens, as *Evernia prunastri*, *Ramalina farinacea*, *Parmelia sulcata*, and *Pertusaria* species, generally dominating the southern sides of the oak trunks. Under favourable conditions it has a considerable power of competition, and can often cover large parts of not too illuminated oak trunks, where a special union, *Arthonietum impolitae*, can be distinguished, subordinate to the federation *Leprarion*, which contains several photophobous communities on rough bark. For the delimitation of these units, cf. under *Lecanactis amylacea*.

A. impolita is mainly accompanied by photophobous species as *Chaenotheca trichialis*, *Lecanactis amylacea*, *Lepraria*e, coccoid green algae, and by the oak epiphytes *Ramalina obtusata* and *pollinaria*. Though often growing near roads, its societies seem to be little influenced by coniophilous lichens. Analysis no. XIII: 7 derives from an oak at the roadside, somewhat more illuminated and more impregnated by dust than is usual in *Arthonietum impolitae*. The occurrence of some photophilous species (*Evernia prunastri*, *Ramalina farinacea* and *fraxinea*) and coniophilous species (*Buellia punctiformis*, the two *Ramalina* species, and *Xanthoria polycarpa*) is noticeable.

Measurements of pH in *Arthonietum impolitae* (30 analyses from 5 stations, viz. Sk. Bosjökloster, Häckeberga, and Maltesholm; Bl. Ysane, and Sj. Tureby) have given values between 3.7 and 5.0, mean value 4.4. The values

correspond with those communicated by Du Rietz (1945 p. 148) for oak trunks with no or small impregnation with dust. The Ysane station mentioned above showed pH = 5.0, which is a high value for the normally very acid oak bark.

Tab. XIII. Arthonia impolita - communities.

On the trunks of old *Quercus*. — 1. **Sk.** Genarp: Häckeberga, E. exposure. — 2. Bara: Torup, N. E. exp. — 3—4. Bosjökloster, both N. exp. — 5. Ö. Sönnarslöv: Maltesholm, N. exp. — 6. Kiaby: Plageboda, N. exp. — 7. **Bl.** Ysane: Sunnansund, at the roadside, E. exp. — 8. Förkärla: Tromtö, E. exp. — 9. **Sj.** Esbönderup: Esrum, E. exp. — 10. Bjærgsted, N. exp.

	1	2	3	4	5	6	7	8	9	10
Arthonia impolita	**4**	**5**	**5**	**4**	**5**	**4**	**4**	**5**	**2**	**4**
Buellia punctiformis	—	—	—	—	—	—	1	—	—	—
Calicium viride	—	—	1	—	—	—	—	—	—	—
Caloplaca phlogina	—	2	—	—	—	—	—	1	—	—
Chaenotheca trichialis	1	2	—	1	—	—	—	1	—	—
Evernia prunastri	—	—	—	—	—	—	1	—	—	—
Haematomma coccineum	—	—	—	—	1	—	—	—	—	—
— leiphaemum	—	—	—	—	1	—	—	—	1	2
Lecanactis amylacea	2	—	—	2	—	1	—	3	1	—
Lecanora expallens	—	—	—	—	—	—	—	—	1	—
Lepraria aeruginosa	**2**	**2**	**3**	**3**	1	1	1	**2**	**2**	**4**
— candelaris	1	—	**4**	**4**	—	—	1	—	**3**	**1**
— decolorans	1	—	—	**3**	2	**4**	**3**	—	**3**	1
Parmelia furfuracea	—	—	—	—	—	—	—	—	—	1
Pertusaria amara	—	—	—	—	—	—	2	—	—	—
Phlyctis argena	—	—	1	—	—	—	—	—	—	1
Ramalina farinacea	—	—	—	—	—	—	**3**	—	—	—
— fraxinea	—	—	—	—	—	1	1	—	—	—
— obtusata	—	—	1	—	**2**	**4**	2	—	—	1
— pollinaria	—	—	—	—	—	—	2	1	1	—
Xanthoria polycarpa	—	—	—	—	1	—	1	—	—	—
Coccoid Chlorophyceae	+	+	+	+	+	+	—	+	+	+
Hypnum cupressiforme	—	—	—	—	—	—	1	—	—	—

Affinity and Variation. — *A. impolita* is, on the whole, a uniform species. Specimens with somewhat more »pulverulent» thallus have been called f. *argillacea* (Malbr.) Zahlbr., a modification probably due to impregnation with dust on somewhat eutrophiated bark. It is occasionally met with also in Scandinavia. Quite a different species is the lichen known by most lichenologists of the last decennium as *Arthonia decolorans* (Turn. & Borr.) Erichs. This characteristic sorediate crusta only known in a sterile state has of old been considered as belonging to *A. impolita* (cf. E. Fries 1831, Floderus 1854). Recently also Redinger (l.c.) treated it as *A. impolita* var. *decolorans*. As pointed out by S. Almquist (1880), Erichsen (1940 b), and Magnusson (1942), it has

nothing to do with *A. impolita*, though they are often met with on the same substratum. I never saw any »Übergänge zur sorediösen Form» as recorded by REDINGER, though I have had many opportunities of studying the two species together. REDINGER (1937) and ERICHSEN (1940) stated that *A. decolorans* gives a red reaction with KOH + $CaCl_2O_2$ a fact which might suggest a certain affinity with *A. impolita*. S. ALMQUIST (1880), LETTAU (1941), and MAGNUSSON (1942) found no reaction, and the large amount of material which I have investigated, is also KC—. As this lichen has never been found with apothecia, there is no real reason for referring it to the genus *Arthonia*. We had better treat it as *Lepraria decolorans* (Turn. & Borr.) n.c. together with several other always-sterile lichens. At least in South Scandinavia, it is probably no rare lichen, especially in the crevices of the bark of old oaks, though overlooked owing to its resemblance to other sterile crustaceous lichens.

As to the confusion between *A. impolita* and *Lecanactis amylacea*, cf. under the latter species.

14. *Arthothelium ruanideum* (Nyl.) Arn.

Syn. *Arthonia ruanidea* Nyl. — Cf. further ZAHLBRUCKNER Cat. Lich. II (1924) p. 132, VIII (1932) p. 183, and REDINGER in RABENHORST's Kryptogamen-Flora IX. 2:1 (1937) p. 162.

History. — This species was named as *Arthonia ruanidea* by NYLANDER (ap. STIZENBERGER 1882) from Switzerland and described by WILLEY (1890). It was referred to *Arthothelium* by ARNOLD (ap. RABENHORST 1891) owing to its muriform spores, the real *Arthoniae* having spores with only transversal septa. The species remained unknown from S w e d e n till 1934, when MALME published it from Dalby in Skåne. At present I know 16 Swedish stations. The species was reported, under the name of *Mycoporum anastomosans*, from D e n m a r k in 1869 by BRANTH & ROSTRUP. The present list contains 24 Danish stations. The first station from N o r w a y is published below.

Scandinavian Distribution (substratum *Fraxinus* unless otherwise stated).

S w e d e n.

Skåne. B a r a: Bokskogen, near the restaurant, 1946! (L). — B e n e s t a d: Örup, the elm wood, 1945! (L). — B o s j ö k l o s t e r: Kulleberga, abundant, 1946! (B, L, O, S, U, MAGN. exs.). — D a l b y: D. Söderskog, 1934 Me (S) MALME 1934 p. 8. REDINGER l.c.; ibm, abundant, 1936, 43! (A, H, L, S, U); ibm. 1937, 43 Deg. (Ds, S). —

Fågeltofta: Kronovall. 1945! (L, S). — Hardeberga: Fågelsång. 1943, 46! (L, S, U). — Kågeröd: swamp just E. of Knutstorp. 1946! (L, O, S). — Ottarp: Bälteberga, near the brook. 1938, 46 (L). — Svalöv: Axelvold. 1946! (L). — Ö. Sönnarslöv: Mattesholm, on *Fagus*. 1944! (L). — Sövestad: S.W. end of Lake Krageholmssjön. 1945! (L); island of Lybäck. 1945! (L). — Tosterup: Tosterupsskogen. 1945! (L). — N. Vram: Vrams Gunnarstorp. 1946! (L, S, U).

Blekinge. Augerum: Hässlegården, on *Fagus*. 1945! (L).

Västergötland. Partille: Bokedalen, on *Fagus*. 1945 Magn. and! (L, M, S).

Norway.

Vestfold. Larvik: the beechwood N. of L., rather abundant on *Fagus*. 1947! (L, O, S).

Denmark.

Sjælland. Haslev: Orneden, on *Fagus*. Branth (K, det. W. Nylander as *Mycoporum anastomosans*) Branth and Rostrup 1869 p. 249. — Herlufsholm (pr. Næstved): S. of the mansion. 1947! (L). — Jyderup: near the bathing-place. 1946! (L). — S:t Jörgensbjærg: Boserup Skov. 1946! (L). — Kalvehave: Stensby Skov, on *Acer*. 1946! (L). — Lidemark: Taageröd Skov, on *Corylus* and *Fraxinus*. 1947 Chr. and! (K, L, S, U). — Lilleröd: Tokkeköb Hegn, on *Fagus*. 1919 Er. (in litt.). — Skamstrup: Vinskov, Skelsbakken, on *Carpinus*. 1946! (L, S). — Valsölille: Vesterskov. 1946! (L).

Lolland. Radsted: Holmeskov, on *Fagus*. 1946! (L, S). — Vesterborg: Rosningen. 1946! (L, S).

Langeland. Hov K.: Lohals, S. of the village. 1946! (L).

Fyn. Middelfart: Hinsgavl. 1946! (L). — Tröstrup Korup: near »Kom-igen-Kroen» (the *Graphis elegans* station), on *Fagus*. 1946! (L).

Als. Notmark: near Helleved. 1946! (L, S). — Ulkeböl (pr. Sönderborg): Sönderskov. 1946! (L).

Jylland. Agri: near Strandkær. 1943 Chr. (K, L) Christiansen 1946 p. 75. — Bov: Frösley. W. Saxen (in litt.). — Gaversland (pr. Vejle): Munkebjærg. 1946! (L). — Haderslev: Hadersley Dam, on *Alnus*. 1947 Chr. (K). — Holböl: Hönsnap Skov. 1946! (L); ibm. W. Saxen (in litt.). — Stovby: Stovby Skov. 1946! (L). — Nr Vilstrup: Kelstrup. 1919 Er. (in litt.). — Volstrup (pr. Sæby): Sæbygaard Skov. 1947! (K, L, S).

The species is not uncommon in suitable localities in the S.W. half of Skåne, the Danish Islands, and S.E. Jylland. In the isolated localities in Blekinge and near Göteborg it was scarce and poorly developed, apparently living under unfavourable climatic conditions.

Extra-Scandinavian Distribution. — In its present delimitation (cf. below) our species seems to be restricted to Central Europe, where it is recorded by Rehinger l.c. as »im ganzen Gebiet zerstreut und stellenweise recht häufig».

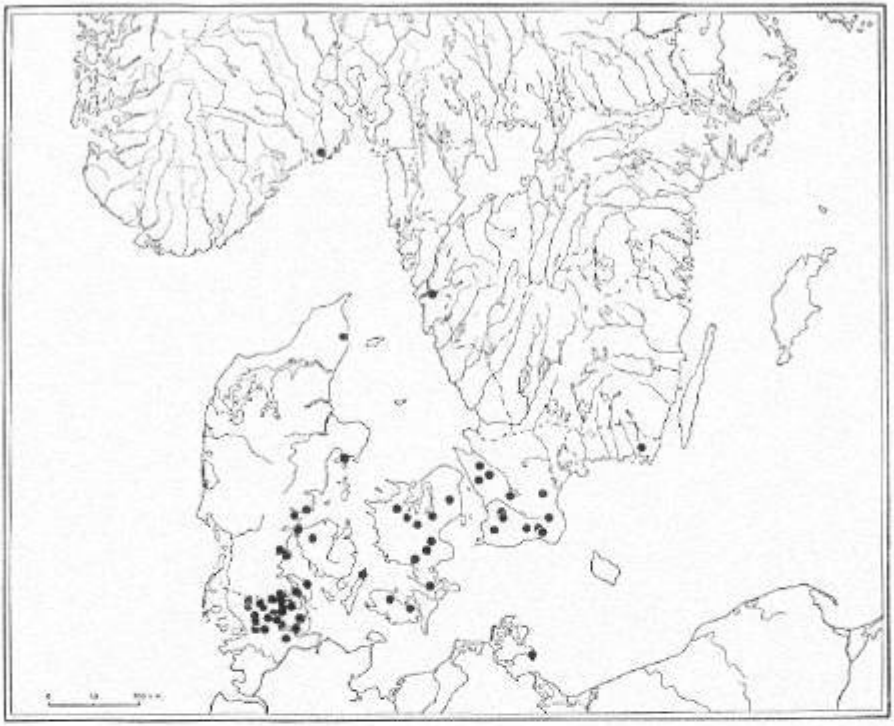


Fig. 18. *Arthothelium ruanideum* in Scandinavia.

REDINGER (l.c.) and LETTAU (1941) enumerated localities from several parts of Germany (Schleswig-Holstein, Rügen, Oldenburg, Thuringia, Wurtemberg, Baden, Bavaria). It prefers young stems of *Fraxinus*, but is also frequently met with on other deciduous trees with smooth bark (also on young *Abies*, sec. LETTAU). The same authors recorded it from Switzerland, Austria (reaching 750 m. above sea level, sec. LETTAU), and Czecho-Slovakia (cf. also SZATALA 1930). The easternmost European localities are situated in the former German East Prussia (leg. LETTAU). There are no records from Western and Southern Europe.

A statement from N. America (»Labrador or Newfoundland», sec. MACOUN 1902) needs confirmation. Probably the species is endemic in Europe.

Habitat Ecology. — In our districts *A. ruanideum* is preferably to be found on the trunks of young *Fraxinus*, sometimes also on *Fagus*, rarely on other deciduous trees with smooth bark. It is a strictly photophobous and hygrophilous species, as a rule growing near the bases of shadowy trunks in a dense vegetation (though by no means restricted to northern sides of the trees; cf. tab. XIV).

Tab. XIV. Arthothelium ruanideum - communities.

1—9 and 13—15 on the trunks of young *Fraxinus*, 10 and 12 on young *Fagus*, 11 on a young *Acer*. — 1 **Sk.** Ottarp: Bälteberga, S. exposure. — 2. Bosjökloster: Kulleberga, W. exp. — 3. Ibm, N. exp. — 4. Ibm, E. exp. — 5. Hardeberga: Fägelsång, N. exp. — 6—8. Dalby: D. Söderskog, all W. exp. — 9. N. Vram: Vrams Gunnarstorp, S. exp. — 10. **Vestl.** Larvik, E. exp. — 11. **Sj.** Kalvehave: Stensby Skov, N. exp. — 12 **Fyn.** Tröstrup Korup, S. exp. — 13. **Als.** Notmark: Helleved, W. exp. — 14. Ulkeböl: Sönderskov, E. exp. — 15. **Jl.** Volstrup: Sæbygaard Skov, S. exp.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Arthonia cinnabarina	1	—	—	—	—	—	—	1	—	—	—	—	—	—	—
— radiata	—	—	1	—	—	—	—	—	—	—	—	—	—	—	1
— spadicea	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—
Arthopyrenia biformis	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2
Arthothelium ruanideum ..	**3**	**2**	**3**	**4**	**3**	**4**	**3**	**3**	**4**	**3**	**3**	**3**	**3**	**3**	**3**
Graphis scripta	2	1	1	**3**	**3**	1	2	**4**	**4**	2	1	**3**	—	1	1
Lecanora subfusca (coll.)..	1	—	—	—	—	—	—	1	—	—	**3**	2	1	2	—
Lecidea olivacea	1	1	1	—	—	—	—	—	—	—	1	—	—	1	1
Lepraria aeruginosa	—	—	—	—	—	—	—	1	1	—	—	1	—	—	—
Opegrapha atra	—	1	2	2	2	—	1	**2**	—	—	2	—	1	2	**3**
— fuscella	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—
— herpetica	**3**	**4**	**3**	—	**4**	1	**4**	**4**	—	—	**3**	—	—	—	**4**
— viridis	—	—	1	—	—	—	—	—	1	—	1	—	—	1	—
Pertusaria leioplaca	—	—	—	1	1	—	—	—	—	1	—	—	—	**3**	**4**
— pertusa	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—
Phlyctis agelaea	—	1	—	1	—	—	2	—	—	—	—	—	—	—	—
— argena	**3**	1	**3**	—	2	1	2	—	—	3	—	1	2	—	—
Porina carpinea	—	**1**	—	**3**	—	—	—	—	—	**3**	—	—	—	**3**	—
Pyrenula nitida	—	—	—	—	—	—	—	—	—	**3**	—	—	—	—	—
— — var. nitidella	—	—	—	—	—	1	1	1	—	—	—	—	—	—	—
Dichaena faginea	—	—	—	—	—	—	—	—	—	**3**	—	1	—	—	—
Coccoid Chlorophyceae ..	—	—	+	+	+	+	—	—	+	—	+	+	+	+	—
Hypnum cupressiforme ...	3	—	—	—	1	1	—	1	1	1	—	—	—	—	—
Neckera complanata	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
Orthotrichum octoblephare	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—
Frullania dilatata	—	—	—	—	—	—	—	—	—	1	—	—	—	—	1
Radula complanata	—	—	1	—	—	1	—	1	—	1	—	—	—	—	1

It is a member of *Opegraphetum herpeticae*, a photophobous and coniophobous union characteristic of the bark of young ashtrees (cf. further under *Opegrapha atra* and *Arthonia cinnabarina*). Among its components *Graphis scripta*, *Opegrapha atra* and *herpetica*, *Phlyctis argena*, and green algae play prominent parts. *Lepraria aeruginosa* being a rare species for the same reason as stated under *Opegrapha atra*. *Arthonia radiata*, *Lecanora subfusca*, *Lecidea olivacea*, *Pertusaria leioplaca*, and *Phlyctis agelaea*, which otherwise are characteristic of the epiphytic vegetation of young ashtrees (usually in a not too shadowy

exposition, higher on the trunks) are rarely represented in *A. ruanideum* societies.

Measurements of pH from communities with *A. ruanideum* (20 samples, each 10 from Sk. Dalby and Bosjökloster) gave values between 5.2 and 5.6, mean 5.4 (Dalby) and between 5.5 and 5.8, mean 5.7 (Bosjökloster). They agree with the values previously stated for *Opegraphetum herpeticae* (cf. under O. *atra*).

Affinity and Variation. — The differences between *A. ruanideum* and the related species *A. dispersum* (DC.) Mudd [including also *A. anastomosans* (Ach.) Arn., *A. ruanum* (Mass.) Zw., and *A. Beltraminianum* (Anzi) Mass.] which is distributed in Central, Western, and Southern Europe are not quite clear. The latter species differs chiefly in some macroscopical characters: greyish-white thallus and smaller, more innate apothecia. In an earlier work ERICHSEN (1916 p. 73) united the two species, a view which may prove to be correct. The Scandinavian material contains no typical specimens of the *dispersum* type. »*Mycoporum anastomosans*» from Haslev in Denmark (cf. above) is, according to the scanty herbarium material, referable to *A. ruanideum*.

The Scandinavian population has a comparatively small variation. Of the two variations recorded by REDINGER (l.c.), f. *ulcerosum* Erichs. with the central parts of the apothecia dropping off and leaving naked spots in the substratum is not uncommon in old specimens also in our district. It is a mere age state with no taxonomic value. Var. *olivaceum* Erichs. refers to forms with a rather dark olive brown thallus. A good deal of the Scandinavian material belongs to this type, which, in my opinion, is hardly worth a name.

15. *Catinaria Laureri* (Hepp) Degel.

Syn. *Catillaria Laureri* Hepp — *Catillaria intermixta* (Nyl.) Arn. — Cf. further ZAHLBRUCKNER Cat. Lich. IV (1927) p. 47, VIII (1932) p. 390, TH. FRIES Lich. Scand. II (1874) p. 582, and GALLÖE Nat. Hist. of Danish Lichens II (1929) p. 40, plates 47—50.

History. — This lichen was known by ACHARIUS and E. FRIES though considered as belonging to »*Lecidea parasema*», a collective name including among others the species now known as *Lecidea euphorea* and *Buellia disciformis*. It was distributed in 1826 by E. FRIES in Lich. Suec. exs. 216 D (as *L. parasema* var. *convexa*) with the remark »In variis arboribus, optima in *Fago*. Cel. Achario distincta

visa est». When in the middle of the past century sporal characters began to be used for the delimitation of genera and species of lichens, it was possible to define it better. W. NYLANDER (1861) described a *Lecidea intermixta*, differing from the two species mentioned above in having uniseptate, hyaline spores. It was stated to grow »ad corticem fagi in Scania, ex hb. Acharii (sub varietatibus '*parasemae*' (immixta)». TH. FRIES (1874) showed that NYLANDER had previously (1855) used the name *L. intermixta* for a different lichen from Chile, and therefore he recorded the present species under the younger name *Catillaria Laureri* Hepp in ARNOLD exs. 353 (1867). Later VAINIO (1934) clearly emphasized that the original Nylanderian *L. intermixta* is quite another plant with a pale hypothecium, but nevertheless several recent authors still use the name »*C. intermixta*» for our species. Under the generic name *Catillaria*, TH. FRIES included most »*Lecideae*» (sensu ACHARIUS and E. FRIES) with uniseptate, hyaline spores. VAINIO (1922) removed some species (mainly *C. grossa*, syn. *C. leucoplaca*) containing *Trentepohlia*-gonidia to a new genus, *Catinaria*, while *Catillaria* s. str. was restricted to species with *Protococcus*-gonidia. DEGELIUS (1941 b) showed that *C. Laureri* has *Trentepohlia*-gonidia and must be referred to *Catinaria*.

The first exact stations from S w e d e n (Skåne, Blekinge, and Småland) were published by TH. FRIES (l.c.). As far as I know, the species has been found in 25 localities in Sweden, 10 of them previously recorded in the literature.

The first station from D e n m a r k was published by BRANTH in 1867. There are 25 stations known from Denmark, 13 of them stated in the literature.

Scandinavian Distribution (substratum *Fagus* unless othervise stated).

S w e d e n.

Skåne. B r u n n b y: Kullaberg, Kockenhus, 1890 Berg (L); ibm, S. of Käringmalen, 1939! (L). — H j ä r s å s: Skarvik, 1891 Me (S). — O p p m a n n a: Bokenäset, abundant, 1891, 1916 Me (K, L, S, T, MALME exs. 613) MALME 1895 p. 142; ibm, 1916 Vrang (G, M, S, U, Vä); ibm, 1943! (L). — R i s e b e r g a: Skäralid, 1916 Sthm (G). — S t e h a g: between Råröd and Lake Ringsjön, 1888 Berg (f. *amphileuca*) (L) BERG 1890 p. 170. — Ö. S ö n n a r s l ö v: Maltesholm, 1890 Me (S). — T o r e k o v: Hallands Väderö, Southern forest, 1884 Hellb. (G, S) HELLBOM 1887 pp. 17, 60; ibm, 1944! (L). — T o s j ö: Rösjöholm, 1895 Alythin (G, L, U). — Ö. V e m m e r l ö v: Gyllebo, 1891 Berg (L). — N. V r a m: Vrams Gunnarstorp, 1946! (L). — V. V r a m: Linderödsåsen, abundant, 1891 Me (K, L, S, U, MALME exs. 41) MALME l.c. — S i n e l o c o. Ex herb. Ach. (H) W. NYLANDER 1861 p. 194. — »Hallandsås». P. G. Theorin (U) TH. FRIES l.c.

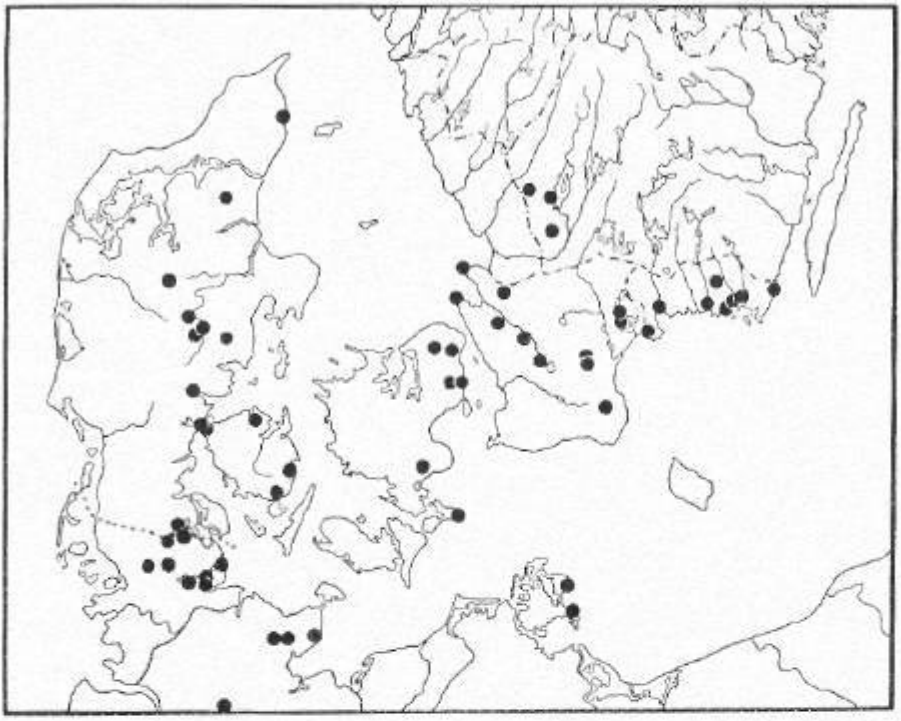


Fig. 19. *Catinaria Laureri* in Scandinavia.

Blekinge. Augerum. 1873 Falk (L, S, U) Falk 1874 p. 16. — Hjortsberga: Tolseboda, near Lake Sännen. 1937, 44! (A, L). — Kristianopel. 1873 Falk (Ka, L, S, U) Falk l.c. — Mörrum. 1876, 78 Svanlund (Ds, G, Ka, L, S, U). — Nättraby: Marielund. Svanlund (f. *amphileuca*) (U) Falk l.c.; Skärva 1943, 47! (L, O, S, U). — Ronneby: Brunnsskogen, one specimen. 1944! (L). — Sölvesborg: Valje. 1924 DR. (M, Vä); ibm. abundant. 1942, 43, 47! (A, H, K, L, O, S).

Småland. Femsjö. E. Fries (U). E. Fries 1831 p. 330 (as *Lecidea parasema* b.); Skubbhult, scarce. 1945! (L). — Odensjö. Th. Fries (U) Th. Fries l.c. — Torpa: Gashult 1943! (L, S).

Sine loco. E. Fries exs. 216 D (cf. above).

Denmark.

»Rather common in the whole country. (Branth)» (transl. fr. Dan.). Lange & Mortensen 1877—79 p. 175.

Sjælland. Asminderöd: Danstrup Hegn. 1905 Gallöe (K) Gallöe l.c. — Maarum?: Grib Skov. Branth (K); ibm. Grönlund. Mortensen 1872 p. 64; ibm, Multebjærg. 1942 Chr. (K). — Söllerød: Geels Skov. Hoffmeyer; Skodsborg. J. Lange (K) Branth & Rostrup 1869 p. 226, Mortensen l.c. — Taarbæk: Dyrehaven. Grönlund. Mortensen l.c. — Östereegede: Jomfruens Egede. Branth (K, U) Br. & R. l.c.

Mön. Magleby: Liselund, near Geddesöen, 1941 Er. ERICHSEN 1942 p. 143; Storeklint, 1946! (L, S).

Fyn. Krogshölle: Körup, Liebmann (K, U). — Middelfart: Hinsgavl, 1867 J. Lange (K) BR. & R. l.c.; Fænö, 1925 Er. ERICHSEN 1933 p. 23. — Tved: Björnemose, Rostrup, BR. & R. l.c. — Vindinge: Kajbjærg Skov, Branth (K, U) BR. & R. l.c.

Jylland. Dollerup: Haid Skov, Branth (K, L, U) BRANTH 1867 p. 83. — Gaverslund (pr. Vejle): Munkebjærg, 1939, 46! (L). — Holböl: Hönsnap Skov, 1946! (L); Rönshoved, W. Saxen (in litt.). — Rye: Rye Sönderskov, Branth (K, L) BR. & R. l.c. — Silkeborg, Branth (G). — Skanderborg, Branth (K). — Skörping: Buderupholm Skov, Branth (K). — Tem: Sönderskov (S. of Silkeborg), 1946! (L, S). — [Vejle, Branth (G). Probably identical with the following station.] — Vinding (pr. Vejle): Vinding Skov, 1867 J. Lange (K) BR. & R. l.c. — Sr Vissing: Addit Skov, 1871 Rostrup (G, K).

[Bornholm. »On deciduous trees, especially *Carpinus*» (transl. fr. Swed.). HELLBOM 1890 p. 85. — Bodilsker: Gadegaard, Hellb. HELLBOM l.c. No specimen seen. — Ibsker: Klinteby, Hellb. HELLBOM l.c. A specimen in G, belongs to *Pachyphiale cornea*.]

C. Laureri is a rather exclusive beech epiphyte in our districts. It has a pronounced southern area and has been searched for in vain in the beech occurrences in Halland, Västergötland and Östergötland as well as in Norway. It prefers the heath beech forests in N. Skåne, Blekinge, and Jylland, being a rare plant in the meadow beech forests in S. Skåne and the Danish Islands (cf. under *Thelotrema lepadinum* and *Usnea florida*).

Extra-Scandinavian Distribution. — *C. Laureri* is distributed, chiefly on *Fagus*, in the suboceanic districts of Europe (Germany, France, England, and Portugal).

In Schleswig-Holstein in Germany it is »verhältnismässig oft wenn auch keineswegs häufig und meist in geringer Menge beobachtet worden» (ERICHSEN 1940 b; several stations recorded). It is rare in Oldenburg (SANDSTEDE 1912) and Westphalia (one station see. BECKHAUS 1859). On Rügen it has been collected by several lichenologists since the middle of the past century, i.a. LAURER, SANDSTEDE, GRUMMANN. From S. Germany I know only one station, in the Black Forest (LETTAU 1944). No record is known from the Alps.

In France there are several stations recorded in the literature (by i.a. NYLANDER, MALBRANCHE, HUE, HARMAND, OLIVIER), but it is probably not common in any district. It is a rare plant in England (only 6 localities recorded by A. L. SMITH 1926).

One station is known from Portugal (SAMPAIO 1918). According to ERICHSEN (1940 b) the statements from S.E. Europe refer to *Catillaria dispersa* (Arn.) Erichs., previously regarded as a variety of *C. Laureri* (cf. below). ERICHSEN recorded *C. dispersa* from Germany (Riesengebirge), Austria (Carinthia), Yugoslavia (near Idria), and Rumania (Transsylvania).

Tab. XV. Catinaria Laureri - communities.

On the trunks of middle-aged — rather old *Fagus*. — 1. **Sk.** Oppmanna: Bokenäset, S. W. exposure. — 2. N. Vram: Vrams Gunnarstorp, E. exp. — 3. **Bl.** Sölvesborg: Valje, N. exp. — 4. Ibm, N. E. exp. — 5. Nättraby: Skärva, W. exp. — 6. Ibm, E. exp. — 7. Ronneby: Brunnsskogen, N. exp. — 8. **Sm.** Femsjö: Skubbhult, S. exp. — 9. **Mön.** Magleby: Möns Klint, W. exp. — 10. **Jl.** Holböl: Sönderhav, N. exp. — 11. Gaverslund: Munkebjærg, S. exp. — 12: Tem: Silkeborg Sönderskov, E. exp.

	1	2	3	4	5	6	7	8	9	10	11	12
Bacidia rosella	—	—	—	—	1	—	—	—	—	—	—	—
Catillaria Griffithii	—	—	—	—	—	2	1	—	—	—	—	—
Catinaria Laureri	1	1	**4**	1	**3**	1	1	1	1	1	1	2
Enterographa crassa	—	—	—	—	—	—	—	—	—	1	—	—
Evernia prunastri	**1**	—	—	—	—	1	—	1	—	1	—	—
Graphis scripta	—	—	1	—	—	—	2	—	—	—	1	—
Haematomma coccineum	—	—	—	**4**	2	1	1	—	—	—	—	—
— leiphaemum	—	2	—	—	—	—	—	—	—	—	—	—
Lecanora expallens	—	1	—	—	2	—	**1**	—	—	—	—	—
— glabrata	1	1	2	—	1	—	—	2	2	1	1	1
— intumescens	—	1	—	—	—	—	2	—	1	—	—	—
— subfusca (coll.)	1	—	1	1	—	1	**2**	1	1	1	—	1
Lecidea olivacea	—	—	—	1	—	1	—	—	—	—	1	—
— quernea	—	—	—	—	1	—	—	—	—	1	—	—
Lepraria aeruginosa	2	**4**	1	—	2	—	1	1	1	1	**2**	1
— candelaris	—	—	—	—	—	—	1	—	—	—	—	—
Opegrapha atra	—	—	—	1	—	—	—	—	—	—	—	—
— varia	—	—	—	—	—	—	1	—	—	—	—	—
— viridis	**4**	2	4	—	**3**	**3**	1	—	—	**3**	—	2
Parmelia fuliginosa var. laetevirens	**2**	—	—	1	1	—	1	—	1	1	—	—
— furfuracea	—	—	—	—	—	—	—	—	1	—	—	—
— physodes	1	—	—	—	—	—	—	—	—	1	—	—
— sulcata	—	—	—	—	—	—	1	—	—	1	—	—
Pertusaria amara	1	—	1	1	**3**	1	**2**	**3**	—	—	—	—
— coccodes	—	—	—	—	—	—	2	1	—	—	—	—
— globulifera	—	—	1	2	1	—	—	—	—	—	—	—
— — f. Henrici	—	—	—	—	—	—	—	—	—	2	—	—
— hemisphaerica	—	—	1	—	—	—	—	—	—	—	—	—
— leioplaca	—	—	—	—	—	1	1	1	—	—	—	—
— leprarioides	—	—	—	—	2	—	—	—	—	—	—	—
— lutescens	—	2	1	—	—	—	—	—	—	—	—	—
— pertusa	1	2	2	2	—	—	—	3	2	1	1	**3**
— subviridis	—	—	—	1	—	—	—	—	—	—	—	—
— Wulfenii	1	**2**	2	—	—	—	—	2	—	1	2	3
Phlyctis agelaea	—	—	—	—	—	—	1	—	—	—	—	—
— argena	3	1	**2**	1	—	2	**1**	2	—	3	—	—
Pyrenula nitida	1	—	2	**4**	**3**	1	1	**4**	**5**	2	1	1
Sphinctrina gelasinata	—	—	—	—	—	—	1	—	—	—	—	—
Dichaena faginea	—	—	—	—	—	1	—	—	—	—	—	—
Coccoid Chlorophyceae	—	+	+	—	+	—	—	—	—	+	—	+
Antitrichia curtipendula	—	—	—	—	—	—	1	—	—	—	—	—
Homalothecium sericeum	—	—	—	—	1	—	—	—	2	—	—	—
Hypnum cupressiforme	2	3	—	1	1	2	1	**2**	—	—	5	2
Neckera pumila	—	2	—	—	—	—	—	—	—	—	—	—
Ulota cfr crispa	1	—	—	—	—	—	—	—	—	—	—	—
Frullania dilatata	—	—	—	—	1	1	1	1	1	—	**3**	1
Metzgeria furcata	—	1	1	—	1	—	—	—	—	1	**3**	1
Porella platyphylla	—	—	—	—	—	—	—	—	1	—	—	—

There are several records from extra-European countries but many of them are surely referable to other species.

It is quoted from Africa (Algeria and the Cape province). Specimens from Ceylon in herb. S (leg. E. Almquist) belong probably to our species.

In America it is known from Canada (Nova Scotia, Ontario, Quebec, Alaska, sec. MACOUN 1902) and U.S.A. (New England, Florida, Oregon, California, sec. FINK 1935; Tennessee, sec. DEGELIUS 1941).

It is also recorded from New Zealand and Tasmania, as well as from several districts in Oceania (Juan Fernandez Islands, New Caledonia, Hawaii).

Habitat Ecology. — *C. Laureri* is a rare component in the epiphytic vegetation of the beech. It prefers old trees, mostly found only as a single specimen. As seen by tab. XV it has rather seldom a higher degree of density than 1 in the analysed localities. The only station where I have seen it forming special societies is Valje in Blekinge. Its companions are the common epiphytes constituting the *Pyrenuletum nitidae* of old beech trunks with a moderate exposition to light, mainly *Lecanora glabrata* and *subfusca*, *Lepraria aeruginosa*, *Opegrapha viridis*, *Pertusaria pertusa* and *Wulfenii*, *Phlyctis argena*, and *Hypnum cupressiforme*. None of the species listed in tab. XV is characteristic of eutrophiated bark. It has a small power of competition against the accompanying lichens. Through the rational forestry there are very few old beeches left in many places, and thus the number of localities suitable to this lichen becomes rather restricted. I have the impression that it must be considerably rarer now than in the past century.

Affinity and Variation. — As mentioned above, ERICHSEN recorded *Catillaria dispersa* as a species of its own. Specimens from Transsylvania (leg. Lojka) in herb. S give the impression of being specifically different with a thinner, rather smooth thallus and scattered apothecia (not aggregate as often in *C. Laureri*). The microscopic characters show no essential differences. I have collected a similar form at Skubbhult in Femsjö, but I hesitate to give it a higher taxonomic rank.

The variation within the Scandinavian population of *C. Laureri* is of no great importance. F. *amphileuca* (Th. Fr.) n. c. is characterized by a thicker, whitish margin of the apothecia. Exceptionally all apothecia have this margin (as in the original collection from Nättraby), but rather often only younger apothecia are margined (cf. the picture ap. GALLÖE 1929 pl. 48: 167). Taxonomically this character will be of small value.

16. *Opegrapha fuscella* (Fr.) Almb.

Syn. *O. hapaleoides* Nyl. — Cf. Zahlbuckner Cat. Lich. II (1924) p. 200, VIII (1932) p. 192, X (1940) p. 146, and Rediger in Rabenhorst's Kryptogamen-Flora IX. 2: 1 (1938) p. 352.

History. — In E. Fries exs. 194 (ed. G. C. Ljungstedt) a lichen was distributed which was described (apparently by Fries) in »Schedulae criticae» (1826) as »*Pyrenothea fuscella*, crusta tenuissima cinerascente: apoth. minutis innatis, globulo albo persistente. — Ad corticem Fagi frequens, ad cort. & lignum quercus rarius. — Per triennium observata numquam exhibet apothecia scutellata.»

Later (1831 p. 452), Fries treated the same plant as a variety of *P. vermicellifera* Kunze. This plant which previously was only a nomen nudum (distributed in Reichenbach & Schubert Lich. exs. No. 60, ed. in 1823), was described by Fries (l.c.): »crusta laevigata glaucescente, peritheciis prominulis e crusta vestiente albis, nucleo filorum instar erumpente. — Ad cortices arborum in Hispania, Gallia, Germania; in Suecia numquam vidimus». Under this species Fries subordinated »β *fuscella*, crusta cinereo-fuscescente, peritheciis subglobiferis. — Ad cortices arborum frondosarum Europae australioris, inque Scania copiose, sed in pineto-montanis Smolandiae etc., ubi myriades P. leucocephalae, nullum hujus vestigium».

The »perithecia» of these diagnoses refer to the white-pruinose spermogonia characteristic of this species. No mention was made of the elongate graphidinous apothecia, which are present in the exsiccat E. Fries 194 mentioned above.

The same species was described, without consideration of the spermagonia, by W. Nylander (1869) from France as *Opegrapha hapaleoides*. In 1884 Arnold showed that Nylander's species was identical with the »plantae spermogoniferae» previously known as *Pyrenothea leucocephala* (Ehrh.) Fr. (only pr. p.; chiefly referable to *Lecanactis abietina*) and *P. vermicellifera* Kunze ap. Fr. Later lichenologists have known the lichen as *O. hapaleoides*, considering the Friesian names to be invalid as the descriptions refer only to spermogoniferous states.

In fact, the present rules of nomenclature (Briquet 1935 art. 57) allow the rejection of an older name of a spermogoniferous state in favour of a younger name of a »perfect» state only in the fungi. As lichens and fungi are strictly separated from a nomenclatorial point of view, the name *fuscella* must be used for the present species, being the oldest specific epithet with a clear diagnosis and verified by

authentical specimens. *Lichen colliculosus* Hoffm. (1784) cited by FRIES (1831) as a synonym of *P. vermicellifera* is a very doubtful and collective name, which is better left out of account.

Apart from the 19th century statements of *Pyrenothea fuscella* and *P. vermicellifera*, this lichen was not recorded from Sweden until 1913, when ERICHSEN published it from Skåne (as *Opegrapha hapaleoides*). At present I know it from 24 Swedish stations. ERICHSEN was also the first lichenologist to record it from Denmark. In fact it had already been collected in 1866 by E. ROSTRUP though determined as a form of *O. atra* [cf. also the expression »often provided with white-pruinose spermagonia» (transl. fr. Dan.) ap. BRANTH & ROSTRUP 1869 under *Graphis varia* b. *atra*]. The following list contains 12 Danish stations.

Scandinavian Distribution.

Sweden.

Skåne. »Copiose». E. FRIES 1831 p. 452. — Benestad: Orup, the elmwood, on *Ulmus*. 1942 Deg. (Ds). — Bjäresjö: the wood N. of Bergsjöholm, on *Fagus*. 1944! (L, S). — Bosjökloster: Kulleberga, on *Fagus*. 1946! (L, only spermogonia). — Brunnby: Arild, »in den Rindenfurchen alter Eichen und Ulmen und am Grunde alter Buchen bei Haga; alter Birnbaum am Strande westlich von Hagahus». 1911 Er. ERICHSEN 1913 p. 42.; Kullen, Käringmalen, on *Ulmus*. 1943 Deg. and ! (A, Ds, L, S, U). — Dalby: Dalby Söderskog. 1890 Berg (L as *O. atra*); ibm, on *Ulmus* and *Fraxinus*. 1934 Me (S) MALME 1934 p. 8; ibm, on *Fagus*, *Fraxinus* and *Ulmus*. 1936, 43, 46! (A, L, S, O); ibm, on *Ulmus* and *Fagus*. 1937, 43 Deg. (Ds, O). — Genarp: Häckeberga, on *Aesculus*, 1946! (L). — Högestad: Lyckås, on *Fagus*. 1945! (L). — Oppmanna: Arkelstorp, on *Carpinus*. 1916 Me (S as *O. vulgata*). — Ottarp: Bälteberga, E. FRIES 1835 p. 290; ibm, on *Ulmus*. 1893 Alvthin (L as *Lecanactis abietina*); ibm, on *Fraxinus*. 1943! (L, S, U). — Riseberga: Räred, on *Fagus*. 1940! (L, S). — Skabersjö: avenue W. of the castle, on *Ulmus*. 1946! (L). — Ö. Sönnarslöv: Maltesholm, on *Fagus* in the park. 1939 Deg. (Ds). — Sövestad: Krageholm. E. FRIES 1835 p. 290; ibm, on *Quercus*. 1943! (L); island of Lybäck. 1889 Berg (L together with *O. viridis*); ibm, on *Ulmus* and *Tilia*. 1944! (L, S); Vistorp, on *Ulmus*. 1943! (L, O, S, U). — Torekov: Hallands Väderö, on *Fagus*. 1944! (L, S). — Tosterup: Tosterupsskogen, on *Ulmus*. 1945! (L, S). — N. Vram: Vrams Gunnarstorp, on *Fagus*. 1946! (L).

Blekinge. Edestad: Anglemåla, on *Tilia*. 1937 Hedv. (A, L). — Mjällby: Hanö. 1871 Hult. (L as *Pyrenothea leucocephala*). — Ronneby: Fornanäs, on *Fagus*. 1937! (A, L). — Sine loco. Hult. (herb. Wien) REDINGER 1938 p. 355.

Öland. Kastlösa: Övre Västerstad, on *Ulmus*. 1943! (L, S, U). — Repplinge: E. of the castle of Borgholm, on *Ulmus*. 1943! (L, O, S).

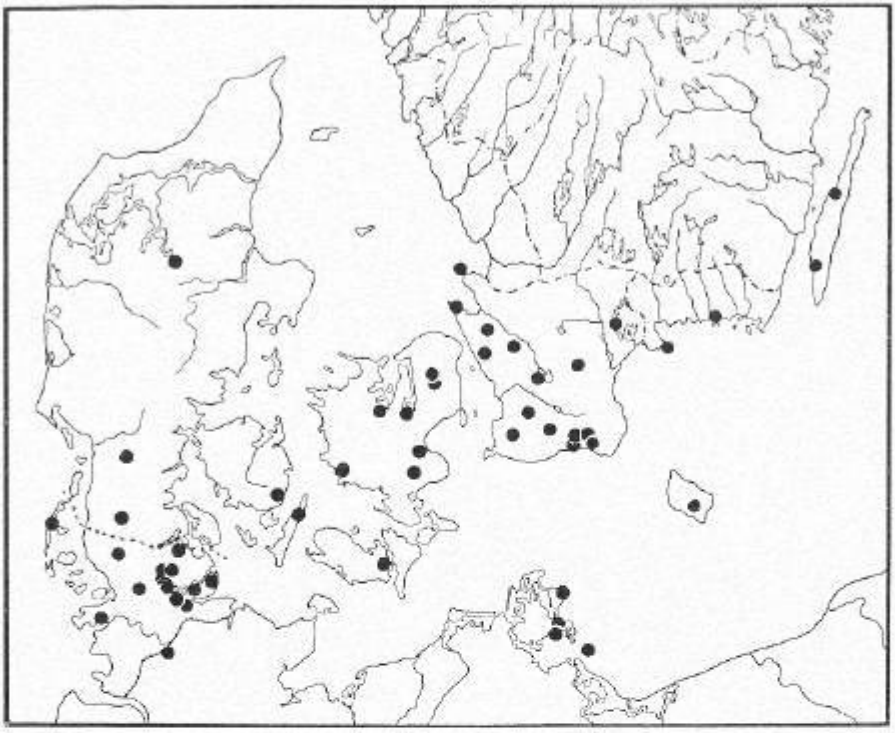


Fig. 20. *Opegrapha fuscella* in Scandinavia.

Denmark.

Sjælland. Aagerup: avenue near Eriksholm, on *Tilia*. 1941 Chr. (K, L). — Boeslunde: Skelskör Dyrehave, on *Quercus*. Branth (L as *Graphis varia* "*vulgata*). — Hastev: Bregentved, the mansion park, on *Ulmus*. 1946! (L, S). — Herfølge: S. of Köge, on *Quercus*. 1947 Deg. (Ds, L). — Hilleröd: on an old *Quercus* in the park, 1941 Er. Erichsen 1942 p. 143. — St Jörgensbjærg: Boserup Skov, on *Ulmus*. 1946! (L, S).

Lolland. Toreby: Fuglsang Storskov, on *Quercus*. 1943 Chr. (K, L).

Langeland. Traneksær: on *Fraxinus*. 1946! (L, S).

Fyn. Ore: Knarreborg, on *Quercus*. 1866 Rostrup (K as *O. atra spermogonifera*).

Jylland. »In Nordschleswig an Eichen häufig; nicht selten in der Pyknidenform». Erichsen in litt. — Dollerup: Hald, near the pond, on *Fagus*. 1946! (L). — Gram: the mansion park, on *Quercus*. Er. Erichsen 1942 p. 143. — Løgumkloster: Draved Skov, on *Quercus*. 1908 Er. (K).

O. fuscella is not uncommon in S.W. Skåne and is probably somewhat more frequent in Denmark than indicated by the scattered

localities. As it is a rather inconspicuous lichen in a sterile state, it is easily overlooked. In Blekinge and Öland it is certainly a rare plant. As it has been searched for in vain in Halland and Småland I can only confirm the statement of E. FRIES: »in pineto-montanis—nullum vestigium».

Extra-Scandinavian Distribution. — The species is distributed in Central and Western Europe.

According to REDINGER (l.c.) it is »bis zu den Alpen und Karpathen auf verschiedenen Laubhölzern ziemlich häufig und verbreitet». REDINGER (l.c.) and LETTAU (1941) recorded several stations from various parts of Germany (Schleswig-Holstein, Rügen, Brandenburg, Oldenburg, Westphalia, Silesia, Thuringia, Baden, Bavaria) as well as from Switzerland, Austria, and Czecho-Slovakia. It does not reach any high altitudes; according to LETTAU it has been collected up to 800 m. above sea level in the Black Forest.

It is also recorded from the E., N., and W. districts of France (NYLANDER l.c., B. DE LESDAIN 1910, OLIVIER 1914, REDINGER l.c., LETTAU l.c.). In the British Isles it is little known. A. L. SMITH (1926) treated it under *O. vulgata* together with *O. subsiderella*. REDINGER (l.c.) reported 3 stations from Ireland.

It seems to be unknown in S. Europe, apart from an unconfirmed statement from Spain (E. FRIES 1831). The easternmost localities known are situated in the former German East Prussia (LETTAU l.c.).

The species is probably endemic in Europe.

Habitat Ecology. — *O. fuscella* is met with on various kinds of deciduous trees, mainly *Ulmus*, *Quercus*, and *Fagus*. It is a pronouncedly photophobous and hygrophilous lichen, often growing in the crevices of the rough bark of old elms and oaks, preferably on the northern side and often near the ground, where it can constitute special societies. Sometimes (e.g. in Dalby Söderskog where the species plays a considerable part in the epiphytic vegetation of the old elms), a special union, *Opegraphetum fuscellae*, can be distinguished. It is extremely poor in species, the naked bark sometimes forming the largest part of the analysed sheet (cf. tab. XVI). Its main constituents are *Lepraria aeruginosa*, *O. fuscella*, and green algae. Sometimes also *Phlyctis argena* and mosses from the basal zone of the trunks are present. Macrolichens are, as a rule, quite lacking. This union is subordinate to *Leprarion*, the federation of photophobous communities from rugged bark (cf. under *Lecanactis amylacea* p. 33).

The Skabersjö station (XVI:6) from an elm near the road is of a certain interest, containing some coniophilous species (*Physcia tenella*,

Xanthoria polycarpa). Probably, however, such kinds of habitats are not favourable to *O. fuscella*.

Measurements of pH (10 samples from Sk. Dalby, on *Ulmus* and *Fraxinus*) showed values between 4.9 and 5.7, mean 5.3.

Tab. XVI. Opegrapha fuscella - communities.

1—4, 6—7 and 9—10 on the trunks of old *Ulmus glabra*, 5 on a middle-aged *Sorbus aucuparia*, 8 on an old *Ulmus carpinifolia*. — 1—4. **Sk.** Dalby: D. Söderskog. N. exposure. — 5. Ottarp: Bälteberga, S. exp. — 6. Skabersjö: N. exp. — 7. Sövestad: Lybäck, N. exp. — 8. **Öl.** Repplinge: near the castle of Borgholm, E. exp. — 9—10. **Sj.** St Jörgensbjærg: Boserup, S. exp.

	1	2	3	4	5	6	7	8	9	10
Arthonia spadicea	—	—	2	—	—	—	—	—	—	—
Arthopyrenia punctiformis	—	—	—	—	—	—	1	—	—	—
— sphaeroides	—	—	—	—	—	—	—	1	—	—
Arthothelium ruanideum	—	—	—	—	1—	—	—	—	—	—
Bacidia luteola	—	—	—	—	—	—	1	1	—	—
Graphis scripta	—	—	—	—	1	—	1	—	—	—
Lecanora expallens	—	—	—	—	—	1—	1	—	—	—
— subfusca (coll.)	—	—	—	—	—	1	—	1	1	2
Lecidea olivacea	—	—	—	—	—	—	—	1	—	1
— quernea	—	—	—	—	—	—	—	—	—	1
Lepraria aeruginosa	**3**	**3**	**4**	**3**	1—	**3**	**3**	**2**	**3**	**4**
Opegrapha atra	—	—	—	—	—	1—	—	1	—	—
— cinerea	—	—	—	—	3	—	—	—	—	—
— fuscella	**4**	**3**	**4**	**4**	**3**	2	**4**	**5**	**3**	**3**
— varia	—	—	—	—	—	2	—	—	—	—
Phlyctis argena	—	—	—	—	**1**	**3**	2	—	2	**4**
Physcia tenella	—	—	—	—	—	1	—	—	—	—
Pyrenula nitida var. nitidella	—	—	—	—	3	—	—	—	—	—
Xanthoria polycarpa	—	—	—	—	—	1—	—	—	—	—
Coccoid Chlorophyceae	+	+	+	+	—	+	+	+	+	+
Hypnum cupressiforme	—	—	—	1	2	—	—	—	—	—
Neckera complanata	**3**	**4**	—	1	—	—	—	—	—	—
Metzgeria furcata	1—	—	—	3	—	—	—	—	—	—
Radula complanata	—	—	—	—	1	—	—	—	—	—

Affinitiy and Variation. — *O. fuscella* is distinguished from other species of the genus in its brownish, white-pruinose spermogonia often occurring on sterile thalli (cf. above). It differs from the *vulgata* group, to which it has near relations having 6—7-celled spores, by its straight spermatia, 3—5×1 μ (curved in *vulgata* and related species). With this delimitation *O. fuscella* is a well-defined species, showing very small variation. Erichsen (1934, 1941) has described some variations — apparently mere modifications — of *O. hapaleoides*, viz. f. *deplanata* with smaller apothecia and spermogonia and somewhat longer sper-

matia (»offenbar nur eine Kümmer- und Degenerationsform», sec. REDINGER), f. *subpulicaris* with short apothecia and somewhat longer spores and spermatia, and var. *discrepans* with smooth thallus, small apothecia and longer spores, often 8-celled.

17. *Parmelia elegantula* (Zahlbr.) Rās.

Syn. *P. incolorata* (Parr.) Lettau. — Cf. further ZAHLBRUCKNER Cat. Lich. VI (1929) p. 86, MAGNUSSON Flora över Skand. busk- och bladlavar (1929) p. 87, and HILLMANN in RABENHORST's Kryptogamen-Flora IX,5:3 (1936) p. 147.

History. — In Lichenographia Scandinavica (1871) TH. FRIES treated *Parmelia olivacea* (L.) Ach. as a polymorphous species divided into var. *corticola* with f. *aspidota*, and var. *prolixa* (including all saxicolous forms) with f. *fuliginosa* and f. *panniformis*. *P. sorediata* was considered as a subspecies of *P. olivacea*. In the 60's and the 70's of the past century W. NYLANDER described several species belonging to the formcircle of the Acharian *P. olivacea*. They were distinguished chiefly by the morphology of the soredia and isidia, and in the positive or negative colour reactions of the medulla with calcium hypochlorite. In Scandinavia little attention was paid to these species until the present century. MALME (1910) and MAGNUSSON (1916) recorded the following species of the *olivacea* group from Sweden with remarks of their taxonomy and ecology: *P. aspera* (=*aspidota*), *olivacea* s. str., *prolixa* (=*pulla*) with var. *panniformis* and var. *isidiotyla* (both varieties are now regarded as proper species), *sorediata*, *exasperatula*, *fuliginosa* with var. *laetevirens*, *subaurifera*, and *subargentifera*. Further investigations during the last three decennia have proved these species to be well defined and distributed over large parts of Scandinavia, most of them being common species.

In addition to these Nylanderian species, the *Parmelia olivacea* group has been increased by two new members, ranked as species in the present century, viz. *P. elegantula* and *P. laciniatula*. The former lichen was described from the present Czecho-Slovakia as *P. aspidota* var. *elegantula* Zahlbruckner (1894), and from France as *P. fuliginosa* f. *incolorata* Parrique (1906) and as *P. exasperatula* var. *perisidiata* Harmand (1909). LETTAU (1919) treated it under the specific name of *P. incolorata*, though he considered it not to be specifically different from *P. laciniatula* (cf. below). In fact this combination had to be rejected having been used previously by FLOERKE for a *Lecidea* species.

The valid species name of the lichen must be *P. elegantula* (Zahlbr.) Räs. (RÄSÄNEN 1931).

The species was first recorded from Sweden (the Göteborg district) by MAGNUSSON in 1929. Further stations have been communicated by DEGELIUS [1929 b (G. NILSSON), 1939 b] and the present writer (1939). At present about 45 stations are known from Sweden.

The only station known from Norway was found by DEGELIUS in 1947 (an earlier record is not correct). From Denmark it was recorded in 1939 by the present writer. About 25 Danish stations are listed below.

Scandinavian Distribution.

Sweden.

Skåne. Bara: Torup, on *Fagus*. 1946! (L). — Borlunda: the churchyard, on *Fraxinus*. 1947! (L). — Bosjökloster: the cemetery, on *Fagus*. 1942! (L); near the youth hostel, on *Fraxinus* and *Sorbus aucuparia*. 1942, 47! (A, H, L, S, U). — Brunnby: Krapperup, between the mansion park and Lerhamn, on *Fraxinus*. 1929 Deg. (Ds) DEGELIUS 1929 p. 246. — Börringe: Börringekloster and Vidarp, on *Aesculus*. 1938! (L, S) ALMBORN 1939 p. 775; Ramnakärr, on *Aesculus*. 1942! (K, L, S); Stavik, on *Aesculus* and *Ulmus*, rather abundant. 1943 Deg. (Ds, L, S, U). — Genarp: Häckeberga, on *Carpinus* and *Ulmus*. 1946, 47! (L). — Gärdslöv: Tärnö, on *Fagus*. 1943! (L). — Hov: Myggarp, on *Alnus*. 1942! (L, S). — Hyby: Bökeberg, on *Fagus*. 1936, 38! c. fr. (A, L, S) ALMBORN l.c.; Eksholm. 1943! (L); N. end of Lake Yddingen, on *Alnus*, abundant. 1944! (L, S, U). — V. Igelstad: the churchyard, on *Tilia*. 1942! (A, L, S). — Ignaberga: W. of the village, on *Fagus* and *Tilia*. 1943! (L). — Kristianstad: Ängsgården, on *Acer*. 1942! (A). — V. Sallerup: the road to Ellinge, on *Acer*. 1942! (A). — Skabersjö: L. Roslätt, on *Fagus*. 1942! (L); W. of the mansion, on *Fraxinus*. 1946! (L). — Slimminge: Skönabäck, on *Quercus* and *Acer Pseudoplatanus*. 1943! (L, S). — Smedstorp: Tunbyholm, on *Fagus*. 1943! (L). — Stehag: in the village, on *Fraxinus*. 1942! (L); S. of Sjöholmen, on *Quercus*. 1947! (L). — Svedala: Roslätt, on *Fraxinus* and *Aesculus* in the avenue. 1942! (L); S. Lindved, on *Aesculus*. 1942! (A, L, S). — Sövde: Amalielund, on *Populus canadensis*. 1943! (L, S); Kristinelund, on *Fagus*. 1943! (L); Vasen, on *Alnus*. 1943! (L). — Sövestad: Krageholm, on *Fraxinus* in an avenue. 1938! (A, Ds, L, S, U) ALMBORN l.c. — Tirup: Tarstadgården, on *Sorbus intermedia*. 1943! (L). — Veberöd: Hasslamöllan, on *Quercus*. 1936! (L) ALMBORN l.c. — Villie: Rydsgård, on an old *Aesculus* in the avenue. 1943! (L).

Blekinge. Sölvesborg: Valje, near the S. end of Lake Siesjön, on *Quercus*. 1937, 42! (A, L) ALMBORN l.c.; near the athletic ground, on *Fagus*. 1943! (L).

Halland. Kungsbacka: the railway station, rather abundant, on *Fraxinus*. 1946 Deg. (Ds, L). — Onsala: Gatan, on *Fraxinus* and *Alnus*. 1947 Deg. (Ds). — Tölö: Gåsevadholm, near the mansion, rather abundant, on *Sorbus intermedia*, scarce on *Tilia*. 1938 Deg. (Ds) DEGELIUS 1939 b p. 393.

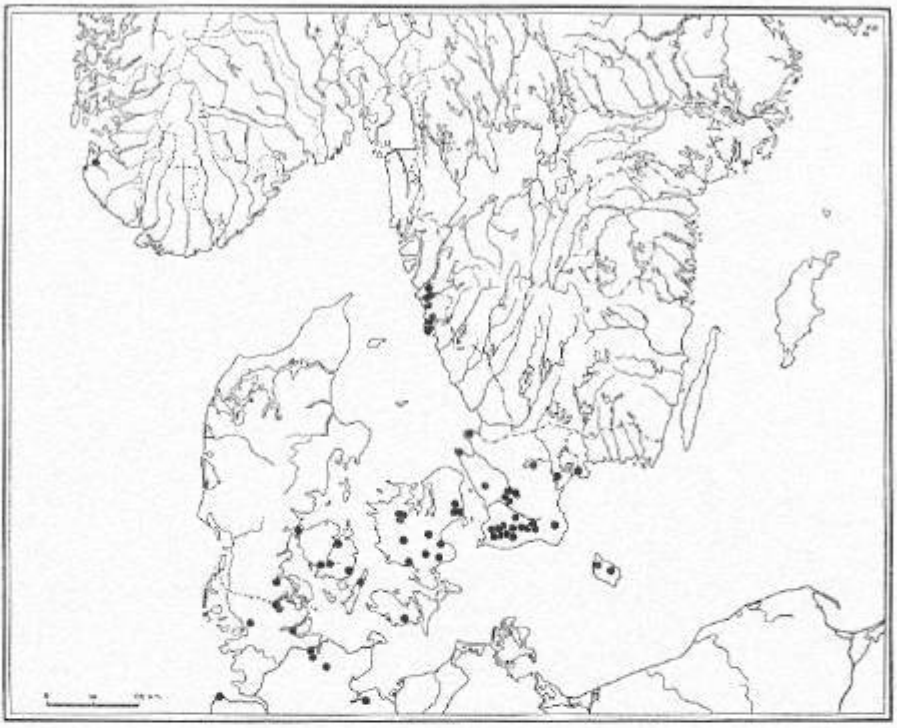


Fig. 21. *Parmelia elegantula* in Scandinavia.

Västergötland. Angered: Lärjeholm, on *Fraxinus*. 1922, 42 Magn. (M). — Askim: Kubbegård, on *Fraxinus*. 1941 Magn. (A, M). — Göteborg: between St. Torp and Böö, on young *Fraxinus*. 1928 Magn. (M) MAGNUSSON 1929 p. 87, DEGELIUS 1929 b p. 246; St. Torp, on *Fraxinus* in an avenue. 1942 Magn. (M). — Mölndal: the old cemetery, on young *Fraxinus*. 1929, 37 Deg. (Ds) DEGELIUS l.c.; ibm, on *Tilia*. 1934 Magn. (M, MAGN. exs. 182); ibm, on *Tilia*. 1937! (A, L.); ibm, on *Fraxinus*. 1937 Hedv. (L.); Lunnagård, on *Alnus*. 1942 Magn. (M).

Norway.

Rogaland. Sandnes: Langgaten, near the railway station, on young *Acer Pseudoplatanus*. 1947 Deg. (Ds).

[Opland. Lom: Ulstad, saxicolous. 1909 Lynge (O) LYNGE 1921 p. 164 (as *P. incolorata*). Belongs to *P. infumata*: cf. DEGELIUS 1929 b p. 247.]

Denmark.

Sjælland. Borup: Vasemader Bro, on *Fagus* and *Quercus*. 1940 Gelt. GELTING 1941 p. 405. — Braaby: Villa Gallina, on *Fagus*. 1946! (L.). — Frydendal K.: Torbenfeld, on *Acer* and lignum. 1941 Gelt. (in litt.). — Sr Jernlöse: Knapstrup

Hovedgaard, on *Acer*. Gelt. GELTING l.c. — K a r r e b æ k: Karrebækstorp Skov, on *Fagus*. Gelt. GELTING l.c. — L y n g b y: Frederiksdal, on *Fagus* and *Fraxinus*. 1941 Gelt. — S k a m s t r u p: Skellingsted, on lignum. 1940 Gelt. — S o r ö: near the inn »Ägir» at Lake Sorösöen, on *Fagus*. Gelt. GELTING l.c. — S ö l l e r ö d: the high road N. of Holte, on *Ulmus*. 1945 Chr. (K) CHRISTIANSEN 1946 b p. 108. — T a a r b æ k: Jægersborg Dyrehave, on *Fagus*. 1938 Gelt.; ibm, on *Fagus*. 1938 Chr. (K). — V a l l ö b y: Vallö Dyrehave, on *Aesculus*. Gelt. GELTING l.c. — V e m m e t o f t e: Vemmetofte Vesterskov, on *Fagus*. 1937! (L) ALMBORN l.c.

Lolland. F u g l s e: N. of Kærstrup, on *Aesculus* in an avenue. 1946! (L, S).

Langeland. T r a n e k æ r: N. of the mansion, on *Aesculus*. 1939! (L) ALMBORN l.c.

Fyn. B r a h e t r o l l e b o r g: in the avenue, on *Fraxinus* and *Tilia*. 1939, 46! (K, L, S) ALMBORN l.c.; ibm, on *Aesculus*. 1941 Gelt.; Korinth Kro, on *Alnus, Juglans, Fagus*, and *Aesculus*. 1941 Gelt. — J o r l ö s e: Damsbo, on *Ulmus* and lignum. 1941 Gelt. — M i d d e l f a r t: Hinsgavl, on *Tilia* in an avenue. 1939, 46! (K, L, S) ALMBORN l.c.; ibm, on *Ulmus, Aesculus, Fraxinus, Fagus*, and *Populus*. 1941 Gelt. — S t e n l ö s e: Lindved, on *Fagus* and lignum. 1941 Gelt. — V e j s t r u p: Tiselholt, on *Aesculus*. 1946 Chr. (in litt.); W. of Tiselholt, on *Ulmus* in an avenue. 1946 Chr.

Jylland. E n s t e d: Aarup Skov, Luisenlund. Er. SAXEN in litt.

Bornholm. R u t s k e r: the churchyard, on *Fraxinus*. 1943 Gelt. — Ö r L a r s k e r: Risen, S. of Nybro, on *Quercus*. 1943 Gelt.

P. elegantula must be characterized as a rather rare species in our districts, being somewhat common only in a limited area in S. Skåne. Owing to its similarity to *P. fuliginosa* var. *laetevirens* it is easily overlooked, but the striking disjunctions in its Scandinavian area cannot only be due to insufficient investigation. Its absence in S.E. Jylland and in S. Halland where several lichenologists have worked, is difficult to explain.

Extra-Scandinavian Distribution. — Its extra-Scandinavian area is restricted to Central, Western, and Southern Europe.

HILLMANN (l.c.) records it as »wahrscheinlich im ganzen Gebiet» (i.e. Central Europe) »mit Ausnahme der höheren Gebirge verbreitet, aber zerstreut und vielleicht übersehen». In G e r m a n y it is known from Schleswig-Holstein (»zerstreut», sec. ERICHSEN in manuscr., »dürfte zu den seteneren Arten gehören», SAXEN in litt.), Pomerania, Oldenburg, Hannover, Brandenburg, the former »Grenzmark Posen-Westpreussen», Silesia, Lippe, Thuringia, and Baden (»häufig in Südbaden», sec. LETTAU 1919). It is further reported from S w i t z e r l a n d (LETTAU l.c.), C z e c h o - S l o v a k i a (SUZA 1923, 1925—26, HILITZER 1924), and H u n g a r y (GYELNIK 1928, SZATALA 1929 b). In the Carpathians it reaches an altitude of 600 m. above sea level.

MAAS GEESTERANUS (1947) reported several stations from the N e t h e r l a n d s.

In France it is little known, only 6 stations from the southern and eastern districts being cited by HARMAND (1909). It is unknown from the British Isles.

There are only some few finds recorded from S. Europe. TAVARES (1915) stated it from two stations in N. Portugal (leg. Sampaio). From Italy I know one station (Toscana, Monte Amiata, on *Castanea*, leg. C. Sbarbaro; herb. L). It is also reported from Greece (RÄSÄNEN 1944).

No extra-European localities are known.

Habitat Ecology. — *P. elegantula* belongs to the coniophilous epiphytic vegetation characteristic of trees in parks, avenues and churchyards, and of solitary trees near roads and houses. It is never found in the depth of the forests but is sometimes met with on the outskirts, on somewhat eutrophiated bark. It has a decided preference for the rather smooth bark of (not too young) *Fagus* and *Fraxinus* but it also likes the special structure of the *Aesculus* bark. Not seldom it is found on more rugged bark, e.g. on *Acer*, *Alnus*, *Quercus*, *Tilia*, and *Ulmus*. Occasionally it also grows on lignum. There is no Scandinavian record from coniferous trees, nor from rocks.

Its power of competition is moderate, as it seldom reaches a higher degree of density than 3 (cf. tab. XVII) and seldom forms societies. The *P. elegantula* community is as a rule rich in species, among which *Buellia punctiformis*, *Evernia prunastri*, *Lecanora subfusca*, *Parmelia laciniatula*, *P. sulcata*, and *Phlyctis argena* can be considered as constants. *Candelaria concolor*, *Candelariella xanthostigma*, *Parmelia exasperatula*, *Pertusaria globulifera* f. *Henrici*, and *Physcia tenella* are also rather regular components. Of these lichens *Buellia punctiformis*, *Candelaria concolor*, *Candelariella xanthostigma*, *Parmelia exasperatula*, *P. laciniatula*, *Pertusaria globulifera* f. *Henrici*, and *Physcia tenella* are differential species of the coniophilous (»rich bark») epiphytic societies against the coniophobous »poor bark». Other typical coniophilous species as *Parmelia acetabulum*, *Physciae*, and *Xanthoriae* can be present together with *Parmelia elegantula*, but as a rule in small quantities. This will be due to the fact that these lichens need a higher amount of light than is optimal for *P. elegantula*.

Sociologically *P. elegantula* -communities attach to *Xanthorion*, the characteristic federation of »rich bark» epiphytes (cf. pp. 83 and 221).

Together with the communities of e.g. *Pertusaria subviridis* and *Parmelia laciniatula*, they constitute a transitional facies of the *Xanthorion* (cf. under the former species). The delimitation and nomenclature of this facies is still under investigation.

Concerning the pH values, I refer to what is stated under *P. laciniatula*.

Tab. XVII. Parmelia elegantula - communities.

On the trunks of deciduous trees. — 1—2. **Sk.** Sövde: Amalieland, on *Populus canadensis*, S. exposure. — 3—4. Hyby: near Yddingen, on *Alnus*, N. exp. — 5. Skabersjö, on *Fraxinus*, S. exp. — 6. Bosjökloster, on *Sorbus aucuparia*, S. exp. — 7—8. Borlunda: the churchyard, on *Fraxinus*, S. exp. — 9. **Loll.** Fuglse, on *Aesculus*, W. exp. — 10. **Fyn.** Middelfart: Hinsgavl, on *Tilia*, W. exp.

	1	2	3	4	5	6	7	8	9	10
Anaptychia ciliaris	1	—	—	—	—	—	—	—	—	**1**
Buellia betulina	—	—	—	—	1	—	—	—	—	—
— punctiformis	**2**	1	1	1	1	1	1	—	3	1
Candelaria concolor	—	1	1	1	1	—	3	2	—	—
Candelariella vitellina	—	—	—	1	—	—	—	—	—	—
— xanthostigma	**2**	**2**	—	2	—	1	—	1	—	1
Cladonia ochrochlora	—	—	—	1	—	—	—	—	—	—
Evernia prunastri	1	1	1	1	—	3	1	1	3	1
Lecanora expallens	—	—	—	—	2	—	—	—	3	1
— Hageni	—	—	1	—	—	—	—	—	—	—
— subfusca (coll.)	1	1	3	2	—	—	2	1	1	1
Lecidea olivacea	1	—	—	—	—	—	1	—	—	—
Lepraria aeruginosa	—	—	—	—	2	—	—	—	—	—
Parmelia acetabulum	—	—	—	—	1	—	—	—	—	1
— elegantula	**4**	**3**	3	**3**	**3**	**5**	**3**	**3**	**3**	**3**
— exasperatula	—	2	—	1	1	1	**3**	1	—	—
— fuliginosa	—	—	—	1	—	—	—	—	3	—
— furfuracea	—	—	1	—	1	—	—	—	—	—
— laciniatula	3	3	1	1	**1**	**2**	1	—	—	**3**
— physodes	—	—	3	1	1	—	—	—	—	—
— sulcata	**1**	2	2	2	**1**	**1**	3	3	**1**	**2**
— tubulosa	—	—	**3**	—	—	—	—	—	—	—
Pertusaria amara	—	—	—	—	—	1	—	—	—	—
— coccodes	—	—	—	—	—	1	—	—	—	—
— globulifera	—	—	1	—	1	—	—	—	—	—
— — f. Henrici	1	1	—	1	**3**	—	—	1	—	1
— lutescens	1	—	1	—	—	—	—	—	—	—
— pertusa	—	1	—	—	—	—	—	—	—	1
— subviridis	—	—	—	—	2	—	—	—	—	**3**
— Wulfenii	—	—	—	—	—	—	—	—	—	1
Phlyctis argena	3	3	1	1	—	1	1	1	1	—
Physcia ascendens	—	—	—	—	—	—	—	—	—	1
— grisea	—	—	—	—	—	—	—	—	—	1
— pulverulenta	—	—	—	—	—	2	—	—	—	—
— tenella	**1**	2	—	1	**1**	**1**	—	—	—	—
Ramalina farinacea	—	—	1	1	**1**	**2**	—	—	—	—
— fastigiata	—	1	—	—	**1**	1	—	—	—	1
Xanthoria candelaria	—	—	—	—	—	1	—	—	—	—
— parietina	—	—	—	—	—	—	—	—	—	1
— polycarpa	—	—	—	—	—	—	—	—	1	—
Coccoid Chlorophyceae	—	—	+	+	—	—	—	—	+	—
Hypnum cupressiforme	—	—	—	1	—	—	—	—	—	1
Orthotrichum ochoblephare	—	—	—	—	2	—	—	—	—	—
Frullania dilatata	—	—	—	—	—	—	—	—	—	**1**
Metzgeria furcata	—	—	—	—	—	—	—	—	—	**1**

Affinity and Variation. — *P. elegantula* is closely allied to *P. exasperatula*, as whose variety it is regarded in ZAHLBRUCKNER's Catalogus. The latter species, however, has far broader isidia, claviform or spatuliform, not cylindrical as in *P. elegantula*. As a rule its dense, dark brown isidia give *P. elegantula* a characteristic habit, and, in my opinion, these two species are well separated. *P. elegantula* is far more similar to some forms of *P. fuliginosa*. This species has sometimes about the same colour of the thallus and the same type of isidia but is easily distinguished by its much thicker thallus and its distinct positive C reaction of the medulla. HILLMANN (l.c.) and ERICHSEN (1937) record a *P. elegantula* var. *isidioidea* (Oliv.) Hillm., which is said to resemble *P. elegantula* morphologically differing only in its positive C reaction. Nothing is mentioned about the thickness of its thallus. I have seen no authentic specimens, but I do not hesitate to refer such plants to the polymorphous species *P. fuliginosa*, considering the C reaction as a decisive character.

LETTAU (1919) suggests that our species is not specifically delimited from *P. laciniatula*, the latter being only a f. *panniformis* of his *P. incolorata*. Such intermediate forms are also recorded by ANDERS (1928) and ERICHSEN (1930). As stated by ERICHSEN (l.c.) and the present writer (1935), the two lichens are no doubt distinct species. Some of these intermediate forms which I have studied in some places in Skåne, are apparently due to an entanglement between the lobes of the two species, which are often growing together. At times some broad lobes of *P. laciniatula* can be covered with ± isidioid verrucae, somewhat resembling the young isidia of *P. elegantula* or *exasperatula*. On the other hand I have seen the species growing together without intermediate states so many times that I must consider their specific segregation well founded. Apart from the morphology of the isidia (or laciniae respectively) there is a striking difference as to the colour of the two lichens, *P. elegantula* being darker brown than the olive brown—olive green *P. laciniatula*.

As to the delimitation between *P. elegantula* and related species, cf. further the exhaustive discussions ap. MAAS GEESTERANUS 1947.

As is the case in its whole area, *P. elegantula* is as a rule sterile, the isidia being its chief diaspores. I have seen fertile specimens only once, at Bökeberg in Skåne.

18. *Parmelia laciniatula* (Flag.) Zahlbr.

Cf. Zahlbruckner Cat. Lich. VI (1929) p. 94, VIII (1932) p. 361, Magnusson Flora över Skand. busk- och bladlavar (1929) p. 87, and Hillmann in Rabenhorst's Kryptogamen-Flora IX.5:3 (1936) p. 142.

History. — This lichen was described from France by Flagey in 1894 as *P. exasperatula* var. *laciniatula*, and by Nylander in 1898 as *P. exasperatula* f. *laevigatula*. Parrique (1906) ranked it as a species under the name of *P. laevigatula*, but as this combination had already been used by Nylander for a tropical species, Zahlbruckner (1916 b) recorded it as *P. laciniatula*.

In Sweden the species was first collected in Skåne (Torrlösa: Trolleholm) by Degelius in 1933 (published in the same year) and independently by Stenholm. Subsequently several stations have been published by the present writer (1935, 1939) and Degelius (1939 b). At present I know it from about 120 Swedish stations.

Lynge (1921) published it from Norway. In Denmark it was collected as early as in 1884 by C. A. Gad (labelled as *Parmelia olivacea*). This find was published by Lynge in 1923. It is now known from about 90 stations in Denmark.

Scandinavian Distribution.

Sweden.

Skåne. Known from about 110 stations in the following parishes: Allerum, Andrarum, Balkåkra, Bara, Billinge, Bjäresjö, Bläntarp, Bollerup, Berrlunda, Bosarp, Bosjökloster, Brunnby, Brågarp, Bunkeflo, Börringe, Dalby, Degeberga, Eljaröd, Fjärestad, Fränninge, Fågeltofta, Genarp, Gladsax, Gråmanstorp, Grönby, Gudmundtorp (Magn. exs. 181), Gårdstånga, Gärslöv, Gässie, Gödelöv, Halmstad, Hammarlunda, Hardeberga, Hedeskoga, V. Hoby, Hov, Hyby, Hällestad, Härslöv, Hässlunda, Högestad, Hörby, Hörröd, Höör, Ignaberga, V. Karaby, Katslösa, Konga, Kristianstad, Kågeröd, V. Kärrstorp, Ö. Ljungby, Lund, Långaröd, Maglehem, Odarslöv, Riseberga, Risekatslösa, N. Rörum, Röstånga, V. Sallerup, Ö. Sallerup, S. Sandby, S:t Olof, Skabersjö, Slimminge, Smedstorp, Stehag, Stenestad, Stiby, Svalöv, Svedala, Svenstorp, Sövde, Sövestad, Tirup, Tjörnarp, Torrlösa, Tosterup, Tranås, Trolienäs, Törringe, Uppåkra, Vallby, Veberöd, Villie, Vollsjö, N. Vram, V. Vram, S. Åby, Åspinge, Örkelljunga, Örtofta, Östraby, Öved.

Several stations published by Almborn 1935 p. 464 and 1939 p. 774.

Blekinge. Mjällby: near the church, on *Aesculus*, rather abundant, 1944 (L. S).

Småland. Vrå: Bodaberg, S. of the bridge over the Krokån, several specimens on a young *Sorbus aucuparia*, 1943! (A, L, O, S, U).

Halland. Enslöv: Spånstad, several specimens at the base of a young *Fraxinus* by the road, 1947! (L). — Hasslöv: near the post office, on *Aesculus*, 1942! (L). — Spannarp: Nackhälle, on *Alnus* (several specimens on one tree), 1945! (L, S). — Veinge: Vessinge, by the cross-roads, on *Tilia*, 1943! (L, S, U). — Vinberg: Tröinge, two specimens on a *Sorbus aucuparia*, 1945! (L, S). — Älvsåker: the valley near the church, one small specimen on *Salix caprea*, 1938 Dec. (Ds) DEGELIUS 1939 b p. 393.

Bohuslän. Kareby: the churchyard, on *Acer*, 1935 Magn. (M).

Västergötland. Angered: Lärjeholm, on *Fraxinus*, 1942 Magn. (A, M).

Norway.

Vestagder. Kristiansand: Ravnedalen, Lynge, LYNGE 1921 p. 164. — Oddernes: 1 km. N.E. of the church, scanty on a young *Quercus* at the Arendal highroad, 1947! (L).

Denmark.

Sjælland. Boeslunde: Skelskör Dyrehave, on *Quercus*, Gelt. (in litt.). — Borup: Svenstrup Dyrehave, on *Quercus* and *Fagus*, Gelt.; Vasemader Bro, on *Quercus* and *Fagus*, Gelt. — Braaby: Gisselfeld, on *Aesculus* (L); between B. and G., on *Quercus* (S); near Villa Gallina, on *Fagus* (L), All 1946! — Buerup: Klinteskov, near Tissö, on *Fraxinus*, Gelt. — Vr Egede: on *Aesculus*, *Sorbus aucuparia* and *S. intermedia*, Gelt.; Brödbæk, on *Alnus*, 1946! (L); Bönnede, on *Sorbus intermedia*, 1947! — Everdrup: Bækkeskov, on *Fraxinus*, 1942 Gelt. — Frydendal K.: Torbenfeld, on *Quercus*, Gelt. — Fuglebjærg: Kastrup Oredrev, on *Fagus* and *Corylus*, Gelt. — Grandlöse: Dragerup Skov, on *Ulmus*, Gelt. — Gundersley: between Tystrup and Buvelse Sö, on *Quercus*, Gelt. — Gyrstinge: St. Bögeskov, on *Aesculus*, Gelt. — Haraldsted: Allindelille Fredskov, on *Fagus*, 1942 Chr. (K). — Haslev: Bregentved, on *Fraxinus*, Gelt. — Holmstrup: Ranglemölle, on *Quercus*, also saxicolous, Gelt. — Hornbæk-Hellebæk: Saunte Overdrev, 1942 Gelt. — Jystrup: E. of J., on *Acer*, 1939! (L). — Karrebæk: Karrebækstorp Skov, on *Fagus*, Gelt. — Kastrup (pr. Vordingborg): Oregaard, on *Quercus*, Gelt. — Lellinge: L. Skovbusvænge, on *Fagus*, Gelt. — Lilleröd: Ravnsholt Hegn, on *Fagus*, 1942 Chr. (K, L). — Lyngby: Frederiksdal, on *Fagus*, 1941 Gelt.; Hjortedam near Fortunen, on *Acer*, 1939 Chr. (K, L). — Nordrup: Giesegaard, on *Fagus*, Gelt. — Præstö: Nysö, on *Quercus*, Gelt. — Skamstrup: Skellingsted, on *Acer*, Gelt. — Skellebjærg: Kullebjærg, E. of Konradinelyst, on *Fagus* and *Alnus*, Gelt. — Sorö: Sönderskov, on *Tilia*, 1939! (L); the railway station, on *Aesculus*, Gelt. — Stenmagle: Maglelyng, on *Fagus*, Gelt. — St Peder: Slagelse Lystskov, on *Fagus*, 1946! (L). — Taarbæk: Jægersborg Dyrehave, on *Acer* and *Crataegus*, 1938 Gelt.; Eremitagesletten, on *Acer*, Gelt.; ibm, on *Crataegus*, 1940, 42 Chr. (K). — Taastrup: Pilemölle, on *Acer*, 1941 Chr. (K). — Tikö b: Gurre Sö, on *Fagus*, 1942 Gelt. — Tureby K.: Tureby-holm, on *Fagus* and *Quercus*, Gelt.; near the high road, on *Quercus*, 1947! (L). — Töllöse: Tjörnede, on *Acer*, Gelt. — Undlöse: Mölleskov, on *Fagus*, 1946! — Vallöby: Vallö, on *Tilia*, 1942 Gelt. — Valsölille: Nebs Mölle, on *Fagus*,

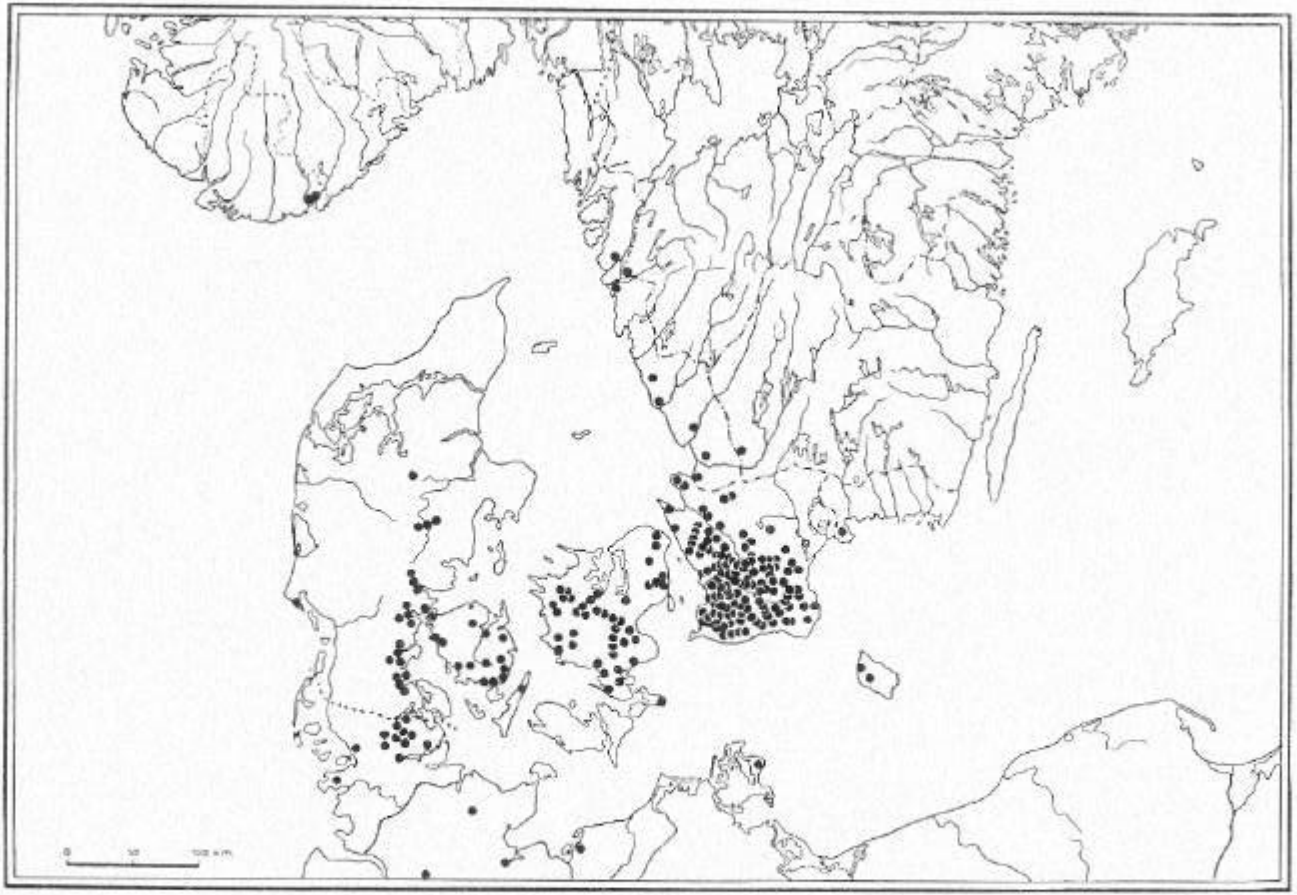


Fig. 22. *Parmelia taciniatula* in Scandinavia.

Gelt.; Vesterskov, on lignum. 1946! — Vejlö: Gavnö, Lönned Skov, on *Quercus*. Gelt. — Vemmetofte: Vesterskov, on *Fagus*. 1947! (K, L). — Vigersted: Humleore, on *Betula*, *Quercus*, and *Corylus*. Gelt. — Vor Frue: on *Prunus avium*. 1938 Gelt.

Mön. Magleby: Storeklint, near the hotel, on *Fagus*. 1939! (A, K, L, S).

Langeland. Tranekær: N. of the mansion, on *Aesculus*. 1939! (L).

Fyn. Bovense: on *Acer*. 1947! (L). — Brahetrolleborg: in the avenue, on *Fraxinus* and *Tilia*. 1939! (A, K, L, S); ibm, on *Aesculus*. 1941 Gelt.; Brændegaard, on *Quercus* and lignum. 1941 Gelt.; Lammehaver, on lignum. 1941 Gelt.; Korinth Kro, on *Aesculus*. 1941 Gelt. — Egense: Hvidkilde, on a gate post. 1939! (K, L). — Ellested: the churchyard, on *Acer* and *Fraxinus*. 1941 Gelt.; Ravnholt Dyrehave, on *Alnus*. 1941 Gelt. — Hesselager: Purreskov, on *Fagus*. 1941 Gelt. — Hostrup: Damsbro, on *Quercus*. 1941 Gelt. — Husby: Wedellsborg, in the park, on *Fagus*. 1939! (K, L, S); Kongeskov, on *Fagus*. 1941 Gelt. — Kværndrup: Egeskov, near the mansion, on *Tilia*. 1939! (L, S). — Langaa: near Stenshave Hus. 1946 Chr. — Middelfart: Hinsgavl, on *Fraxinus* and *Tilia*. 1939! (K, L, O, S); ibm, on *Fagus*, *Fraxinus*, and *Aesculus*. 1937, 41 Gelt. — Ore: on *Tilia*. 1946 Chr.; Knarreborg Vandmölle, on *Fraxinus* and *Quercus*. 1946 Chr. — Sandager: Orelund, on *Populus canadensis*. 1941 Gelt. — Stenlöse: Lindved, on *Alnus* and *Fraxinus*. 1941 Gelt. — Svindinge: Glorup, Glorup Dyrehave, on *Fagus*. 1946 Chr. — Sönderse: Sönderse Skov, on *Fraxinus*. 1947! (K, L). — Vejstrup: Tiselholt, on *Aesculus*. 1946 Chr.

Jylland. Asmild Kloster: between Viborg and Brunshaab. 1884 C. A. Gad (K as *P. olivacea*) LYNGE 1923 p. 75. — Bjerning: Errested (N. of Hadersley), on *Fraxinus*. 1946! (L). — Bryrup: between B. and Velling, scanty on *Fraxinus*. 1947! (L). — Dalby: by the road Kolding—Stenderup, on *Fraxinus*. 1939! (K, L). — Ensted: Laksmöllen, on *Ulmus*. 1913 Er. (in litt.). — Erresö: Snoghöj, on *Aesculus*. 1941 Gelt. — Felsted: between F. and Sr Hostrup, on *Quercus*. 1946! (L). — S. Galten: S. of Galten, on *Ulmus*. 1937 Gelt. — Gaverslund: Munkebjærg, near the hotel, on *Fagus*. 1939! (K, L, S). — Hadersley: especially on *Fraxinus* near the N. town gate. 1915, 16 Er. (K, O, S). — Harte (W. of Kolding): on *Ulmus*. 1941 Gelt. — Kollerup (pr. Vejle): on *Fraxinus* and *Alnus*. 1941 Chr. (K). — Löjt: Stollig, on *Fraxinus*. 1913 Er. (in litt.). — Olsböl: Skallingen, on lignum. 1941 Chr. (K). — Rye: Himmelbjærget, near the hotel, on *Fagus*. 1939! (K, L, S). — Ör Starup (N. of Kolding): Brakker, on *Prunus avium*. Gelt. — Tavlov: by the soldiers' tomb, on *Sorbus Aria*. 1941 Gelt. — Vedsted: near Holmshus. 1938 Er. (in litt.). — Vilstrup: Vonsmose, on *Fraxinus*. 1939! (K, L). — Vinding (pr Vejle): Mölholm, on *Fraxinus*. 1939! (K, L, S).

Bornholm. Aaker: Vallensgaard, one specimen on *Aesculus*. 1934! (A). — Rutsker: the churchyard, on *Fraxinus*. 1943 Gelt.

Some of the Danish stations published by GELTING (1938 p. 358, 1941 p. 405) and ALMBORN (1939 p. 774).

P. laciniatula is a rather common species in S. and W. Skåne, the Danish Islands and S.E. Jylland. In several of these districts it is, however, perceptibly rarer in the vicinity of the sea (cf. p. 233). North of the

line Söderåsen—Linderödsåsen in Skåne it must be regarded as a rare species, though eagerly searched for during the last decennium. It is almost completely lacking in N. and W. Jylland, chiefly owing to climatic conditions, but to a minor part also to the rareness of suitable localities. Further finds from S. Norway may be expected. It is decidedly more frequent than the related *P. elegantula* and has a somewhat wider range without obvious disjunctions.

Extra-Scandinavian Distribution. — The species is distributed chiefly in Central Europe.

It is not uncommon in Germany, known from Schleswig-Holstein (»stellenweise häufig», sec. ERICHSEN in manuscr.), Mecklenburg, Pomerania, and Rügen (unpublished finds from 1938 by the present writer), Teutoburgerwald in Lippe (HILLMANN 1936), Fichtelgebirge (collected already by Laurer in the middle of the 19th century, sec. HILLMANN l.c.), Thuringia and Baden (LETTAU 1919), and Bavaria (HILLMANN l.c.). It is also recorded from Switzerland (leg. Meylan, sec. HILLMANN l.c.), Austria (distributed in Krypt. exs. 2362 b, leg. Suza), and Czecho-Slovakia (HELITZER 1924, SUZA 1925, 1930).

Four stations from the Netherlands are reported by MAAS GEESTERANUS (1947). According to HARMAND (1909) it is rare in France and restricted to the eastern, central, and southern districts. It seems to be unknown from the British Isles and from Spain and Portugal. From Italy I know a collection from Grande Sila in Liguria (leg. Sbarbaro, in herb. S). Several stations are reported from Yugo-Slavia (SERVIT 1929, 1934). It is not recorded from Eastern Europe. The species is apparently endemic in Europe.

Habitat Ecology. — Like *P. elegantula*, *P. laciniatula* is a coniophilous species. It is most frequently met with on *Aesculus* and *Fagus* near roads etc. but often also on *Acer*, *Alnus*, *Fraxinus*, *Quercus*, *Tilia*, and *Ulmus*. It is very rare on *Betula*. I have collected it once on *Picea*, never on *Pinus*. Lignicolous specimens are recorded from some places in Denmark. I have seen it saxicolous once (at Höör in Skåne), apparently having immigrated from a large colony on an *Aesculus* standing close by the rock. Similar records of its substratum are published from Germany by ERICHSEN (1930) and HILLMANN (l.c.).

As a rule *P. laciniatula* has a moderate degree of density but as seen by tab. XVIII it can sometimes cover large parts of the stems constituting societies of its own. It is accompanied by about the same species as are listed under *P. elegantula* (cf. tab. XVII). As relatively frequent constituents in *P. laciniatula* -societies can be regarded *Anaptychia ciliaris**, *Buellia punctiformis**, *Evernia prunastri*, *Lecanora subfusca*, *Parmelia acetabulum**, *exasperatula**, *fuliginosa*, *physodes*, and *sulcata*, *Pertusaria globulifera* f. *Henrici** and *pertusa*, *Phlyctis*

Tab. XVIII. Parmelia laciniatula - communities.

On the trunks of middle-aged — rather old deciduous trees. — 1. **Sk.** Genarp: Häckeberga, on *Aesculus*, W. exposure. — 2. Slimminge: Skönabäck, on *Fagus* near a pasture, N. exp. — 3. Ibm, on *Acer Pseudoplatanus*, S. exp. — 4. Villie, Rydsgård, on *Aesculus*, W. exp. — 5. Smedstorp, Tunbyholm, near the road, on *Fagus*, S. W. exp. — 6. Hässlunda: Gödstorp, on *Aesculus*, E. exp. — 7. Sövestad: Vistorp, on *Carpinus*, near the crofter's cottage, W. exp. — 8. Börringe: Börringekloster, on *Ulmus*, S. exp. — 9. Långaröd: Hemmenekköp, on *Fagus*, S. exp. — 10. Gudmundtorp: Rolsberga, on *Fraxinus*, N. exp. — 11. Hörby: Osbyholm, on *Acer*, S. exp. — 12. Borlunda: the churchyard, on *Fraxinus*, W. exp. — 13. **Hl.** Enstad: Spånstad, on *Fraxinus*, N. exp. — 14. **V. Agd.** Kristiansand, on *Quercus*, S. exp. — 15. **Sj.** Braaby: between B. and Gisselfeld, on *Quercus*, S. exp. — 16. Tureby: near the Köbenhavn highroad, on *Quercus*, W. exp. — 17. **Fyn.** Brahetrolleborg: avenue near the castle, on *Fraxinus*, W. exp. — 18. Middelfart: Hinsgavl, on *Tilia*, W. exp. — 19. **Jl.** Felsted: between F. and Sr Hostrup, on *Quercus*, N. exp. — 20. Hover: N. of Grejsdal, on *Acer*, S. exp.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Anaptychia ciliaris	3	—	2	2	—	—	—	1	—	—	1	—	—	—	1	—	1	1	—	—
Bucllia betulina	—	—	—	—	—	—	—	—	—	2	—	—	—	—	—	—	—	—	—	—
— punctiformis	—	—	—	1	—	2	—	1	—	—	**1**	4	—	—	**4**	2	—	1	—	—
Caloplaca herbidella	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—
Candelaria concolor	1	—	—	—	—	—	—	**1**	—	—	—	1	—	—	—	3	—	—	—	1
Candelariella vitellina	—	—	—	—	1	—	—	—	—	—	**1**	—	1	—	—	—	—	—	—	—
— xanthostigma	—	—	1	—	—	—	—	—	—	1	—	—	—	1	—	—	2	1	—	1
Cetraria chlorophylla	—	1	—	—	—	1	—	—	—	—	—	—	1	1	—	—	—	—	—	—
Cladonia ochrochlora	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—
Evernia prunastri	1	3	—	1	—	—	1	**1**	—	—	1	1	—	1	1	3	—	1	1	1
Lecania cyrtella	—	—	—	—	—	—	—	—	—	—	—	—	4	—	—	—	—	—	—	—
Lecanora atra	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—
— carpinea	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—
— expallens	1	—	—	—	—	—	1	—	—	—	1	—	1	—	1	—	—	1	1	—
— Hageni	—	—	—	—	—	—	—	—	—	—	—	2	—	—	—	—	—	—	—	—
— impudens	—	—	—	—	—	—	—	—	—	—	—	—	2	—	—	—	—	—	—	—
— subfusca (coll.)	—	—	1	1	—	—	1	—	—	3	—	—	1	—	—	1	—	1	2	1
— varia	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—
Lecidea olivacea	—	—	—	1	—	—	—	—	—	—	1	—	2	—	—	—	—	—	1	—
Lepraria aeruginosa	—	—	—	—	—	—	—	—	2	—	—	—	—	—	2	—	1	—	—	—
Parmelia acetabulum	4	—	1	1	—	3	—	1	—	1	2	—	—	—	1	1	2	1	—	—
— elegantula	—	—	2	1	—	—	—	1	—	—	—	—	—	—	—	—	1	3	—	—
— exasperata	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—
— exasperatula	—	1	1	—	1	1	—	—	1	1	1	—	1	3	—	2	—	—	—	1
— fuliginosa	1	1	1	—	—	—	—	—	—	2	—	2	—	1	—	1	—	—	2	—
— furfuracea	—	2	—	—	—	—	—	—	—	—	1	3	—	—	—	—	—	—	—	—
— laciniatula	3	3	3	4	5	3	4	3	4	3	5	3	4	1	3	3	2	3	3	4
— physodes	—	1	—	1	1	1	1	—	2	—	—	2	1	1	—	—	—	—	2	2
— saxatilis	—	—	—	—	1	—	—	—	3	—	—	—	—	2	—	—	—	—	—	—
— subaurifera	—	1	1	—	—	1	—	—	—	1	—	—	1	—	1	—	—	—	—	—
— sulcata	—	2	1	1	2	—	—	2	1	2	1	—	1	3	—	1	—	2	2	1
— tubulosa	—	2	—	—	—	—	—	1	—	—	—	—	1	—	—	—	—	—	1	—
Pertusaria amara	1	—	—	—	—	—	2	—	—	—	1	—	—	—	1	—	—	—	—	—
— globulifera	—	—	1	1	1	—	—	—	—	—	1	—	—	—	—	—	1	—	—	—
— — f. Henrici	1	1	1	1	1	—	—	1	3	—	—	1	—	—	1	—	—	1	—	1

Tab. XVIII. Continued.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Pertusaria leioplaca	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—
— leprarioides	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—	1	—	—	—	—
— lutescens	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—	—	—	—
— pertusa	—	1	1	1	1	—	—	—	—	—	1	—	—	1	—	1	1	1	—	1
— subviridis	—	—	—	2	—	—	—	—	—	—	1	—	—	—	1	1	—	3	—	—
— Wulfenii	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—
Phlyctis argena	3	3	3	2	1	2	4	4	2	4	1	3	2	1	1	—	1	—	1	1
Physcia ascendens	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—
— grisea	3	—	2	—	—	—	—	1	—	—	1	—	—	—	1	3	1	1	—	—
— leptalea	—	—	1	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
— pulverulenta	—	—	3	—	—	—	—	—	—	—	—	—	—	1	1	—	—	—	—	—
— tenella	2	—	2	1	—	1	—	1	2	3	1	2	2	3	2	3	1	—	1	3
Ramalina farinacea	—	1	1	—	1	—	—	—	1	1	1	—	—	1	—	1	—	—	1	1
— fastigiata	1	—	1	1	—	—	—	1	—	2	—	—	—	—	1	—	1	1	1	—
— pollinaria	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—
Xanthoria candelaria	—	—	—	1	—	—	1	—	—	—	—	1	1	—	1	—	—	—	—	—
— fallax	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—
— parietina	—	—	1	—	—	—	—	—	—	1	—	—	—	—	—	—	1	1	—	—
— polycarpa	1	—	—	1	1	—	1	1	—	—	1	1	1	—	1	1	—	—	—	1
Schizophyllum commune	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Coccoid Chlorophyceae	—	+	—	+	—	+	+	+	+	+	+	+	—	—	+	—	+	—	+	—
Hypnum cupressiforme	2	—	—	—	1	—	—	—	—	—	1	—	—	—	3	2	1	1	—	—
Leucodon sciuroides	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	1	—	—	—	—
Neckera complanata	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Orthotrichum affine	1	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
— Lyellii	—	—	—	—	—	—	—	1	—	1	—	—	—	—	—	—	2	—	—	—
— octoblephare	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—
— stramineum	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Frullania dilatata	—	—	—	1	—	—	—	—	—	—	—	—	—	2	—	—	—	1	—	—
Metzgeria furcata	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	—	—

*argena, Physcia grisea** and *tenella**, *Ramalina farinacea* and *fastigiata*, and *Xanthoria polycarpa**. The species marked with an asterisk are differential species of the rich bark, never occurring on dust-free bark. Quite like *P. elegantula, P. laciniatula* is seldom found on well illuminated trunks, where it succumbs to *Evernia, Ramalinae, Xanthoriae*, and other photophilous lichens. The latter species play quantitatively subordinate parts in *P. laciniatula* -societies, which nevertheless should be treated as belonging to a subphotophobous and subacidiphilous aspect of the *Xanthorion* (cf. under *Pertusaria subviridis* and *Parmelia elegantula*).

Measurements of pH from *P. laciniatula*-societies (30 samples from several stations in Skåne and Sjælland; substratum: dust-impregnated bark of *Acer*, *Aesculus*, *Alnus*, *Fagus*, *Fraxinus*, *Quercus*, and *Ulmus*) showed variations between 4.9 and 5.9, mean 5.5. The lowest values were from *Alnus* and *Quercus* (each 3 samples), in both cases varying between 5.0 and 5.3; thus distinctly higher than stated for dust-free *Alnus* and *Quercus* with coniophobous vegetation (cf. under *Parmelia revoluta* and *Arthonia impolita*). From typical aspects of the *Xanthorion* (from still more dust-impregnated and illuminated stations) Du Rietz (1945 p. 149) and Krusenstjerna (1945 p. 239) recorded pH values between 6 and 7.

Affinity and Variation. — *P. laciniatula* is a well-defined species distinguished from other brown *Parmeliae* by its fine-lobate thallus without soredia or real isidia. As to its relation to *P. elegantula*, cf. under this species. — *P. laciniatula* is a rather uniform species, the few forms described having a very slight taxonomic value. F. *exilis* Erichs. (1930) is a lignicolous »Kümmerform» with a small thallus and sparsely developed laciniae. Probably it is caused by the abnormal substratum. F. *fusca* Servit (1934) has a dark brown thallus, no doubt a normal protective reaction of the lichen against too strong illumination. A form of *P. exasperatula* with the spatuliform isidia partly developed into foliose laciniae, f. *sublaciniatula* Erichs. (1930), somewhat resembles *P. laciniatula*, but cannot in any respect displace the specific limits between the two species.

All Scandinavian specimens seen have been sterile. Fertile gatherings have been recorded, as very rare, from Central Europe (sec. Hillmann). Its reproduction is mainly vegetative through fragmentation of the fine lobes of the thallus.

19. *Parmelia revoluta* Flk.

Cf. Zahlbruckner Cat. Lich. VI (1929) p. 193, Degelius Ozean. Element der Strauch- und Laubflechtenflora v. Skand. (1935) p. 130, and Hillmann in Rabenhorst's Kryptogamen-Flora IX.5:3 (1936) p. 204.

History. — This lichen was described in 1815 by Floerke from Tiergarten in Berlin. Though it was found in several parts of Europe in the 19th century and was never considered a critical lichen, it was not recorded from Sweden until in 1932, when Degelius published a find from the neighbourhood of Göteborg. Further finds have been reported by Degelius (1937, 1939 b) and the present writer (1942). Up to now about 50 Swedish stations are known by me. The first

finds from Norway (by Degelius and Ahlner) are listed below. The species was first found in Denmark (Sönderjylland) by ERICHSEN in 1915, published in 1939. The following list contains 13 Danish stations.

Scandinavian Distribution (substratum *Alnus glutinosa* unless otherwise stated).

Sweden.

Skåne. Bara: Bokskogen, near the restaurant, 1946! (L). — Billinge: Storegården, at the outflow of the Billebäck into the Rönneå, one specimen, 1942 S. Waldheim (L) ALMBORN 1942 p. 400. — Bjäresjö: the wood N. of Bergsjöholm, 1944! (L, O, S, U). — Bosjökloster: Sätofta No. 10, rather scanty, 1942! (A, L, O, S) ALMBORN l.c. — Brönnestad: Tormestorp, at the outflow of the T. rivulet, 1943! (L); N. of T. Klint, very scanty, 1943 Deg. and ! (Ds, L). — Brösarp: 2 km. E. of Hörröd, scanty, 1943! (L). — Dalby: Sjöstorp (W. of the road D.—S. Sandby), 1943! (L, S, U); ibm. 1943 Deg. and ! (Ds); ibm. 1947 Sant. and ! (U). — Fjärestad: Nymöllan, near Gantofta, some specimens, 1943! (L, S, U). — Genarp: between G. and Häckeberga, 1945, 46! (L). — Hjärnarp: Hulebäckseröd, on the Kägleå, one specimen, 1942! (L) ALMBORN l.c. — Hyby: Sjölund, in a pasture, 1944! (L); N. end of Lake Yddingen, 1944! (L). — Hästveda: W. of the church, rather scanty, 1944! (L, S). — Hörja: at the road 1.5 km N.W. of H. 1945! (L, S). — V. Karup: Norrviken, pasture S. of the road E. of the gardens, 1942! (A, G, L, S, U) ALMBORN l.c. — Kropp: Västraby, 1943! (L, S). — Ö. Ljungby: Stidsvig, immediately W. of the main road, rather abundant, 1942! (L, S) ALMBORN l.c. — Matteröd: Pilatorpet, one small specimen, 1943! (L). — N. Mellby: Adseke, 1945! (L, S). — Munkarp: Ry, W. of the road, abundant, 1942, 47! (Ds, H, K, L, M, S, U) ALMBORN l.c. — Riseberga: S.E. of Anderstorp, scanty, 1942! (L, S); Herrevadskloster, N.W. of the mansion, rather abundant, 1942! (A, D, L, S, U) ALMBORN l.c. — Röddinge: between Kurremölla and Ängeldal, one specimen, 1943! (S). — Röstånga: S. of the road to Gillastig, scanty, 1942! (L) ALMBORN l.c. — Sövde: Assmåsa, near Lake Snogeholmssjön, 1943 ! (L, S). — Sövestad: Krageholm, 1943! (S); island of Lybäck 1944! (L). — Tjörnarp: Torup, pasture near the road, scanty, 1947! (L). — Torekov: E. of the village, several specimens on one tree, 1942! (A, L, S, U) ALMBORN l.c. — Tosjö: Vilan, at the crossroads, some specimens on one tree, 1942! (L, S) ALMBORN l.c. — N. Vram: N.W. of Finnshus, one specimen, 1942 S. Waldheim (L) ALMBORN l.c. — V. Vram: 2 km. E. of the church, near the main road, 1947! (L). — Ystad: near Saltsjöbaden (at the restaurant), several specimens on one tree, 1943! (L, S, U). — Örkelljunga: Hjälmsjö, by a brook near the road to Röke, 1942! (H, L, O, S) ALMBORN l.c.

Småland. Markaryd: Tånneryd, scanty, 1947! (L). — Vrå: Bodaberg, S. of the bridge over the Kroká, several specimens at the base of one tree, 1943! (A, L, S).

Halland. Alfshög: Krokalund, some specimens in an alder grove near the road, 1945! (L). — Frillesås: Snogge, several specimens, 1945! (Ds, L, S). — Gällinge: between Gödatorp and Breared, scanty, 1938 Deg. (Ds) DEGELIUS

1939 b p. 394. — Hasslöv: S. of Bondåkra, near a brook, one small specimen. 1942! (L) ALMBORN l.c. — Lindome: Rantorp. 1937 Deg. (Ds, G, S, U) DEGELIUS 1937 p. 499. — Rolfstorp: Kärrsgården, near a brook. 1943! (L, S). — Sibbarp: S. of Skärbäck, by the lake, some specimens on one tree. 1945! (L, S). — Skrea: 2 km. S. of Falkenberg, in an alder grove near the road, scanty. 1947! (L). — Snöstorp: Marbäck, between the two furrows of the Fylleå, several specimens on one tree. 1942! (L, S, U) ALMBORN l.c.; Fyllinge, S. furrow of the Fylleå, W. of the bridge. 1943! (L). — Tvååker: N. of Galtabäck, W. of the main road, one specimen. 1947! (L). — Vinberg: Tröinge, in a pasture, rather abundant. 1945! (L, S). — Växtorp: Jonstorp, by a brook N. of the village, one specimen. 1942! (L) ALMBORN l.c. — Värö: Backa. 1938 Deg. (Ds, G, U) DEGELIUS 1939 b p. 394. — Ås: Stengårdshult, alder grove N. of the road. 1943! (L, S).

Västergötland. Göteborg: N. of Eklanda, 1942 Magn. (M). — Mölndal: Kärra, near Kroken, rather abundant on *Alnus, Fraxinus,* and *Prunus Padus.* 1932 Deg. (Ds, Dz, U); ibm. 1932 Deg. and Hasselrot (Ds, H) DEGELIUS 1932 p. 278, 1935 p. 130, 353; ibm. 1933 Deg. and Magn. (MAGN. exs. 138); ibm. 1937 Deg. and ! (A, K, L, S); ibm. 1937 Deg. and Hedv. (L).

Norway.

Rogaland. Forsand: Frafjorddalen, Brådland, pasture at the E. side of the river, near the bridge, abundant on *Alnus incana* and *Sorbus aucuparia.* 1947 Deg. (Ds, L). — Hetland: W. of the railway station Vaulen, some specimens on *Abies* in a plantation. 1947 Ahlner (Ar).

Hordaland. Etne: S. of Fossa, some specimens on *Alnus incana.* 1947 Ahlner (Ar). — Ölen: N.W. of Haugen (1 km. N.E. of Ölensjöen), some specimens on *Salix caprea.* 1947 Ahlner (Ar, O, U).

Denmark.

Sjælland. Frederiksborg Slotssogn (pr. Hillerød): St. Dyrehave one small specimen. 1946! (L).

Falster. Falkerslev: Virket Lyng, on *Rhamnus Frangula.* 1943 Chr. (K) CHRISTIANSEN 1947 p. 180.

Fyn. Vejstrup: Tiselholt Skov. 1946 Chr. (K). — Ore: W. of Knarreborg, in a small alder grove. 1946 Chr. (K) CHRISTIANSEN l.c.

Jylland. Agri: Strandkær, Dunholmene. 1944 Chr. (K, L) CHRISTIANSEN 1946 p. 82. — Bov: Kollund, N. of the youth hostel, on *Fagus.* 1946! (L, S). — Dronninglund: near the mansion, scanty. 1947! (L). — Flade: Bangsbo (pr. Frederikshavn), on *Alnus* and *Sorbus aucuparia.* 1947 Magn. (L, M). — Gaverslund: Munkebjærg, near the restaurant, some specimens on *Fagus.* 1946! (L, S). — Hammelev: Törning Gd, on *Aesculus.* 1938 Er. ERICHSEN 1939 p. 79. — Rold: Rold Skov, some specimens. 1947! — Nr Vilstrup: Kelstrup, on *Fagus.* 1945 Er. ERICHSEN 1939 p. 79. — Vinding: near Ulvehave. 1941 Er. (K) CHRISTIANSEN 1947 p. 180.

DEGELIUS (1935) recorded *P. revoluta* as belonging to the oceanic element of the Scandinavian lichen flora. What has been known during

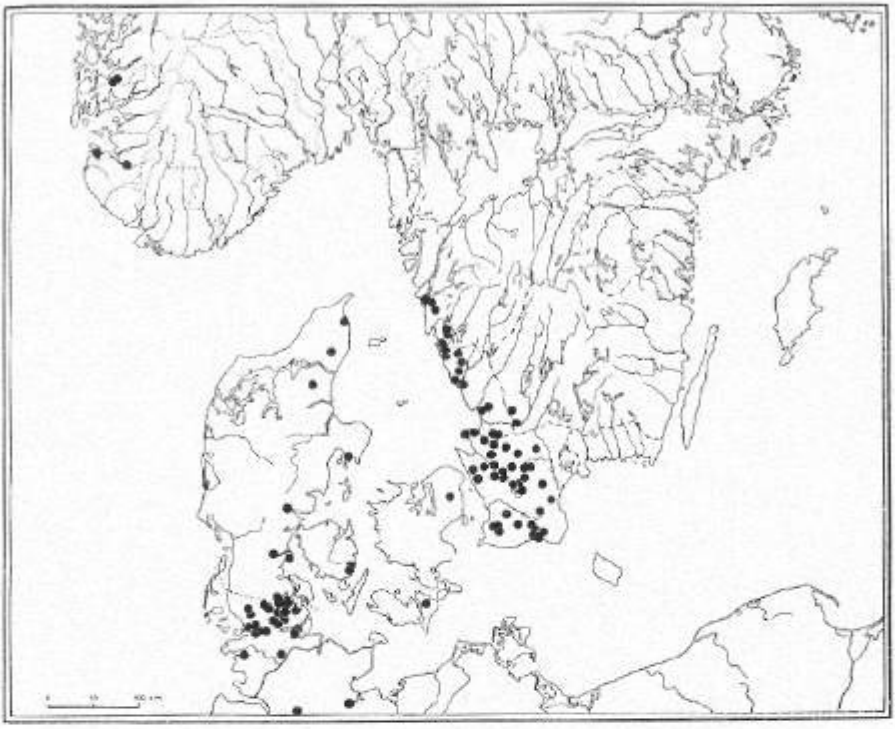


Fig. 23. *Parmelia revoluta* in Scandinavia.

the last decennium about its Scandinavian area does not indicate a typical oceanic species, as it is rare or lacking in the extreme oceanic districts (W. Norway and the Femsjö district in Småland). Its Scandinavian area conforms far more with e.g. *P. elegantula* and *P. laciniatula* than with oceanic species. (Cf. the maps of e.g. *Lobaria amplissima* and *Pannaria pityrea* ap. DEGELIUS l.c.) When once recognized, it has proved to be no rare species in suitable localities in Skåne (except the N.E. part) and Halland. We should have expected it to be more common in Denmark than the few stations indicate, but its rareness there is at least partly due to the rather sparse occurrence of its chief substratum, *Alnus glutinosa*.

Extra-European Distribution. — The European distribution of *P. revoluta* falls chiefly within the central and western part of the continent.

It is recorded (cf. ANDERS 1928, HILLMANN l.c.) from most parts of Germany, e.g. Schleswig-Holstein («zerstreut», sec. ERICHSEN in manuscr.), Branden-

burg (»selten», sec. HILLMANN), Oldenburg (»häufig», sec. SANDSTEDE 1912), Hannover, Westphalia, Silesia, Saxony, Wurtemberg, Baden, Bavaria (collected at 1200 m near Berchtesgaden, sec. HILLMANN). The same authors also recorded it from Switzerland, Austria, and Czecho-Slovakia (»in Nordböhmen ser selten und wenig entwickelt, im übrigen Böhmen sehr zerstreut, nicht über 1000 m aufsteigend», sec. ANDERS l.c.).

MAAS GEESTERANUS (1947) reported it from several stations, mainly on *Quercus* and *Fagus*, in the Netherlands. It is distributed over all France, though not common, sec. HARMAND 1909 (»sans etre très commun . . cependant assez pour qu'il soit superflu de citer des localités»). In the British Islands A. L. SMITH (1918) recorded it as »general but not common in S.W. and N. England, rare in the Channel Islands, S. Scotland and the W. Highlands and W. Ireland». KNOWLES (1929) reported 7 Irish stations.

In the Iberian Peninsula it is »ziemlich verbreitet», sec. DEGELIUS 1935 (collected by Degelius in Spain and Portugal). TAVARES (1945) recorded it from some stations in the western provinces of Portugal, mainly N. of river Tejo. In Italy, JATTA (1909) stated it to be distributed »ad terram, truncos et rupes muscosas, in Alpibus et in montibus Campaniae, in Igilio insula (et in Etruria)». SBARBARO (1932) reported it from the Gulf of Genoa. In the Balkan Peninsula it seems to have been collected chiefly in Yugo-Slavia (sec. DEGELIUS).

Though mainly distributed in the oceanic districts of Europe it is also recorded from some stations in E. Europe. LETTAU (1912 b) stated it from the former German East Prussia, and SULMA (1935) from the Lublin Highland in S. Poland. MINIAEV (1936) reported it from the neighbourhood of Leningrad in Russia and OXNER (1937) from the neighbourhood of Kiev.

The species has a wide distribution in tropical, subtropical, and temperate districts in all parts of the world. For a detailed survey of the extra-European literature (some records probably not trustworthy) I refer to DEGELIUS (1935) and MINIAEV (1936). Cf. also DEGELIUS 1940 c and 1941, where the species is reported as new to U.S.A. (from Maine, N. Carolina, and Tennessee). MINIAEV also gave a schematic and (at least as to Europe) not very exact map of its total distribution.

Habitat Ecology. — In Scandinavia our species is as a rule met with on a very special substratum, the trunks of *Alnus glutinosa*. It is very seldom recorded from other trees. At Mölndal it grew also on *Fraxinus* and *Prunus Padus*, and in Denmark it has been found on *Fagus*, *Aesculus*, and *Rhamnus Frangula*. In other parts of Europe it is recorded from almost all species of deciduous and coniferous trees and occasionally also on rocks. In Skåne and Halland it is found especially in small alder groves along brooks and rivers and in not too damp alder woods (not in bogs etc.).

The *Parmelia revoluta* -communities belong to the union *Physodeto-sulcatetum* of the federation *Physodion* (cf. DU RIETZ 1945 p. 147, KRUSENSTJERNA 1945 p. 91). As constants can be regarded *Cladonia ochrochlora*, *Parmelia fuliginosa* var. *laetevirens*, *P. sulcata*, and *Phlyc-*

tis argena. Relatively frequent constituents are also *Evernia prunastri*, *Lecanora subfusca*, *Lepraria aeruginosa*. *Parmelia physodes*, *saxatilis*, and *subaurifera*, *Pertusaria amara*, and *Hypnum cupressiforme*. As seen by tab. XIX, *Parmelia physodes* often plays a considerable part, but as a rule it yields to some extent in favour of *P. sulcata*, which is a true companion of *P. revoluta*. Therefore *P. revoluta* is never met with in the *Euphysodetum* (with *P. physodes* absolutely dominating and *P. sulcata* lacking or very scarce) characteristic of the alder trunks of E. Sweden. The number of species in *P. revoluta* -societies is rather large but smaller than in *P. laciniatula* -societies (cf. tab. XVIII). The chief differential species of the eutrophiated bark (*Xanthorion*), e.g. *Physcia* and *Xanthoria* species, are lacking in *P. revoluta* -societies, but traces of coniophilous lichens (small specimens of e.g. *Anaptychia ciliaris*, *Buellia punctiformis*, *Parmelia exasperatula*, *Pertusaria globulifera* f. *Henrici*, and *Xanthoria polycarpa* have occassionally been listed together with *P. revoluta*). On beech bark the community has a somewhat, though not much, different composition; at least in the few analysed societies (XIX: 18—20), characteristic beech epiphytes play a small part (only *Pertusaria Wulfenii* and the fungus *Dichaena faginea* listed). Though it has its optimum on dust-free bark in woods and groves, *P. revoluta* is sometimes met with on slightly eutrophiated bark near roads and houses.

P. revoluta is rather tolerant as to various light conditions though mainly a photophilous lichen. Its power of competition is much inferior to that of *P. physodes* and of *P. sulcata*. Therefore it is often found only in some few specimens, seldom constituting societies of its own.

The investigated *P. revoluta* -societies are pronouncedly acidiphilous, owing to the effect of the acid *Alnus* bark.

Measurements of pH (30 samples from 3 stations, Sk. Dalby, Munkarp: Ry, and Tjörnarp; all from dust-free or slightly dust-influenced alder bark showed a small variation between 4.5 and 5.0, mean 4.8. Cf. further p. 221.

Affinity and Variation. — Concerning the specific differences between *P. revoluta* and other grey *Parmeliae*, especially *P. sulcata*, I refer to Anders (1928), Degelius (1932), and Maas Geesteranus (1947). It is easily recognized from the latter species by its somewhat lighter grey colour and especially by its revolute lobes bearing punctiform, soon confluent soredia, often with a greenish-yellow colour (never with reticulate sorediate furrows as in *P. sulcata*). All plants investigated

Tab. XIX. Parmelia revoluta - communities.

1—17 on the trunks of *Alnus glutinosa*, 18—20 on *Fagus*. — 1. **Sk.** Bosjökloster: Sätofta, S. exposure. — 2. V. Karup: Norrviken, N. exp. — 3. Ö. Ljungby: Stidsvig, E. exp. — 4—6. Munkarp: Ry, E. exp. — 7. Ystad: Saltsjöbaden, S. exp. — 8. Kropp: Rosendal, E. exp. — 9. Riseberga: Herrevadskloster, N. exp. — 10. Röstånga, S. exp. — 11. Torekov, N. exp. — 12. Tosjö: Vilan, N. exp. — 13. **Sm.** Markaryd: Tånneryd, W. exp. — 14. **Hl.** Hasslöv: Bondåkra, W. exp. — 15. Växtorp: Jonstorp, S. exp. — 16. Rolfstorp: Kärrsgården, S. exp. — 17. **Jl.** Dronninglund, E. exp. — 18. Bov: Kollund, S. exp. — 19—20. Gaverslund: Munkebjærg, W. exp.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Anaptychia ciliaris	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Buellia betulina	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	**2**	**3**
— punctiformis	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—
Cetraria chlorophylla	—	—	—	—	—	—	—	—	—	1	—	1	—	—	—	—	—	—	—	—
— glauca	—	—	1	1	—	—	—	—	1	—	—	2	1	—	1	—	—	—	—	—
— pinastri	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Cladonia ochrochlora	2	2	1	1	**3**	1	1	2	**2**	—	**2**	**2**	1	1	—	1	**4**	—	1	—
Evernia prunastri	1	2	1	1	—	—	1	—	—	1	2	2	—	1	2	—	—	1	1	1
Lecanora expallens	—	—	—	—	—	—	1	—	—	—	—	—	1	—	—	**3**	1	—	—	—
— subfusca (coll.)	—	—	—	1	—	1	—	1	—	—	—	—	**2**	—	2	1	2	—	—	1
Lecidea quernea	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—
Lepraria aeruginosa	1	—	—	—	1	**2**	2	1	—	—	—	1	1	—	—	—	**2**	**3**	1	1
Ochrolechia androgyna	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	1	—	—	—	—
Parmelia Bitteriana	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—
— exasperatula	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—
— fuliginosa	—	—	—	1	—	—	—	—	—	—	1	—	—	—	1	—	—	—	—	—
— — var. lactevirens	2	1	2	1	1	2	**4**	1	—	2	—	2	2	1	—	1	—	1	2	1
— furfuracea	—	—	—	1	—	—	—	—	1	1	—	1	1	—	—	—	—	—	1	—
— physodes	—	1	2	2	—	1	**3**	—	**2**	**3**	1	2	**3**	1	**2**	—	—	—	2	3
— revoluta	**3**	**4**	**3**	**4**	**4**	**3**	**4**	**5**	**3**	**4**	**3**	**3**	**3**	**3**	**3**	**4**	2	**3**	1	1
— saxatilis	1	1	1	2	—	—	—	—	2	1	1	—	—	—	—	1	—	1	3	—
— subaurifera	—	2	1	—	—	—	—	—	1	1	1	1	—	1	1	—	—	—	—	—
— sulcata	**3**	1	**3**	2	1	1	1	1	**3**	1	3	1	1	**3**	**3**	1	1	—	1	1
— tiliacea	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—
— tubulosa	—	2	—	1	—	—	—	—	—	**2**	—	1	**3**	—	1	—	—	—	—	—
Parmeliopsis ambigua	—	—	1	1	—	—	—	—	1	2	—	—	—	—	1	—	—	—	1	—
Pertusaria amara	1	—	2	1	—	1	—	—	2	—	2	1	—	—	—	—	2	—	3	—
— coccodes	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—
— globulifera	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
— — f. Henrici	1	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—
— maculata	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
— pertusa	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—	1	—
— Wulfenii	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—
Phlyctis argena	**3**	—	**3**	**3**	**3**	**4**	2	**2**	**3**	2	3	**3**	**3**	3	2	**3**	**3**	**3**	1	—
Ramalina farinacea	1	1	1	—	—	—	—	—	—	1	—	—	—	1	—	1	—	—	—	—
— fastigiata	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Usnea hirta	—	—	—	—	—	—	—	—	—	1	—	—	1	—	—	—	—	—	—	—
Xanthoria polycarpa	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Dichaena faginea	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	**3**	—
Hysterium pulicare	—	—	—	—	1	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Tab. XIX. Continued.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Coccoid Chlorophyceae	—	—	—	—	—	+	+	—	—	—	—	—	+	—	—	—	+	+	+	+
Hypnum cupressiforme	1	2	1	—	1	—	1	1	—	2	2	2	—	—	—	—	4	2	1	—
Neckera pumila	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Plagiothecium latebricola	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—
— silvaticum	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—
Ulota Bruchii	—	1	—	—	—	—	—	—	—	—	—	—	1	—	1	—	—	—	—	—
Frullania tamarisci	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Lophocolea heterophylla	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—

have given a distinct C+ rosa reaction in the medulla and the soredia. DEGELIUS found part of this material from Mölndal C—, a statement which I have not been able to confirm.

Some modifications, apparently with no taxonomic value, have been described on South-European specimens. F. *latifolia* (Anzi) Oliv. and f. *angustifolia* (Anzi) Oliv., both described from Italy, are probably only extreme growth forms. F. *rugosa* (Tayl.) Hillm. with the whole surface of the thallus dissolved in soredia, seems to be due to impregnation with dust. ERICHSEN (1941) recorded two forms from the neighbourhood of Hamburg, f. *minor* (Harm.) Sandst., a dwarf form, and f. *foliolifera* Erichs. with a somewhat granulate thallus partly dissolved in small laciniae. Sec. specimens in herb. S, both forms are slight modifications caused by unfavourable habitats (trees near roads). The Scandinavian population is very uniform. None of our specimens are so deviating as to justify a special name.

Apothecia seem to be rare over its whole area. They have never been found in Scandinavia.

20. *Pertusaria leptospora* Nitschke.

Cf. ZAHLBRUCKNER Cat. Lich. V (1928) p. 170 and ERICHSEN in RABENHORST'S Kryptogamen-Flora IX.5: 1 (1936) p. 611.

History. — This lichen belongs to a critical group of the genus *Pertusaria*. It was described by NITSCHKE from Westphalia in 1883. Already in 1887 HELLBOM reported it from the island of Hallands Väderö in Sweden, but his specimens belong to *P. velata* (cf. ALMBORN 1942

p. 398 and the present work p. 186). In fact the real *P. leptospora* had been collected (as *P. sorediata*) already by E. FRIES at Femsjö in Småland. The chief part, however, of his *P. sorediata* is referable to *P. amara* (cf. E. FRIES 1831 p. 422). The first correct record of *P. leptospora* from Sweden is as late as from 1940, when ERICHSEN published a find from the Kullen in Skåne, which he had earlier determined as *P. multipuncta*. At present I know it from 12 Swedish stations.

There is no statement from Norway but the closely related species *P. laevigata* is collected near Larvik (cf. below). The first record from Denmark was made by ERICHSEN in 1942 (collected by him in 1919). The following list contains 10 Danish stations.

Scandinavian Distribution (cf. ALMBORN l.c.).

Sweden.

Skåne. Brunnby: near Mölle, on an old *Fagus*. 1911 Er. ERICHSEN 1913 p. 64 (as *P. multipuncta*), 1940 p. 40. — Riseberga: Skäralid, on *Fagus*. 1947 H. Runemark (L). — [Torekov: Hallands Väderö, in the southern forest, on *Quercus*. 1884 Hellb. HELLBOM 1887 p. 48 (as *P. multipuncta*). No specimens seen; perhaps referring to *P. leptospora*. The *P. leptospora* recorded by HELLBOM (l.c.) is *P. velata* (cf. p. 186).] — Vittsjö: Boalts böke, on *Fagus*, abundant. 1945, 47! (A, Ds, K, L, M, S, MAGN. exs.).

Småland. Femsjö: on *Fagus*. E. Fries (U as *P. sorediata*) TH. FRIES 1871 p. 309. — Landeryd: N. of Jansbergssjön, several specimens on a young *Fagus*. 1945! (L, O, S, U).

Halland. Abild: Arnared, several specimens on *Fagus*. 1945! (H, L, O, S). — Knäred: near the power station, on *Carpinus*. 1936 Me (S) MALME 1937 p. 181 (as *P. multipuncta*); On, on *Fagus*. 1936 Me (S, an undetermined specimen).

Bohuslän. Hjärtum: Hasteröd, on *Quercus*. 1937 Magn. (MAGN. exs. 302 as *P. multipuncta*); ibm. 1937 Deg. (Ds); near Holmvattnet (at the Vargklintarna), on *Corylus*. 1937 Hedv. (L as *P. multipuncta*); W. side of the Lysebergen, on *Quercus*. 1935 Hedv. (L, M as *P. multipuncta*). — Jörlanda: Ranebo, scarce on *Quercus*. 1945 Magn. (M) MAGNUSSON 1946 p. 213.

Denmark.

Sjælland. Hillerød: on *Quercus* in the park. 1919 Er. ERICHSEN 1942 p. 145. — Vallö: Vallö Dyrehave, on an old *Quercus*. 1941 Er. ERICHSEN l.c.

Fyn. Middelfart: Fænö, on *Quercus*. 1925 Er. ERICHSEN in litt.

Jylland. Broager: Kobbelskov, on *Fagus*. 1913 Er. ERICHSEN in litt. — Ensted: Sr Hostrup, Agesö (»Aagsee«), on *Fraxinus*. 1913 Er. ERICHSEN in litt. — Gaverslund: Munkebjærg, abundant on *Fagus*. 1939, 46, 47! (A, Ds, G, K, L, M, O, S, U) ALMBORN 1939 p. 776 (as *P. laevigata*; cf. below). — Hammelev: Pamhule Skov, on *Crataegus*. 1947 Chr. (K). — Løgumkloster: Draved

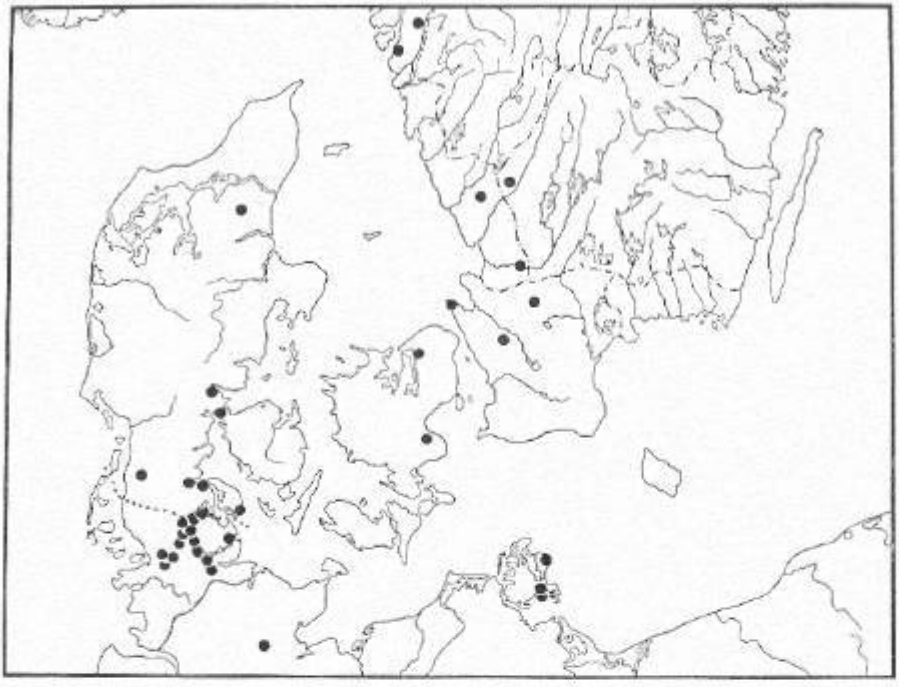


Fig. 24. *Pertusaria leptospora* in Scandinavia.

Skov, on *Fagus*. 1908 Er. Erichsen in litt. — Sköping: Buderupholm, on *Fagus*. 1943 Chr. (K. L.). — Varnæs: Tykskov, on *Fagus*. 1913 Er. Erichsen in litt.

[Bornholm. Vestermarie: Almindingen, at the road from Kristianshöj to Rokkestenerne, rare on deciduous trees. Hellbom 1890 p. 66 (as *P. multipuncta*). No specimens seen; perhaps belonging to *P. leptospora*.]

In Scandinavia *P. leptospora* is restricted to the beech districts, though it is no obligate beech epiphyte. Its distribution is southern-oceanic with centres in the districts with a high annual precipitation (S. W. Sweden, S.E. Jylland). It is absent in the oceanic districts of W. Norway, probably because it needs a relatively high summer temperature (cf. Chapter VI B).

Extra-Scandinavian Distribution. — *P. leptospora* has its chief distribution in Central and Western Europe.

From Germany Erichsen (l.c.) reported it as »in Nordwestdeutschland und Schleswig-Holstein verbreitet wenn auch nicht gerade häufig». Stations have been

recorded from Schleswig-Holstein, Rügen, Brandenburg, Oldenburg (SANDSTEDE 1912), Westphalia, Boden (all from ERICHSEN l.c.), and Bavaria (ERICHSEN 1940). It is also known from Schoenhorst in the Netherlands (ERICHSEN 1936). In France it is recorded from the W. and N.W. parts (OLIVIER 1912). I have seen a specimen from England: Lamorran woods in Cornwall, leg. F. A. Sowter (L). One station is known from Rumania (CRETZIOU 1937). A schematic map of its distribution is given by ERICHSEN 1940. As far as known the species is endemic in Europe.

Tab. XX. Pertusaria leptospora - communities.

On the trunks of middle-aged *Fagus*. — 1—4. **Sk.** Vittsjö: Boalts böke, all in S. exposure. — 5. **Sm.** Landeryd: N. of Jansbergssjön, S. exp. — 6. **Hl.** Abild: Arnared, S. E. exp. — 7. **Jl.** Gaversiund: Munkebjærg, N. exp. — 8. Ibm, W. exp.

	1	2	3	4	5	6	7	8
Arthonia radiata	—	—	—	—	—	—	1	—
Buellia betulina	—	—	—	1	1	—	—	—
Cladonia ochrochlora	1	1	1	—	—	—	—	—
Evernia prunastri	1—	2	1	1	1	—	—	—
Graphis scripta	1	—	—	—	—	1	1	—
Lecanora glabrata	—	—	1	2	1	1	—	—
— intumescens	1	—	—	1	—	2	—	—
— subfusca (coll.)	1	—	—	—	3	2	—	1
Lecidea cyathoides var. corticola	—	—	—	1	1	—	—	—
— quernea	—	1	—	—	—	—	—	—
Lepraria aeruginosa	—	2	2	1	1	1	3	3
Ochrolechia androgyna	—	—	—	—	1	—	—	—
Opegrapha viridis	3	1	—	—	—	—	—	4
Parmelia fuliginosa var. laetevirens	—	1	1	1	—	—	2	1
— physodes	—	1	—	1	1	—	—	—
— saxatilis	—	—	—	2	—	—	—	—
— subaurifera	1—	—	—	—	1	—	—	—
— sulcata	—	1	—	2	1	—	1	—
Pertusaria amara	—	—	—	—	3	2	—	—
— hemisphaerica	—	1	—	—	1	—	—	—
— leioplaca	2	—	1	2	2	1	—	—
— leptospora	3	2	3	3	3	2	2	3
— pertusa	2	4	5	3	1	2	2	3
— Wulfenii	1	1	—	—	—	2	—	—
Phlyctis argena	1	1	1	—	2	1	1	3
Dichaena faginea	3	—	—	—	—	2	—	1
Coccoid Chlorophyceae	—	—	—	—	—	—	+	+
Hypnum cupressiforme	2	3	3	1	2	—	1	1
Neckera pumila	—	—	—	—	—	1	—	—
Ulota cfr Bruchii	—	—	—	1	—	—	—	—
Frullania dilatata	—	—	—	—	1	1	—	—

Habitat Ecology. — *P. leptospora* is mainly a beech epiphyte, in Scandinavia as well as in other districts. Occasionally it has also been collected on *Quercus*, *Fraxinus*, and *Corylus*. I have studied the lichen

growing on *Fagus* on some localities (tab. XX) where its chief companions were *Evernia, Lecanora glabrata* and *subfusca, Lepraria aeruginosa, Parmeliae, Pertusaria leioplaca* and *pertusa, Phlyctis argena,* and *Hypnum cupressiforme.* The presence of *Evernia* and *Parmeliae* indicates rather illuminated stations. In Sweden it was also as a rule observed as growing on the southern sides of the trunks. Two records (XX: 7, 8) from the Munkebjærg locality in Denmark were taken from rather shadowy beech trunks with abundant *Lepraria* and green algae. No coniophilous species have been listed together with *P. leptospora.* Its power of competition is not very great, as more than a few specimens on each trunk are seldom met with.

Measurements of pH show values normal for dust-free beech trunks. 20 samples (from Sk. Vittsjö and Jl. Gaverslund) had values between 5.0 and 5.4, mean 5.2.

Affinity and Variation. — Our species belongs to the section *Multipunctae* of the subgenus *Variolaria,* a polymorphous group of species whose amplitude of variation is still difficult to survey. ERICHSEN (1936, 1938 b) has described several »Kleinarten» from various parts of Europe so that in all 12 corticolous species of this section (besides some saxicolous and muscicolous ones) are known from Europe and the Mediterranean district. It is impossible to get a view of this widely ranking circle of forms without access to original specimens and to a larger material from extra-Scandinavian herbaria than is obtainable under the present conditions. The following scheme comprises only the 3 species found in Scandinavia (the little known North-Finnish species *P. atropallida* Vain. is omitted).

	P. multipuncta	*P. leptospora*	*P. laevigata*
Thickness of thallus	thin	rather thick	rather thick (in Norwegian specimens)
Taste	—	faintly bitter	—
Reaction of medulla and soredia	K—	K+ slowly yellowish, later brownish	K+ immediately intensely yellow, later brownish(—red)
Form of fertile verrucae	flat	conic—semiglobose	conic—semiglobose
Colour of disk	greyish-black, pruinose	yellowish—reddish brown, not pruinose	reddish, not pruinose, but covered with soredia
Number of spores in asci	1	1	2

P. multipuncta (Turn.) Nyl. grows chiefly on *Alnus* and *Betula* and is not known from the southern provinces of Götaland, nor from Denmark. It is habitually well separated from *P. leptospora* by its thinner, smooth thallus (this character, however, is subject to a certain variation), another form of its fertile verrucae, and another colour of the disks of the apothecia. Its negative K reaction seems to be a constant character in the plants investigated by me. I do not venture to judge the identity of *P. multipuncta* var. *leptosporoides* Erichs., which is said to be K+ yellow, later yellowish red. Perhaps rather referable to *P. leptospora*? In my opinion, the J reaction to which ERICHSEN attaches a good deal of systematic importance, is too variable, and not corresponding with morphological characters, to be of taxonomic value in this group. *P. leptospora* has also a bitter taste (not as sharp as in *P. amara*) which is not perceptible in *P. multipuncta*. According to ERICHSEN, the bitter taste is an essential character of the section *Amarae*, and the literature contains no statement of it from other sections of the genus.

P. laevigata was recorded by HÖEG (1923) from some stations on *Fagus* in the Larvik district of Norway. This species is very closely related to *P. leptospora*, and habitually HÖEG's specimens (in herb. T) cannot be distinguished from the latter species, having the same shape of verrucae and a thicker thallus than is usual in extra-Scandinavian *P. laevigata* (whose thallus is often as thin and smooth as in *P. multipuncta*). Yet the intense K reaction of *P. laevigata* and its regularly bisporous asci (only occasionally can some singular monosporous ones be found) seem to justify a specific segregation. My specimens from Munkebjærg were first determined as *P. leptospora*, but on the authority of Herr ERICHSEN I published them as *P. laevigata*. In fact all specimens from this gathering have a far fainter K reaction than in *P. laevigata* [cf. the opposite statement »doch spricht die kräftig gelbe bis trüb bräunliche K Reaktion für letztere Art (=*P. laevigata*)«, ERICHSEN 1940]. After having found ripe asci which were exclusively monosporous (most asci were quite sterile), I do not hesitate to refer this find to *P. leptospora*.

E. The *Buellia canescens* Group.

21. *Arthonia cinnabarina* (DC). Wallr.

Syn. *Coniocarpon cinnabarinum* DC. — *Arthonia gregaria* (Weig.) Kbr non Fée. — Cf. further S. Almquist Monogr. Arth. Scand. (1880) p. 20, Zahlbruckner Cat. Lich. II (1924) p. 21, VIII (1932) p. 175, X (1940) p. 129, and Rediнger in Rabenhorst's Kryptogamen-Flora IX. 2:1 (1937) p. 122.

History. — The species was described by Weigel in 1772 from Germany. Acharius did not know it from Sweden. E. Fries (1831, 1835) recorded it from Skåne, but gave no precise locality. During the last century the lichen has been collected only at three places in Sweden.

In Norway there are 7 records of the species all from the Vestland, where it was first collected by M. N. Blytt on Finnöy in Rogaland (year unknown). The locality was published by S. Almquist in 1880. The first statement of the lichen from Denmark was a picture in Flora Danica vol. VIII tab. 1352 (1808) after a specimen collected by N. Hofman-Bang, probably in Fyn. The first exact Danish locality (from Fyn) was communicated by Branth & Rostrup in 1869. At present I know 12 collections from Denmark.

Scandinavian Distribution.

Sweden.

Skåne. »Europae totius, excepta Suecia, ubi non nisi in extima Scania obvium fuit». E. Fries 1831 p. 379. — »Ad cortices *Carpini* etc. Scaniae australis». G. C. Ljungstedt (L, S) E. Fries 1835 p. 281. — Dalby: D. Söderskog, very scarce on *Fraxinus*. 1947! (L); ibm. 1947 Sant. and! (U). — Ottarp: Bältaberga, near the rivulet, some few specimens on *Fraxinus*. 1943, 46! (A, Ds, L, S). — Sine loco. E. Fries exs. 312 (f. *kermesina*).

Gotland. Stenkumla: Myrsjö (»Myrsö»). 1870 J. F. Laurer (U) S. Almquist l.c.

Norway.

Vest-Agder. Lyngdal: innermost parts of Lyngdalsfjord, on *Fraxinus*. 1939 Magn. (f. *obscura*) (M, S).

Rogaland. Finnöy: island of F. (Findö), M. N. Blytt, S. Almquist l.c. — Forsand: Dirdal, on *Fraxinus* on the slope E. of the church. 1947! (L, O, S).

Hordaland. Askö y: near Ask, on *Sorbus aucuparia*, *Corylus*, and *Fraxinus*. 1909 Hav. (B, O, Å, Hav. exs. 92, Hav. occ. exs. 521). — Fjell: Ekerhovde, on Sotra (Sartorøen) near Bergen, mainly on *Fraxinus*, rather rare, sparingly c.fr. 1897 Hav. (B, Å) Havås 1909 p. 34. — Moster: Mosterhavn, rather rare on *Fraxinus* and *Corylus*. 1915 Hav. and Lynge (O) Havås 1917—18 p. 15. — Tysnes: Sunde, Loksund, on *Fraxinus*. 1910 Hav. (Hav. exs. 611).

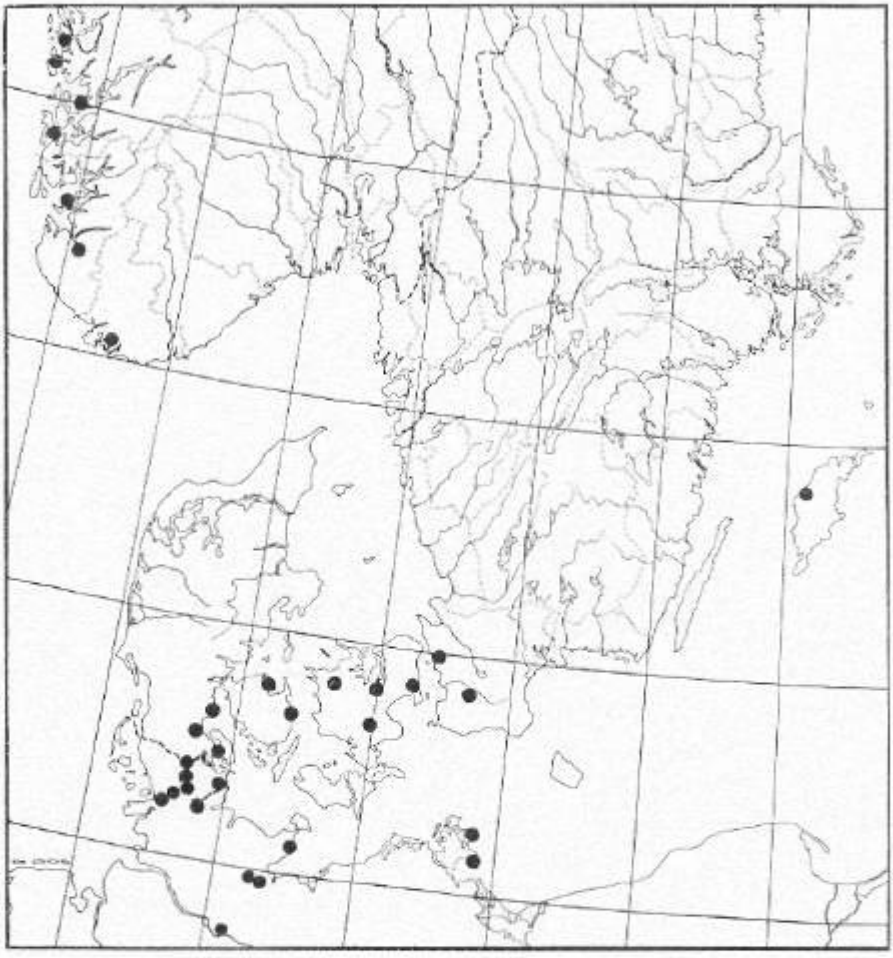


Fig. 25. *Arthonia cinnabarina* in Scandinavia.

Denmark.

»Common on the bark of *Fagus*, *Corylus*, and other trees in Denmark and the duchies» (transl. fr. Dan.). HORNEMANN 1836 p. 579.

Sjælland. Avnsö (K: Kongens Möller, on *Fagus*. LANGE 1872 p. 252. — Haslev: Orneden. 1887 W. Taussing (K). — Jyderup: Skarresö (»Skarrit Sö»). Chr. Chrönlund (K, U) S. ALMQUIST l.c. — Köbenhavn (?): »pr. Hafniam». Ex herb. Liebmann (K). — S:t Jörgensbjærg (pr. Roskilde): Boserup Skov, one specimen on *Fraxinus*. 1946! (L).

Fyn. Norup: Hofmansgave. N. Hofman-Bang? Ex herb. Liebmann (K). — Nyborg: the brickyard wood, on *Fagus*. E. Rostrup (K) BRANTH & ROSTRUP 1869 p. 246.

Als. Augustenborg: the mansion park, on *Fraxinus*. 1913 Er. (f. *marginata*) ERICHSEN 1939 p. 64.

Jylland. Hansted: H. Skov, on *Fraxinus*. 1887, 89 J. Jeppesen (L, U). — Lõjt: near Knappen, scarce on *Fraxinus*. 1913 Er. (f. *concolor*) ERICHSEN 1938 p. 132 and l.c. — Ovsted: Elling Skov, on *Fraxinus*. 1887 J. P. Pedersen (B, K, L, S). — Osby: Tamdrupskov near Aarösund, on *Fraxinus*. 1915 Er. (f. *marginata*) ERICHSEN 1939 p. 64.

As seen by the map, the localities are situated chiefly in the southernmost part of the region, and in the Norwegian Vestland. It is a rare plant everywhere in the Scandinavian countries, though easily recognized by its red colour. HORNEMANN's statement »common» mentioned above is no doubt exaggerated. Also in the well investigated Schleswig-Holstein it is »ziemlich selten» (ERICHSEN 1941). In spite of the sparse localities, its southern and suboceanic tendency is evident, a fact which also agrees with its distribution in other districts of Europe.

Extra-Scandinavian Distribution. — *Arthonia cinnabarina* is a rather common plant in the western, southern, and central parts of Europe.

In Germany, Austria, and Switzerland it is »sehr häufig und verbreitet» (REDINGER 1937). In Vorarlberg in the Austrian Alps it ascends to 600—700 m (sec. LETTAU 1941). It is lacking in East Prussia and Thuringia (LETTAU l.c.), and in Bavaria it is stated to be »im ganzen sehr selten» (KREMPELHUBER 1861). It is a rare species in Czecho-Slovakia, recorded from Bohemia (RABENHORST 1870) and Slovakia (SZATALA 1936). It is unknown from Hungary in its post-war delimitation (cf. SZATALA l.c.).

It was collected at many places in the Netherlands (sec. herb. Leyden) and in Belgium (DE WILDEMAN & DURAND 1898). In France it is no rare species, at least in the western parts (»Commune sur les écorces: coudriers (*Corylus*), fresnes (*Fraxinus*), pins (*Pinus*), hêtres (*Fagus*) etc.», sec. OLIVIER 1897). In Lorraine, HARMAND (1895—99) stated it to be »assez commun dans les grandes forêts des regions montagneuses, même des terrains calcaires». In Franche-Comté, however, FLAGEY (1883) recorded it as »assez largement disseminée, dans les bois de la plaine, sans être cependant commune, ni très abondante». It is also »frequent in England and Ireland» (A. L. SMITH 1926). KNOWLES (1929) recorded its Irish distribution as »frequent on the bark of beech, oak, ash, and especially on hazel».

From Spain there are several localities known (cf. e.g. DEL AMO 1870, SAMPAIO & CRESPI 1927), and from Portugal TAVARES (in litt.) has reported it as »somewhat scarce, mainly in the western districts». In Italy it is recorded as »ad truncos totius Italiae et insularum haud rara» (JATTA 1909—11). It is also distributed in the Balkan Peninsula, at least in Rumania (LOJKA exs. 144).

A statement from Central Russia is reported by TOMIN 1939.

The lichen is nearly cosmopolitan and seems to be frequent mainly in tropical and subtropical districts with oceanic climate.

In Africa it is recorded from most districts, from Morocco to the Cape Territory, and besides from Madagascar and the Azores.

In Asia stations are known from India, Ceylon, Farther India, the Sunda Islands, several districts in China, Formosa, and the Philippine Islands.

It is distributed over large areas of America, from the United States to Central Chile, as well as from the West Indies.

Stations are recorded from Australia and New Zealand. It is also widely distributed in the Pacific islands.

Habitat Ecology. — In our districts *A. cinnabarina* is found exclusively on deciduous trees with smooth bark, especially young *Fraxinus* but also *Fagus, Sorbus aucuparia,* and *Corylus.* It is a rather photophobous and hygrophilous lichen. In the four localities where I have studied it in nature, it grew on young ashtrees, mainly on the northern sides of the trunks and often near the ground. As seen from tab. XXI it is a member of the union *Opegraphetum herpeticae,* subordinate to the federation *Graphidion* (cf. under *Opegrapha atra*). It often grows together with *Arthothelium ruanideum* (in S.W. Skåne and Denmark), *Graphis scripta, Lecanora subfusca, Lepraria aeruginosa, Opegrapha atra, O. herpetica, Phlyctis argena,* and *Hypnum cupressiforme.* It is evident that in our districts it has a low power of competition against other lichens. I never saw it forming a society of its own, and I have searched for it in vain in several apparently suitable localities.

Tab. XXI. Arthonia cinnabarina - communities.

On the trunks of young *Fraxinus.* — 1. **Sk.** Dalby: Dalby Söderskog, W. exposure. — 2. Ibm, N. exp. — 3—4. Ottarp: Bälteberga, N. exp. — 5. **Rog.** Forsand: Dirdal, N. exp. — 6. **Sj.** Sæt Jörgensbjærg: Boserup Skov, N. exp.

	1	2	3	4	5	6
Arthonia cinnabarina	1	2	1	2	**3**	1
— radiata	—	—	—	—	1	—
— spadicea	—	—	—	—	—	1
Arthopyrenia punctiformis	—	—	—	—	2	—
Arthothelium ruanideum	**3**	**3**	**3**	1	—	1
Graphis scripta	**4**	**3**	2	1	1	1
Lecanora subfusca (coll.)	2	1	1	—	1	2
Lecidea olivacea	—	—	1	—	2	—
Lepraria aeruginosa	1	1	—	1	—	1
Opegrapha atra	**2**	**3**	—	—	2	—
— fuscella	1	—	—	—	—	—
— herpetica	**4**	**3**	3	—	**3**	—
Pertusaria leioplaca	—	—	—	—	**3**	—
Phlyctis argena	—	—	**3**	3	—	**2**
Pyrenula nitida var. nitidella	1	—	—	—	—	—
Coccoid Chlorophyceae	—	—	—	—	—	+
Hypnum cupressiforme	1	1	3	1	—	—
Radula complanata	1	—	—	—	—	—

Affinity and Variation. — *A. cinnabarina* is a conspicuous lichen differing from other European species of the genus by its red apothecia. In its main distributional area it is a variable species. The numerous forms described with regard to thickness and colour of the thallus, size and colour of the apothecia, etc. are of small systematic value. The Swedish and Danish specimens are of a rather uniform type with greyish thallus and rather small, often pruinose apothecia with red margins. The red colour is softer in our specimens than is usual in collections from southern countries. Some of the Norwegian specimens are of a differing type. They have brown-red thallus and brownish (—brown-red) apothecia [f. *glabra* (Mass.) Red.]. They are probably nothing but depauperate specimens, being the northernmost outposts of this mainly tropical and subtropical species.

22. *Buellia canescens* (Dicks.) De Not.

Syn. *Catolechia canescens* Anzi. — Cf. further Zahlbruckner Cat. Lich. VII (1931) p. 460, Th. Fries Lich. Scand. II (1874) p. 587, and Gallöe Nat. Hist. of Danish Lichens IV (1932) p. 31, pl. 33—34.

History. — This lichen was described from England by Dickson in 1785 as *Lichen canescens*. In 1798 it was recorded from S w e d e n by Acharius (»Habitat ad muros et truncos arborum»). As Acharius lived at Landskrona in the 80's of the 18th century, it is not impossible that he had found the species somewhere in Skåne, but no locality was published in his works. Subsequently it remained unknown from Sweden until 1911, when Erichsen found it at the Kullen in Skåne. A second Scanian find has been published by Gelting.

The species was recorded from D e n m a r k by Branth & Rostrup (1869), but according to an old specimen without an exact locality (probably leg. Liebmann), it had been collected far earlier in this country. Up to the present time about 25 Danish stations are known.

Scandinavian Distribution.

S w e d e n.

Skåne. B r u n n b y: Haga near Arild, on an old *Ulmus*, 1911 Er. Erichsen 1913 p. 81; ibm. 1939, 40! (A, B, Ds, K, L, O, S, Magn. exs.); ibm. 1943 Deg. and ! (Ds, U). — T r o l l e - L j u n g b y: on an old *Ulmus* at the pond E. of the castle, 1944 Gelt. (Dz, Ge, L) Gelting 1945 p. 464; ibm. 1947! (L).

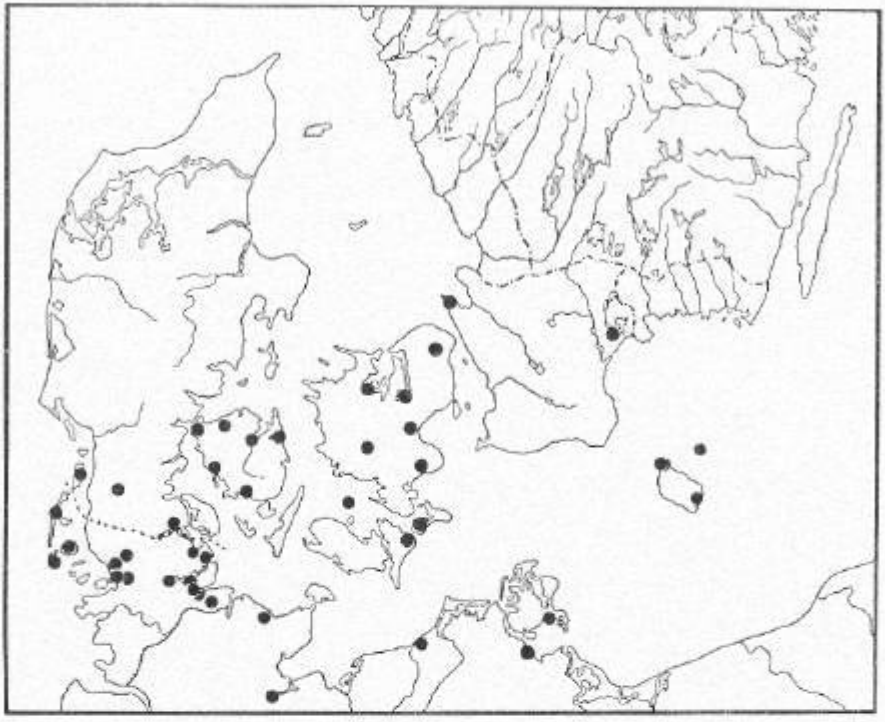


Fig. 26. *Buellia canescens* in Scandinavia.

Denmark.

Sjælland. Bavelse: the peninsula in Lake Bavelsesö, on *Quercus*. 1940 Gelt. (Ge) Gelting l.c. — Esbönderup: W. of Esrum, on an old *Quercus*. 1946! (L, S). — Hagested: the churchyard, on an old *Ulmus*. 1946! (L, S). — Herslev: Bognæs, on old *Quercus*. 1887 E. Rostrup (B, K, S) Rostrup 1889 p. 237; ibm, near Gadekæret on *Fagus* and *Quercus*; ibm, Askehoved, on *Ulmus* and *Acer*. Both 1940 Gelt. (Ge) Gelting l.c.; ibm, on *Quercus* and *Fraxinus*. 1942 Chr. (K); ibm, on old *Quercus*, abundant. 1946! (A, L, S). — Højelse: Gl Lellingegaard, near Köge Aa, on *Quercus*. 1946 Chr. (K) Christiansen 1947 p. 174. — Vemmetofte: V. Vesterskov, on an old *Quercus* near the gamekeeper's residence. 1946! (L, S).

Mön. Fanefjord: Marienborg, on *Quercus*. 1943 Chr. (K) Christiansen l.c.

Falster. Aastrup: the churchyard, on *Acer*. 1943 Chr. (K) Christiansen l.c.

Lolland. Fejö: Vejrö, the churchyard, on *Ulmus*. 1942 Gelt. (Ge) Gelting l.c.

Fyn. Aastrup: the churchyard, scarce on *Fraxinus* (one tree). 1939! (L, S). — Middelfart: Hinsgavl, on *Tilia*. 1939, 46! (H, K, L, S). — Odense: on *Quercus*. 1862 E. Warming (K) Branth & Rostrup 1869 p. 236. — Ore (S.W. of Bogense): the churchyard, rather abundant on an old *Fraxinus*. 1947! (K, L, S). — Sönderby: Frederiksgave, abundant on *Quercus*. 1925 Er. Erichsen 1930 p. 52. — Viby: Hverringe Mölleskov, on *Ulmus* and *Aesculus*. 1941 Gelt. (Ge) Gelting l.c.

Jylland. Graasten: »the giant oak». 1913 Er. — Lögumkloster: the church. 1920 Er. — Römö: Nr Tvismark, on whale bones. 1929 Er. All stations communicated by ERICHSEN in litt.

Bornholm. Allinge: on a stone wall (G, L) and on shrubs (G). 1888 Hellb. — Hammershus: on the castle walls, rare. Hellb. — Kristiansö: on a stone wall (G) and on *Ulmus* in »Tibolz' Lund» (G, K). 1888 Hellb. (G, L); near »Mindet» on *Ulmus*. 1937 Gelt. (Ge); Græsholm, on an old *Crataegus* on the E. side of the island. 1936 Gelt. (Ge). — Nexsö: common on the walls in the town. 1884, 88 Hellb. (B, G, K, L, S, U); Frederiksbrottet, on *Larix*. 1884 Hellb. (G, S). — Sine loco (saxicolous). 1888 Hellb. (T). — The Bornholm stations published by HELLBOM 1890 p. 90 and GELTING l.c.

Sine loco. »In cortice quercino Daniae». Ex herb. Liebmann (K).

The Scandinavian area of *B. canescens* ranges over the Danish Islands (incl. Bornholm) and the southernmost part of Jylland. We should have expected it on more stations in Skåne. It cannot have been overlooked there as it is a characteristic and habitually easily recognized species. Analogous areas are known from several phanerogams which are somewhat common in Sjælland but have minimal or no power to spread over the Öresund (cf. Chapter V).

Extra-Scandinavian Distribution. — *B. canescens* has a wide distribution, chiefly on low levels in the oceanic districts of Europe. As it seems to require a considerable amount of summer warmth, it is, however, lacking in W. Norway, N. Scotland, and the mountains of Central Europe.

In Germany it is spread preferably in the western districts. In E. Schleswig it is »verbreitet» (ERICHSEN 1930). It is known from Mecklenburg (FLOERKE exs. 124), Pomerania (Greifswald, sec. E. FRIES 1831), Brandenburg (one station, sec. HILLMANN 1923), and Silesia (»hin und wieder», sec. STEIN 1879). It was not recorded from Saxony by RABENHORST (1870), nor from Thuringia by LETTAU (1912). In W. Germany it is more common (»hin und wieder», in Westphalia, sec. LAHM 1885). It is rare in S. Germany, only some few stations recorded from Bavaria (KREMPELHUBER 1861) and Baden (BAUSCH 1869). It is not recorded from Switzerland and Austria.

It is a common lichen in the Netherlands (many specimens in herb. Leyden) as well as in Belgium (DE WILDEMAN & DURAND 1898). In Western France it is a frequent species (»très commun partout», sec. OLIVIER 1897) but in the eastern districts it grows rarer (»peu commun dans la Lorraine», sec. HARMAND 1895—99). In the British Isles it is »frequent in the Channel Islands, England and Ireland; somewhat rare in Scotland and Wales» (A. L. SMITH 1926). KNOWLES (1929) stated it to be »a very common lichen on shady rocks, walls, and tree-trunks throughout Ireland, seldom fertile».

It has also a wide distribution in S. Europe. In Portugal it is »widely spread and somewhat common except in the mountains» (TAVARES in litt.). There are also several stations recorded from Spain, e.g. ap. COLMEIRO 1867—68, DEL

Amo 1870. In Italy Jatta (1909—11) recorded it as »ad rupes varias et truncos totam per Italiam sat frequens». According to Sbarbaro (1932) it is »abondante in tutta la Liguria». It is recorded from several parts of the Balkan Peninsula, e.g. Yugo-Slavia (Dalmatia, sec. Zahlbruckner 1903, 1919) and Greece (Korfu, sec. Arnold 1887, and the Aegean Islands, sec. Servit 1931 b).

There is no locality known from the eastern parts of the continent.

The species is distributed in some extra-European regions. In Africa it is known from the Mediterranean districts, e.g. Morocco, Algeria, and Egypt. Degelius (1941 b) recorded it from the Azores (leg. H. Persson). Zahlbruckner (1911) reported several stations on coastal rocks from New Zealand.

Habitat Ecology. — *B. canescens* is chiefly a corticolous lichen in Scandinavia. It prefers the very rough bark of old trees, mainly *Quercus* and *Ulmus*, but it has also been collected on *Acer*, *Fagus*, *Fraxinus*, and *Tilia*. In Bornholm and S. Jylland it has also been collected on rocks and especially on the mortar of walls. In Western and Southern Europe it is as often saxicolous and cementicolous as it is corticolous.

Though a rare lichen in our districts, it is often abundant on its localities forming special societies which can be coordinated to a union, *Buellietum canescentis*. It is subordinate to *Xanthorion* and contains several lichens characteristic of highway trees smothered with dust (cf. p. 222). From tab. XXII can be counted as belonging to this group *Anaptychia*, *Buellia punctiformis*, *Caloplaca tegularis* (from a stone-wall near the tree), *Candelariella xanthostigma*, *Lecanora Hagenі*, *Parmelia acetabulum* and *exasperatula*, *Pertusaria globulifera* f. *Henrici*, *leprarioides* and *subviridis*, *Physciae*, *Ramalinae*, and *Xanthoriae*. As a rule it reaches its optimum in photoneutral—photophobous stations. Photophilous foliose and fruticose lichens (e.g. *Anaptychia ciliaris*, *Parmelia acetabulum* and *exasperatula*, *Physciae*, *Ramalinae*, and *Xanthoriae*) are present, but only in small quantities. It is, however, often found together with *Ramalina pollinaria*, a lichen characteristic of old oak trunks. *Lepraria aeruginosa* and green algae are common in the crevices of the bark. Being a mainly photophobous community on rugged bark, *Buellietum canescentis* can be considered as approaching the *Leprarion*, the typical aspects of which, however, are coniophobous and contain a still smaller amount of macrolichens (cf. under *Lecanactis amylacea*, *Arthonia impolita*, and *Opegrapha fuscella*).

Gelting (1945) reports the species from similar habitats and especially from the islands N.E. of Bornholm, where the winds carry nitrogenous material from numerous »bird tops».

Measurements of pH from two stations (Sk. Trolle-Ljungby, on *Ulmus*, and Fyn, Hindsgavl, on *Tilia*, 5 samples from each) gave values between

5.8 and 6.2, mean 6.0, which are consistent with what Du Rietz (1945) and Krusenstjerna (1945) have communicated from the *Xanthorion* of Central Swedish stations.

Tab. XXII. Buellia canescens - communities.

On the trunks of old trees. — 1. **Sk.** Brunnby: Arild, on *Ulmus*, S. exposure. — 2. Trolle-Ljungby, on *Ulmus*, N. exp. — 3 **Sj.** Esbönderup: W. of Esrum, on *Quercus*, S. exp. — 4. Herslev: Bognæs, on *Quercus*, E. exp. — 5. Hagested: the churchyard, on *Ulmus*, W. exp. — 6. Vemmetofte: on *Quercus*, S. exp. — 7. **Fyn.** Middelfart: Hinsgavl, on *Tilia*, W. exp. — 8. Ore: the churchyard, on *Fraxinus*, W. exp.

	1	2	3	4	5	6	7	8
Anaptychia ciliaris	—	—	—	1	—	—	—	3
Arthonia impolita	—	—	**3**	—	—	—	—	—
Buellia canescens	**4**	**3**	**4**	**4**	**4**	**5**	**3**	**4**
— punctiformis	1	—	—	—	—	—	1	—
Caloplaca tegularis	—	—	—	—	1	—	—	—
Candelariella xanthostigma	1	—	—	—	—	—	1	1
Evernia prunastri	—	—	—	1	—	—	1	—
Haematomma leiphaemum	2	—	—	1	—	—	—	**4**
Lecanora expallens	—	—	—	4	—	—	2	—
— Hageni	—	—	—	—	1	—	—	—
— subfusca (coll.)	1	—	—	1	1	—	1	—
Lecidea quernea	—	—	—	—	1	1	—	—
— scalaris	—	—	—	—	—	—	**3**	—
Lepraria aeruginosa	—	2	—	1	3	—	**3**	—
— candelaris	**1**	**3**	—	2	—	1	—	—
— decolorans	—	—	—	—	—	**2**	1	—
Opegrapha atra	—	—	—	1	—	—	—	—
— subsiderella	—	1	—	—	—	—	—	—
Parmelia acetabulum	—	—	—	—	—	—	1	—
— exasperatula	—	—	—	1	—	—	—	—
— subaurifera	—	—	—	—	—	—	1	—
— sulcata	—	—	—	—	—	—	1	—
Pertusaria globulifera f. Henrici	—	—	—	—	—	—	—	1
— leprarioides	1	—	—	—	—	—	—	—
— pertusa	—	—	—	—	—	—	1	—
— subviridis	—	—	—	—	—	—	1	—
— Wulfenii	—	—	—	—	—	—	1	—
Physcia ascendens	—	—	—	—	—	—	—	**3**
— grisea	2	1	1	—	—	—	—	—
— tenella	1	1	—	1	—	—	—	—
Ramalina farinacea	1	—	—	—	—	—	1	—
— fastigiata	—	—	—	—	—	1	1	1
— fraxinea	—	—	—	—	—	1	—	—
— obtusata	—	1	—	—	—	—	—	1
— pollinaria	2	4	1	1	—	**3**	**2**	1
Xanthoria candelaria	—	—	—	—	**2**	—	—	—
— parietina	**1**	1	—	—	2	—	—	1
— polycarpa	—	—	—	1	—	—	—	—
Coccoid Chlorophyceae	+	+	+	+	—	—	+	+
Homalothecium sericeum	—	—	—	—	—	—	**1**	—
Zygodon viridissimus	—	—	—	—	—	—	1	—
Frullania dilatata	—	—	—	—	—	—	1	—
Metzgeria furcata	—	—	—	—	—	—	1	—

Affinity and Variation. — *B. canescens* belongs to the section *Diploicia* (syn. *Catolechia*) which is characterized by its radiate-lobate thallus, the majority of *Buellinae* being purely crustaceous. The section is rather isolated from other *Buellinae* and seems to have closer relations to the mainly tropical genus *Pyxine*, with which it has the subfoliose thallus, the lecideine apothecia, and the brown, biseptate spores in common.

B. canescens has a small amplitude of variation. The North-European population is very uniform (corticolous as well as saxicolous specimens) and no systematic units of minor rank can be distinguished. All specimens seen in our districts, as well as in N. Germany, are sterile, the soredia being its main diaspores. Fertile specimens are not uncommon in S. and W. Europe.

23. *Enterographa crassa* (DC.) Fée.

Syn. *Chiodecton crassum* (DC.) Zahlbr. — *Ch. venosum* (Pers.) Zahlbr. — Cf. further Zahlbruckner Cat. Lich. II (1924) pp. 475, 483, VIII (1932) pp. 221, 223, and X (1940) p. 200, Redinger Revision der Flechtengatt. *Enterographa* und *Sclerophyton* (1938 b) p. 49, and Almborn Scand. Species of *Enterographa* (1942) p. 390.

History. — This lichen was described by De Candolle in 1805 from France, as *Opegrapha crassa*. Owing to its rather special habitats it remained unknown from Scandinavia until in the present century. Its first and still only station in Sweden was published by the present writer in 1942. From Denmark it was recorded by Erichsen (1928). At present about 20 Danish stations are known.

Scandinavian Distribution (substratum *Fagus* unless otherwise stated).

Sweden.

Skåne. Brunnby: Kullen, between Käringmalen and Abbahamn, scarce on *Fagus* near the shore, 1940! (f. *rufescens*) (A, Ds, L, M, S) Almborn 1942 p. 393; ibm. on *Fagus* and *Sorbus aucuparia*, 1943 Deg. and ! (Ds, L).

Denmark.

Mön. Maglehy: Liselund, 1939! (f. *rufescens*) (A, L, S) Almborn l.c.; Lilleskov, 1943 Chr. (K); Storeklint, in the slope, 1941 Er. Erichsen 1942 p. 143 (as *E. venosa*); near Maglevandfaldet (probably identical with the preceding station), 1946! (K, L, O).

Falster. Horbelev: Hesnæs, 1946! (L, S); Pomlenakke, 1946! (L).

Fyn. Middelfart: Fænö, 1925 Er. Erichsen 1933 p. 23; Kongebroskoven, 1947 Chr. (K, L) — Revninge: Storskov S. of Kerteminde, abundant between the

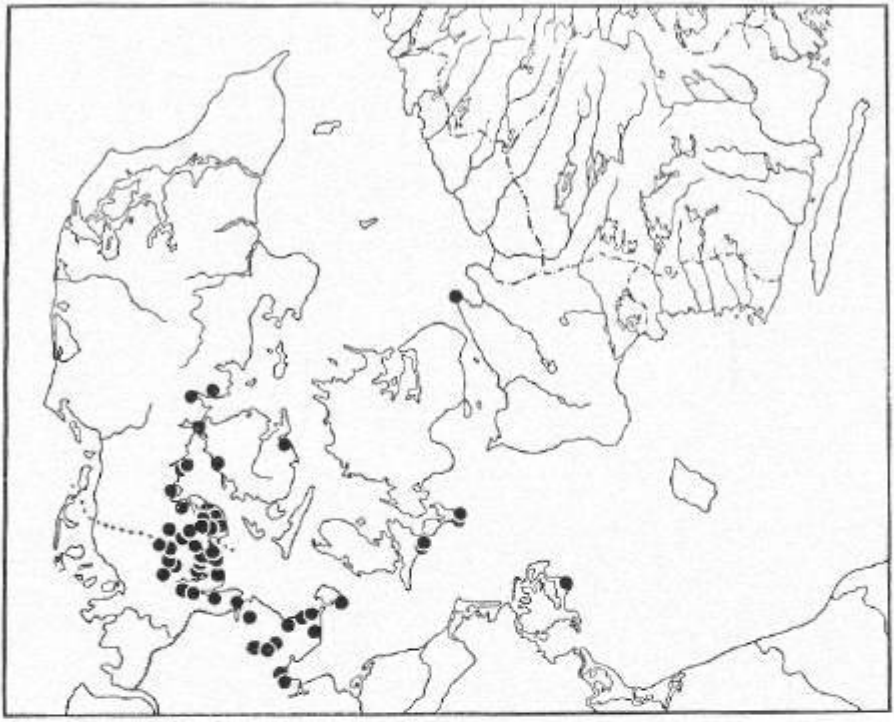


Fig. 27. *Enterographa crassa* in Scandinavia.

road and the shore. 1947! (K, L, S, U). — Sönderby: Frederiksgave, Teglskov. 1925 Er. Erichsen 1933.

Als. Asserbölle: Oleskobbel. 1913 Er. (f. *geographica*) Erichsen 1933. — Augustenborg: the mansion park, on *Aesculus* and *Tilia*. 1932 Er. (+f. *geographica*) Erichsen 1933, 1941. — Notmark: near Frydendal, on *Acer*. 1925 Er. (+f. *geographica*) (K) Erichsen 1928 p. 83, 1941; near Helleved. 1946! (L, S). — Tandslet: Ertebjærgskov, on *Fagus*, *Fraxinus*, and *Quercus*. 1932 Er. (+f. *geographica*). Erichsen 1933. — Ulkeböl: Sönderskov. 1925 Er. Erichsen 1941.

Jylland. Aabenraa: Jörgensgaard. Er. (in maps); ibm. 1939! (A, D, H, K, L, M, O, S, U) Almborn l.c. — Broager: Kobbelskov, on *Fraxinus*. 1913 Er. (+f. *rufescens* and f. *atroviridis*) Erichsen 1933, 1941. — Gaverslund: Munkebjærg. 1946, 1947! (L, O, S, U). — Holböl: Hönsnap Skov (one specimen). 1946!; W. of Rönshoved. W. Saxen (in litt.). — Slovby: Slovby Skov. 1946! (L, S). — Varnæs: Strandskov (?) Er. (in maps). — Nr Vilstrup: Kelstrup Strand. Er. (in maps). — Ösby: Tandrup Skov. Er. (in maps).

Its type of distribution is extremely southern-oceanic. It is restricted to districts with a high winter temperature and a high amount of atmospheric moisture. Its Scandinavian stations are all situated near the sea.

It might be expected to occur at Bästad, at Hallands Väderö, or in some further Danish stations (Bornholm?), but otherwise it is not likely to be found outside the area indicated above.

Extra-Scandinavian Distribution. — *E. crassa* is distributed in the coast districts of Western and Southern Europe.

In Germany it occurs mainly in the N.W. parts. From Schleswig SAXEN (in litt.) reports it as »an den Küsten an einzelnen Stellen reichlich. Im Binnenlande nur einzeln und oft kümmerlich». Maps of its distribution in Schleswig-Holstein and S. Jylland were published by ERICHSEN (1928 p. 10, 1933 p. 22, and 1941 p. 10). On the German Baltic coast it was also found by ERICHSEN near Lübeck, at the island of Fehmarn, and in Mecklenburg. SANDSTEDE, and later ERICHSEN, found it as far to the East as Rügen (SANDSTEDE 1903). In Oldenburg it occurs »in Menge» (SANDSTEDE 1912). It reaches its southern limit in Germany near Münster in Westphalia (LAHM 1885).

It is recorded from Belgium (MATHIEU 1853) and from Luxemburg (KOLZ 1897). In France it occurs mainly in the western coast districts, where it is known from the departments of Nord, Pas de Calais, Seine inférieure, Calvados, Manche, Ille et Villaine, Finistère, Sarthe, Deux-Sèvres, and Vendée (OLIVIER 1897—1903, BOULY DE LESDAIN 1910). It is not reported from the French Mediterranean coast. — In the British Isles it is recorded as »fairly common in the Channel Islands and throughout England, more especially in the southern counties and in S. and W. Ireland, rare in S. and W. Scotland» (A. L. SMITH 1926). In Ireland it is »a common species on the bark of old trees in shadowy situations, especially on sycamore, oak, ash and elm» (KNOWLES 1929).

In Portugal it is »common in some oceanic districts, mainly western» (TAVARES in litt.). Some stations were recorded from Spain (DEL AMO 1870, SAMPAIO & CRESPI 1927). JATTA (1909—11) reported it from the provinces of Liguria and Etruria in Italy and (as *Stigmatidium venosum*) from the Verona district. The only occurrence known in S.E. Europe is from Yugo-Slavia, the Isles of Lussin and Melada in Dalmatia (leg. Baumgartner, sec. ZAHLBRUCKNER 1919).

In Africa it is recorded from Alger (leg. Durieu, sec. ZAHLBRUCKNER 1919). TAVARES (1941 b) communicated it from the Azores. NYLANDER (1868) reported a »*Stigmatidium venosum*» from Port Natal. As it is said to have »sporae usque 15-septatae», it is surely not referable to our species.

A statement from Japan (NYLANDER 1900) needs confirmation.

Habitat Ecology. — In Denmark and Sweden *E. crassa* is chiefly found on *Fagus*, occasionally on other deciduous trees (mainly young trees with smooth bark). Saxicolous specimens are known from W. Europe, not from Scandinavia.

It is an extremely hygrophilous plant, in Denmark and Sweden only found on the bases of trees in the immediate vicinity of the sea, where the atmospheric moisture is high. In Germany and W. Europe

it is also recorded as growing at lakes and rivers at some distance from the sea.

Tab. XXIII. Enterographa crassa - communities.

On the bases of trunks of *Fagus* in the immediate vicinity of the sea. — 1—2. **Sk.** Brunnby: Kullen, N. exposure. — 3—4. **Mön.** Magleby: Storeklint, N. E. exp. — 5—6. **Falst.** Horbelev: Österskov, W. exp. — 7—9. **Fyn.** Revninge: Storskov (pr. Kerteminde), E. exp. — 10. Ilbm, N. exp. — 11—14. **Jl.** Gaverslund: Munkebjærg. N. exp. — 15. **Als.** Notmark: near Helleved, E. exp.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Arthonia radiata	—	—	+	—	—	—	—	—	—	—	—	—	—	—	—
— spadicea	—	—	—	—	—	—	—	—	—	—	+	—	—	—	—
Enterographa crassa	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Evernia prunastri	—	—	—	—	—	—	—	—	+	—	—	—	—	—	+
Lecanora expallens	—	—	—	—	—	—	—	+	+	+	—	—	—	—	+
— glabrata	—	—	—	—	—	—	—	—	+	+	—	—	—	—	—
— subfusca	+	+	+	+	—	—	+	+	+	+	+	+	+	+	+
Lecidea olivacea	—	—	—	—	—	—	+	—	+	+	—	—	—	—	—
— quernea	—	—	—	—	—	—	—	—	—	+	—	—	—	—	—
Lepraria aeruginosa	—	—	—	—	—	—	—	—	—	—	+	+	+	+	+
Opegrapha atra	—	+	—	+	—	—	—	+	+	—	—	—	—	—	—
— herpetica	—	+	—	—	—	—	—	—	—	—	—	—	—	—	—
— viridis	—	—	—	—	+	+	—	—	—	—	+	+	+	+	+
Parmelia fuliginosa var. laetevirens	+	—	—	—	—	—	+	—	—	—	—	+	—	—	—
Pertusaria amara	+	—	—	—	—	+	—	—	—	—	—	—	—	—	—
— leioplaca	—	—	—	—	—	—	+	—	—	—	—	+	+	—	—
— pertusa	+	—	—	+	—	+	+	+	+	+	—	+	+	—	+
— Wulfenii	+	+	—	—	—	+	—	+	+	+	—	—	—	+	+
Phlyctis argena	—	—	—	—	—	—	+	+	—	—	—	—	—	—	—
Porina carpinea	—	—	+	—	—	—	—	—	—	—	—	—	—	—	—
Pyrenula nitida	—	—	—	+	+	+	+	+	+	+	—	+	+	—	+
Dichaena faginea	—	—	—	—	+	+	+	+	+	—	—	—	—	—	—
Coccoid Chlorophyceae	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Hypnum cupressiforme	—	—	—	—	—	—	—	+	+	—	—	—	—	—	—
Neckera complanata	—	—	+	—	—	—	—	—	—	—	—	—	—	—	—
Frullania dilatata	—	—	—	—	—	—	—	—	+	+	—	—	—	—	—

Under favourable conditions it is often dominant, forming special societies on the lower parts of the trunks, but as a rule it does not reach higher than 3—4 dm above the ground. Its societies are poor in species, mainly constituted by some few crustaceous lichens. When growing on *Fagus*, its societies can be subordinated the *Pyrenuletum*. As seen by tab. XXIII they are as a rule composed of ordinary beech epiphytes (besides *E. crassa*, chiefly *Lecanora subfusca*, *Opegrapha viridis*, *Pertusaria pertusa* and *Wulfenii*, and *Pyrenula nitida*) and photophobus green algae. Owing to the restriction of the *E. crassa*-societies

to the basal regions of the trunks my 8×2 dm^2 rectangle proved to be less useful. The analyses (tab. XXIII) were taken from 2×2 dm^2 squares and the taxation of density was omitted.

Very few photophilous macrolichens have been recorded together with *E. crassa*, and no coniophilous lichens.

Measurements of pH from *E. crassa*-societies (from Fyn, Revninge and Jl. Gaversłund; 10 samples from each) showed values normal for beech trunks, varying between 5.1 and 5.8, mean 5.4.

Affinity and Variation. — As to the identity of *E. crassa* (with punctiform apothecia) and *E. venosa* (with lirelliform apothecia), which were regarded as different species by REDINGER (l.c.), I refer to my paper of 1942. The thickness and colour of the thallus varies within rather wide limits. On relatively illuminated trunks it is thick and gray, in a more shadowy situation it is often thin and dark brown, f. *rufescens* (B. de Lesd.) Erichs. F. *atroviridis* (Erichs.) is an extreme type of the last-mentioned form. — F. *geographica* (Erichs.) Almb. has a thallus composed of several small thalli intersected by black hypothallus lines. Also a shadow form. — F. *pallidocincta* (Erichs.) has its apothecia surrounded by whitish thalline areolae. A form analogous to *Opegrapha herpetica* f. *subocellata*.

24. *Enterographa graphidioides* (Leight.) Almb.

Syn. *Schismatomma rimatum* (Flot.) Br. & Rostr. — *Enterographa rimata* (Flot.) Zwackh. — Cf. further ZAHLBRUCKNER Cat. Lich. II (1924) p. 557, VII (1932) p. 232, REDINGER Rev. der Flechtengatt. *Enterographa* und *Sclerophyton* (1938 b) p. 71, and GALLÖE Nat. Hist. of Danish Lichens V (1936) p. 44, plate 42.

History. — This lichen was distributed by J. v. FLOTOW from Germany as *Schismatomma dolosum* Wg ♂ *rimatum* (FLOT. exs. 438 B; locality and year not stated but probably edited in the thirties of the past century). The same plant was described in 1854 by LEIGHTON from England as *Chiodecton graphidioides*. NYLANDER (1855 b) recorded it as *Platygrapha rimata*. As I have previously pointed out (ALMBORN 1942 p. 391), *graphidioides* is the valid name of the lichen, being the oldest species name.

The species is known from 4 localities in Sweden, 2 of which are previously published. In Denmark, it is known from 7 exact stations, first recorded by BRANTH in 1867.

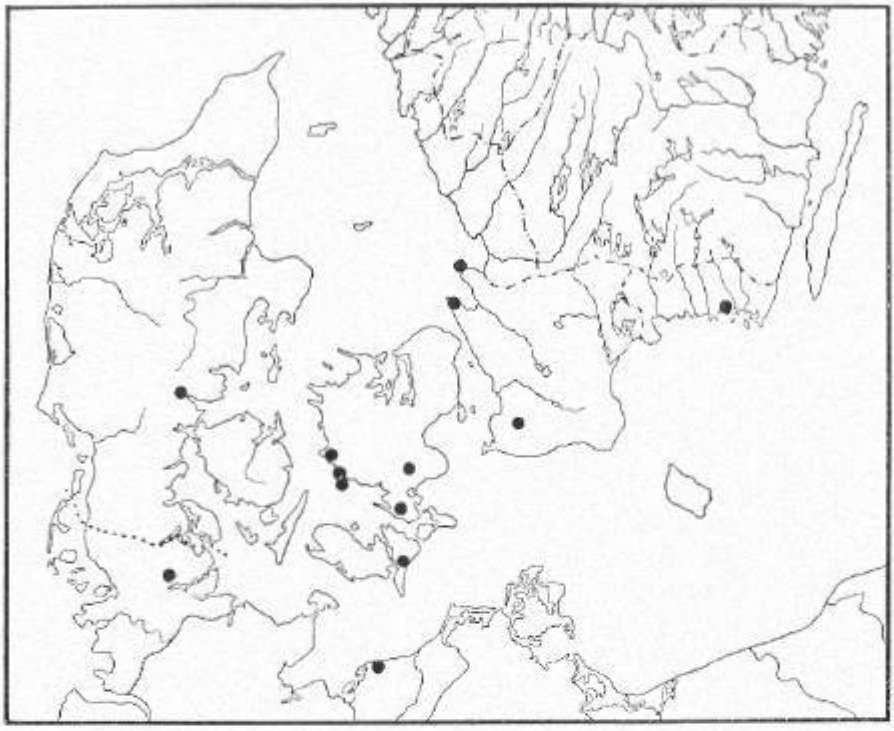


Fig. 28. *Enterographa graphidioides* in Scandinavia.

Scandinavian Distribution (cf. ALMBORN l.c.).

Sweden.

Skåne. Bara: Torup, on *Fagus*. 1887 Berg (L) BERG 1891 p. 172. — Brunnby: Kullen, on *Fagus*, 1871 S. Almquist (G, L, S, U) B. NILSON 1903 p. 490. — Torekov: Hallands Väderö, on *Fagus* in the S. beech forest. 1945! (L, S).

Blekinge. Förkärla: Tromtö, on *Fagus*. 1945, 47! (L, S).

Denmark.

Sjælland. »On *Fagus* in some places in South Sjælland» (transl. fr. Dan.). BRANTH & ROSTRUP 1869 p. 245. — Boeslunde: Apager Skov. Branth (K); Troldehoved Skov, Branth (G, K, L). — Haslev: Bregentved, Branth (K) BRANTH 1867 p. 86. S. ALMQUIST 1869 p. 8 (not Jylland, as written by ALMQUIST). — Magleby: Stigsnæs, on *Fraxinus*. Branth (K, S). — Taarnborg: Klarskov. Branth (K, U).

Falster. Horbelev: »Tromleklint» (probably = »Pomleklint», i.e. Pomlemakke), on *Crataegus*. Rostrup. BR. & R. l.c.

Fyn. »S. Fyn». Rostrup. BR. & R. 1869 p. 275.

Jylland. Vejle: on *Fagus*. Rostrup. Br. & R. l.c. p. 245.

[Bornholm. Aaker: Risebæk, on *Quercus*, 1888 Hellb. (G). — Ibsker: Klinteby, on *Carpinus*, 1888 Hellb. (G, M). — Bodilsker: Kjöllergaards Skov, N. H. Bergstedt (G). All Bornholm stations recorded by HELLBOM 1890 p. 95 refer to *Opegrapha herpetica*.]

Extra-Scandinavian Distribution. — The species is little known and probably overlooked also in other parts of Europe. The few extra-Scandinavian localities known are situated in the oceanic parts of this continent.

I know only 3 exact stations from Germany (Schleswig, near Bollingstedt, on *Fagus*, leg. Er. and Saxen, ERICHSEN 1933. — Mecklenburg, Heiligendamm, on *Acer*, leg. Er. ERICHSEN 1936 c. — Westphalia, Lindenfels, near Heidelberg, on *Fagus*, leg. Zwackh, ZWACKH 1862.)

It is recorded from several places in Western France (sec. NYLANDER, HUE, OLIVIER). In the British Isles it is a rare plant, known only from 2 stations in Wales and one near Dublin in Ireland (A. L. SMITH 1926).

There is one station known in Portugal (near Lisbon, on *Pinus*, leg. Tavares, TAVARES 1944), one from Spain (Valdemose on Majorca, on *Quercus*, MAHEU & GILLET 1922), and some few from Italy (the islands of Igylio and Lampedusa, sec. JATTA 1909—11, and Portofino near Genoa, on *Castanea*, leg. Sbarbaro, sec. REDINGER l.c.). REDINGER also recorded 2 localities in Yugo-Slavia (Dalmatia), leg. Baumgartner.

The easternmost European station is Warnicken in the former German East Prussia, on *Acer*, *Carpinus*, *Fraxinus*, and *Tilia*, leg. Er. and Lettau (cf. LETTAU 1941; distributed in ZAHLBR.-RED. Lich. rar. 335).

It is also recorded from the neighbourhood of Rabat in Morocco, on *Quercus Suber* (SZATALA 1931).

A statement from S. America (Tierra del Fuego) (NYLANDER 1888) is probably referable to another (saxicolous) species.

Tab. XXIV. Enterographa graphidioides - communities.

On the trunks of middle-aged *Fagus*. — 1. **Sk.** Torekov: Hallands Väderö, W. exposure, — 2. **Bl.** Förkärla: Tromtö, N. exp.

	1	2		1	2
Buellia betulina	—	1	Pertusaria amara	—	**4**
Catillaria Griffithii	—	1	— coccodes	—	1
Enterographa graphidioides	2	1	— leioplaca	1	—
Evernia prunastri	—	1	— pertusa	—	1
Lecanora glabrata	2	—	Phlyctis agelaea	—	2
— intumescens	—	1	— argena	—	2
— subfusca	1	**3**	Pyrenula nitida	**5**	—
Lecidea quernea	—	1			
Opegrapha varia	1	—	Dichaena faginea	2	1
— viridis	1	**2**			
Parmelia fuliginosa var. laete-virens	—	**2**	Green coccoid Chlorophyceae	—	1
— sulcata	—	1	Trentepohlia umbrina	—	1

Habitat Ecology. — In Scandinavia *E. graphidioides* prefers the bark of *Fagus*, but it has also been found on other deciduous trees with smooth bark. The following two analyses from beech bark (the only stations where I have studied this lichen) are rather unlike, owing to their different exposition to light. XXIV: 1 is a photoneutral — rather photophobus community in a rather shadowy beech forest. The predominating *Pyrenula nitida* gives room to few other species, none of them playing any important role. XXIV: 2 is a far more photophilous community (in spite of its exposure to the north), from the outskirts of a beech forest. *Pyrenula nitida* is lacking and photophilous lichens, e.g. *Evernia, Lecanora subfusca, Parmelia fuliginosa* var. *laetevirens, P. sulcata, Pertusaria amara, coccodes*, and *pertusa* are rather prominent. At least in Sweden and Danmark the species seems to avoid eutrophiated bark.

Affinity and Variation. — Our species is met with under several generic names in earlier publications (*Chiodecton, Opegrapha, Platygrapha, Schismatomma, Stigmatidium*). REDINGER (l.c.) restituted the old genus *Enterographa* Fée, including the stroma-less species previously treated as *Chiodecton* subgenus *Enterographa* Müll. Arg. (cf. ZAHLBRUCKNER 1926). As suggested by REDINGER this genus should be arranged into the *Graphidaceae*, according to its similarity to *Graphis* and *Opegrapha*, while the genus *Chiodecton* s. str. should be restricted to include species with real stromata (family *Chiodectonaceae*). On the other hand *E. graphidioides* has near relations to *Schismatomma pericleum* (Ach.) Br. & Rostr. (family *Lecanactidaceae*), which differs chiefly in having round apothecia, the internal morphology being about the same. As long as the form of the apothecia (elongate or round) is considered as a character of cardinal importance in lichen taxonomy, these two species must be brought not only to different families but also to different series of the *Gymnocarpeae* (*Graphidineae* and *Cyclocarpineae* respectively). ZAHLBRUCKNER (Cat. Lich. II) solved the problem by treating it as *Schismatomma graphidioides* among the *Cyclocarpineae*, which is hardly consistent with his definition of this subseries.

There is a certain variation concerning the form of the thallus. F. *dispersula* (Red.) Almb. with separated thalline areolae, each with one—some few apothecia, is the chief type in our material. F. *contigua* (Red.) Almb. with an effuse, continuous thallus is represented at least in the gatherings from Torup, Kullen, and Troldehoved. The colour

of the living thallus is as a rule white, often with a faint rosy tinge. In the herbaria it often grows yellowish—greenish grey. »Var. *subvirescens* Nyl.» (ap. BRANTH & ROSTRUP 1869) is apparently such an age state, hardly worth a name.

25. *Pertusaria velata* (Turn.) Nyl.

Cf. ZAHLBRUCKNER Cat. Lich. V (1928) p. 246, X (1940) p. 466, and ERICHSEN in RABENHORST's Kryptogamen-Flora IX. 5:1 (1936) p. 515.

History. — *P. velata* was described in 1808 by TURNER from England. In 1887 HELLBOM recorded a *Pertusaria leptospora* from the island of Hallands Väderö, which, as pointed out previously (ALMBORN 1942 and the present work p. 163), is in fact referable to *P. velata*. This locality where I found the species again in 1945, is still the only one known from our districts. Other statements of *P. velata* from Sweden (ERICHSEN 1913 and MALME exs. 640) refer to other species, viz. *P. subviridis* and *P. amara* respectively.

Scandinavian Distribution.

Sweden.

Skåne. Torekov: Hallands Väderö, on *Fagus*, 1884 Hellb. (G, L) HELLBOM 1887 p. 48 (as *P. leptospora*), ALMBORN 1942 p. 399; ibm, on *Fagus*, 1945! (L).

The Hallands Väderö locality is rather distant from the nearest German occurrences known (in Schleswig and on Rügen). The lichen needs a mild winter climate and a high amount of atmospheric moisture and these conditions can be realized only in a few places in N. Europe. We might have expected it in S.E. Jylland, on Möns Klint, or on Kullen in Skåne. The Swedish and German stations will be relicts from warmer periods. The species has apparently small power of invading new localities.

Extra-Scandinavian Distribution. — The European area of *P. velata* is restricted to oceanic and maritime districts.

The above-mentioned Baltic stations are the only ones known from Germany (ERICHSEN l.c.). There is no statement of the real *P. velata* from France (literary records and specimens seen refer to *P. subviridis*), but it will hardly be lacking in the westernmost departments. In the British Isles it is »rare in S. England, N. Wales and S. Ireland» (A. L. SMITH 1918). KNOWLES (1929) recorded several Irish stations.

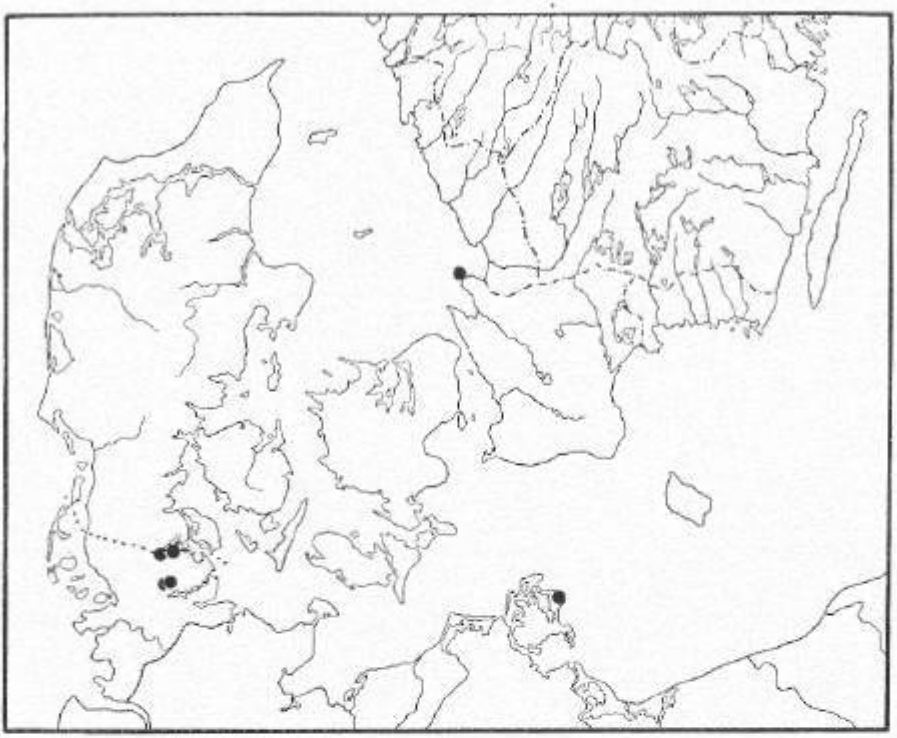


Fig. 29. *Pertusaria velata* in Scandinavia.

From Portugal TAVARES (1946) reported 4 stations on *Ailanthus* and *Olea* in the vicinity of Lisbon. It is unknown from Italy but reported from Yugo-Slavia (Island of Meleda in Dalmatia, leg. Latzel), see. ERICHSEN 1940.

The present species has a wide distribution in all continents, mainly in tropical-subtropical districts with an oceanic climate.

It is recorded from various parts of Africa, e.g. Morocco, Alger, French Equatorial Africa, and Cape of Good Hope. It is also quoted from the Canary Islands, Madeira, the Azores, the Cape Verde Islands, and the Island of St. Thomas in the Guinea Gulf. Further it is reported from the islands of Réunion and Rodriguez in the Indian Ocean.

In Asia it is known from India, Ceylon, several districts of China, Japan, the Philippine Islands, and the Andaman Islands.

It is also recorded from Queensland in Australia, and from New Zealand.

In N. America it is recorded from Alaska, Canada, the United States, and Mexico.

In S. America it is collected in Brazil and Uruguay. Probably it is widely spread in the South Seas.

Habitat Ecology. — At Hallands Väderö where Hellbom collected several specimens in 1884, I could only find one specimen in 1945, growing on the northern side of an old *Fagus* with somewhat uneven bark. The epiphytic vegetation was a *Pyrenula nitida*-society with epiphytes characteristic of a rather slightly illuminated beech trunk. The following species were recorded:

Lecanora expallens	1	Pertusaria velata	1
— glabrata	2	— Wulfenii	1
— subfusca	1	Pyrenula nitida	5+
Lepraria aeruginosa	1—	Sphinctrina gelasinata	1
Pertusaria leioplaca	1	Coccoid Chlorophyceae	1—

The absolutely dominating *Pyrenula nitida* gave little room to the other components of the society. *Lepraria aeruginosa* and the green algae were noticed only in the crevices of the bark.

According to ERICHSEN (1933 p. 10), the species grows on old beeches also in the N. German localities. At Rügen where I studied it in 1938, it grew under about the same conditions as at Hallands Väderö. TAVARES (1946) records it as »nitrophilous», having collected the plant on trees near roads. It is possible that it has a wider ecological amplitude in other districts of its area than in N. Europe.

Affinity and Variation. — As to its relations to *P. leptospora* and *P. subviridis*, cf. ERICHSEN 1936 and ALMBORN 1942. The specimens from Hallands Väderö, as well as most of the German ones, and also the Portuguese ones belong to var. *valentior* Erichs., with a thicker, more uneven thallus and often with badly developed apothecia. It looks rather aberrant from the main type, but it does not deserve the rank of a species.

F. The *Parmelia trichotera* Group.

26. *Parmelia trichotera* Hue.

Cf. ZAHLBRUCKNER Cat. Lich. VI (1930) p. 220, X (1940) p. 538, DU RIETZ Krit. Bemerk. über die *Parmelia perlata*-Gruppe (1924) p. 77, and HILLMANN in RABENHORST's Kryptogamen-Flora IX. 5:3 (1936) p. 248.

History. — Under the names of *Parmelia cetrata* Ach., *P. perforata* Ach., and *P. perlata* (Huds.) Ach., lichenologists of the 19th

century treated a critical group of lichens whose specific delimitation was subject to very differing views. HUE (1898) gave thorough descriptions — based upon French specimens — of 6 species, *P. cetrata* Ach., *P. perforata* Ach., *P. perlata* Ach., and *P. Nilgherrensis* Nyl., which were previously known, and described the new species *P. trichotera* and *P. pilosella*. HARMAND (1909) retained HUE's species concept in its main features with the addition of two new European members of the group, *P. olivaria* Hue and *P. cetrarioides* Nyl. DU RIETZ (1924 a, b) pointed out that Central European lichenologists had used several Acharian names in an erroneous meaning. He published a revision of this group based on the study of Acharian cotypes and attaching much stress to characters taken from soredia, isidia, and pseudocyphellae. DU RIETZ showed that *P. cetrata* and *P. perforata* are nonsorediate lichens chiefly occurring in America, not in Europe. The main part of what European lichenologists have known under these names is a sorediate species, *P. reticulata* Tayl., which, however, is not directly related to the *perlata*-group of the section *Amphiglymnia* Vain. This section comprises one group with yellowish thallus (*Subflavescentes* Vain., e.g. *P. caperata* (L.) Ach.) and another with grayish thallus (*Subglaucescentes* Vain.). According to DU RIETZ the latter group contains only 4 European species, viz. *P. cetrarioides* Del. (=*P. perlata* of most earlier authors, also of TH. FRIES 1871) with var. *rubescens* (Th. Fr.) DR. (=*P. olivaria* Hue), *P. trichotera* Hue with var. *Claudelii* (Harm.) DR. (the variety=*P. perforata* of several authors), *P. Arnoldii* DR. (=*P. Nilgherrensis* Nyl. pro p.), and *P. crinita* Ach. (=*P. pilosella* Hue).

The European distributional areas of these species are southern and oceanic. In Scandinavia *P. cetrarioides* is known from some few stations in the southern and central districts of Sweden, Norway, and Finland (cf. DEGELIUS 1933). *P. Arnoldii* and *P. crinita* are in Scandinavia euoceanic lichens, only known from W. Norway (cf. DEGELIUS 1935 p. 124—128).

P. trichotera was not known from the Scandinavian flora district until in 1939, when ERICHSEN and the present writer (independent of each other) published it from D e n m a r k (S. Jylland). From N o r w a y it was published by HASSELROT in 1942. The *P. trichotera* of HAVÅS (Hav. occ. exs. 94) and LYNGE (1921 p. 179) is *P. Arnoldii* (cf. DEGELIUS l.c.). The species is still unknown from S w e d e n.

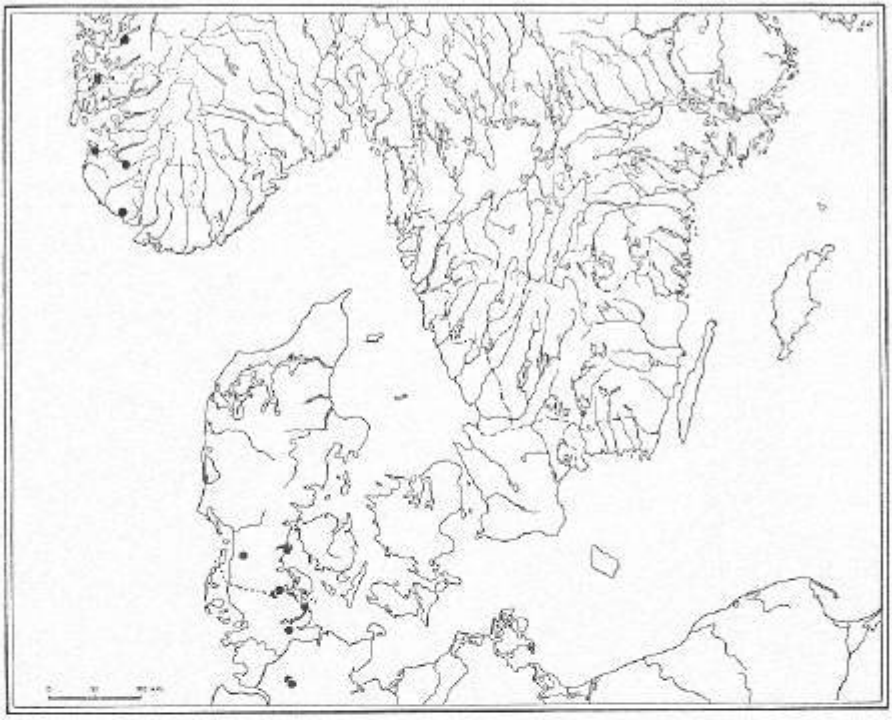


Fig. 30. *Parmelia trichotera* in Scandinavia.

Scandinavian Distribution.

Norway.

Rogaland. Forsand: Frafjorddalen, Brådland, on the E. side of the river (near the bridge), scanty on *Sorbus aucuparia*. 1947 Deg. (Ds, L). — Hetland: Vaulen, some few specimens on *Abies*. 1947 Ahlner (Ar). — Sokndal: Regefjord, Skarås (»Seljuåsen»). 1932 Deg. (Ds) Degelius 1935 pp. 126, 352 (as *P. Arnoldii*), Hasselrot 1942 p. 300; ibm. on *Quercus*, *Salix*, *Betula*, and mossy rocks. 1939 Hasselrot (Ht, L, U) Hasselrot l.c.

Hordaland. Kvinnherad: Rosendal, »Baroniet», some specimens on *Acer* in the park. 1947 Ahlner (Ar). — Vikebygd: Förde, on a cultivated *Picea* by the road, one large specimen. 1947 Ahlner (Ar).

Denmark.

Jylland. Bov: Kollund, near the shore S. of the youth hostel, several specimens on *Quercus*. 1939! (A, K, L, R) Almborn 1939 p. 775. — Döstrup: Tevring, on *Quercus*. Er. (f. *submuda*) Erichsen 1944 p. 35. — Holböl: Sönderhav, light beech wood at the N. side of the shore road, 2 specimens on *Fagus*. 1939! (K, L) Almborn l.c. — Nr Vilstrup: Kelstrup, near the Viktoriabad, scarce on an old *Quercus*. 1915 Erichs. (f. *microphylla*) Erichsen 1939 p. 81.

Extra-Scandinavian Distribution. — *P. trichotera* is a rather common lichen in Central, Western, and Southern Europe with its chief distribution concentrated to the oceanic districts.

In Schleswig-Holstein in Germany, it is »ziemlich selten und immer spärlich und steril» (ERICHSEN 1930), it is lacking in N.E. Germany (Pomerania, Rügen, most parts of Brandenburg, Saxony, as well as in the former German East Prussia), sec. HILLMANN 1936. In W. Germany it is a common plant; sec. SANDSTEDE it is »häufig an Bäumen aller Art» in Oldenburg. In Silesia, Baden, and Bavaria it is probably no rare plant, though literary statements of »*P. perlata*» are more often referable to *P. cetrarioides* than to the present plant. Its distribution in the Alps is not exactly known but it does not ascend to high elevations. It is recorded from Switzerland (DU RIETZ 1924), Austria (RABENHORST exs. 912), and Czecho-Slovakia (Bohemia, sec. HILITZER 1926; Slovakia and the Carpathians, sec. SUZA 1925, 1926, 1930). It is also reported from some few stations in Hungary (GYELNIK 1928, SZATALA 1929 b).

From the Netherlands, MAAS GEESTERANUS (1947) reported it as »formerly fairly common, very rare in the present time». It is also known from Belgium (BOULY DE LESDAIN 1905, DUVIGNEAUD 1938, WESTENDORP exs. 708). According to HARMAND (1909) it is »très commun dans toute la France». In the British Isles it is »general and often plentiful in most parts of Great Britain and in the Channel Islands; apparently rare in Ireland» (A. L. SMITH 1918).

In Portugal it is »one of the most abundant *Parmeliae* in certain districts of this country» (TAVARES 1945, transl. fr. Port.). Probably it is also widely distributed in Spain (SAMPAIO & CRESPI 1927, WERNER 1937, several collections by Degelius). Its distribution in Italy is very imperfectly known as JATTA's statements of *P. perlata* (1900, 1910) are referable to several species. It is recorded from Liguria (several stations at the Gulf of Genoa), sec. SBARBARO 1932. In the Balkan Peninsula it is known from Yugo-Slavia (ZAHLBRUCKNER 1916, SERVIT 1931, 1934, several collections by Degelius), Bulgaria (ascending to 1200 m above sea level, sec. SUZA 1929), and Greece (Korfu, ARNOLD exs. 1912).

The only statements from E. Europe known to me are from the Lublin hills in S. Poland (SULMA 1935) and the Caucasus in Russia (TOMIN 1937).

It is difficult to get a survey of its extra-European distribution as literary records are not reliable. In the older literature and in the herbaria, the present species is often met with as *P. perlata*, but this name can stand for at least 10 different species. I have seen specimens (in herb. L, S, U) of the real *P. trichotera* from the following districts: Africa (Transvaal, Madeira, the Canary Islands, and the Azores), Australia and New Zealand, America (United States, Mexico, Chile), and Oceania (the Juan Fernandez Islands, Hawaii).

Habitat Ecology. — The rather few Scandinavian localities admit of no sure conclusions as to the ecology of the lichen. It has been collected on various species of deciduous and coniferous trees, in Norway also on mossy rocks. The same variation in its habitats is recorded also from extra-Scandinavian stations. It is rather tolerant as to impregna-

tion with dust, collected on roadside trees as well as on dust-free stations. As I have not had the opportunity of studying the species in nature since 1939, I can give no further information about its sociology.

Affinity and Variation. — Concerning the differences between *P. trichotera* and related species of the *Amphigymnia* group, I refer to the works by Du Rietz and Hillmann, where analytical keys are given. Against the opinion of Du Rietz that *P. perlata* »dürfte in Europa nur in der Literatur existieren», Abbayes (1934) pointed out that *P. perlata* [sensu Hue (1898) and Harmand (1909)] is a proper species related to *P. trichotera* and differing from this lichen in its much larger thallus with more rounded lobes with no (or very few) cilia in the margins and no (or very few) rhizinae on the lower surface. Hillmann (1939) agreed with Abbayes and suggested that Hue's species might be identical with *P. perlata* Ach. As this specific epithet derives from *Lichen perlatus* Huds., the meaning of which cannot be stated with certainty, Degelius (1941 b) proposed the new name *P. robusta* for the *P. perlata* of Hue, Harmand, and Abbayes. According to Degelius, the latter species is more restricted to S.W. Europe (occurring in France, Portugal, and Spain) than *P. trichotera*.

A Swedish specimen (from Östergötland, Skedevi: Magnehult, on *Tilia*, 1900 F. O. Westerberg (S), labelled as *P. perlata* var. *cetrarioides*) belongs to *P. robusta* and is not in any respect different from French or Portuguese specimens. With a good deal of probability this record is due to a confusion of labels in the herbarium. A Swedish station for this extremely southern-oceanic species would seem very questionable. A specimen of typical *P. cetrarioides* from the same station and the same collector is also preserved in herb. S (cf. Westerberg 1911 p. 436).

P. robusta is widely distributed in extra-Scandinavian countries (cf. Hillmann 1939 and Degelius 1941 b). In my opinion the two species are, as a rule, easy to distinguish, at least in European collections. Nevertheless, the tropical *Amphigymniae* and related species of sect. *Hypotrachyna* highly need a critical revision.

The Scandinavian population of *P. trichotera* is rather uniform. Hillmann (1936) quoted two forms, f. *nuda* Harm. without soralia and f. *microphylla* B. de Lesd. with very small, short lobes. The latter form was stated by Erichsen from S. Jylland. Apparently it is a dwarf form induced by unfavourable external conditions. Erichsen (1944) described a f. *subnuda* (from several Central European stations, also from S. Jylland) with the diagnosis »Unterseite des Lagers fein runzelig oder kurz- und feinwarzig, ohne oder in der Mitte mit ganz vereinzelten

Haftfasern». The naked lower surface would suggest its identity with *P. robusta*, but this species is also characterized by a much larger thallus than *P. trichotera*. As original specimens are not available at present, it is not possible to decide whether this form is intermediate between *P. robusta* and *trichotera*. If it really is, the specific distinction between these two lichens must be taken into consideration.

With regard to the KOH reaction of the medulla, two varieties have been distinguished. All Scandinavian specimens are K+ yellow (var. *typica* DR.), while another type with medulla K+ yellow, soon changing to red [var. *Claudelii* (Harm.) DR.], is distributed in other parts of Europe as well as in extra-European districts. DU RIETZ found no morphological differences between the two types and found also specimens with an intermediate K reaction (»Eine scharfe Grenze existiert somit nicht, wenn sich auch die beiden Formen recht gut als Varietäten auseinanderhalten lassen»). HILLMANN (1936) stated, concerning the variety, »dass die Reaktion nicht wesentlich von der Stammform abweicht». I can only confirm these statements after examining several specimens from various parts of the world. In fact, the concentration of salazic acid in the thallus, to which the differing K reaction is due, seems to vary within wide limits and cannot be of much taxonomical value.[1]

Recently TAVARES (1945) has ranked the K+ red variety as a proper species, *P. Claudelii* (Harm.) C. Tav., based also on external morphological characters. According to his analytical key the chief difference is said to exist in the form of the soredia, limbiform in *Claudelii*, subcapitiform in *trichotera*. In Portuguese specimens of the two types, kindly sent to me by Dr TAVARES, I cannot find any difference in the soredia. In my opinion »*P. Claudelii*» is chiefly a growth form referring to old specimens with more confluent soredia and a somewhat higher concentration of salazic acid. Besides, the combination *P. Claudelii* for the present lichen is not valid, as it has been used previously by VAINIO (1909) for an Asiatic species, which, according to DU RIETZ, is not identical with HARMAND's plant.

All Scandinavian specimens seen are sterile. On the whole, apothecia are rare in the European population, more common in extra-European specimens.

[1] This is also valid for the chemical difference between *P. trichotera* (K+ intensely yellow) and *P. robusta* (K— »or extremely slightly yellowish») stated by DEGELIUS (l.c.).

G. The *Graphis elegans* Group.

27. *Graphis elegans* (Sm.) Ach.

Cf. ZAHLBRUCKNER Cat. Lich. II (1924) p. 304, VIII (1932) p. 202, X (1940) p. 154, and ALMBORN *Gr. elegans* found in Denmark (1942) p. 387.

History. — *Graphis elegans* is a representative of an extremely southern-oceanic element in the Scandinavian lichen flora. Though it has been known from the oceanic districts of Europe for a long time (described already in 1807 from England by J. E. SMITH) it remained unknown from N. Europe until 1939. The following two stations from Denmark are still the only ones known in our districts.

Scandinavian Distribution.

Denmark.

Fyn. Trøstrup Korup: near »kom-igen-Kroen», on *Fagus*, 1946! (Ds, K, L, S, U).

Jylland. Gaverslund (pr. Vejle): Munkebjærg, on *Fagus*, 1939, 47! (A, Ds, K, L, S) ALMBORN 1942 p. 387.

There is a rather large gap between the Danish stations and the nearest German occurrence in the neighbourhood of Hamburg. It might be expected on some of the outposts of oceanic vegetation in Denmark and Skåne (e.g. Möns Klint, Kullen, Hallands Väderö) but as it is also lacking in the well-investigated lichen flora of Rügen, it seems to represent a more southern type of distribution than *Enterographa crassa* and *Pertusaria velata*.

Extra-Scandinavian Distribution. — *Graphis elegans* has its chief distribution in the oceanic districts of W. Europe.

In Germany it occurs mainly in the N.W. part. ERICHSEN (1939 b) recorded some few stations near Hamburg, northernmost at Trittau in Holstein. According to SANDSTEDE (1912) it is »in den oldenburgischen Waldungen sehr häufig, namentlich an Birken und *Ilex*, auch an Eichen, Buchen, *Sorbus*, *Frangula*, *Corylus*; am rechten Weserufer seltener». LAHM (1885) collected it near Münster in Westphalia. It is also known from St. Georgen in Baden (on *Ilex*), see. BAUSCH 1869.

It is spread in Belgium (DUVIGNEAUD & GILTAY 1938). In France it is no rare plant in the western departments (»assez commun», see. OLIVIER 1884) but is rare in the interior parts (»très rare» in Franche-Comté, see. FLAGEY 1883; »assez rare» in Lorraine, see. HARMAND 1895—99). A. L. SMITH (1926) stated it to be »general and common in England and Ireland, somewhat rare in Scotland». See. KNOWLES (1929) it is »widespread and common on holly, oak, birch etc.» in Ireland.

In S. Europe it is only known from the Iberian Peninsula, not from Italy and Balkan. In Spain it occurs »en varios montes» (COLMEIRO 1867—1868). In Portugal it is »rather sparse, only a few localities» (TAVARES in litt.).

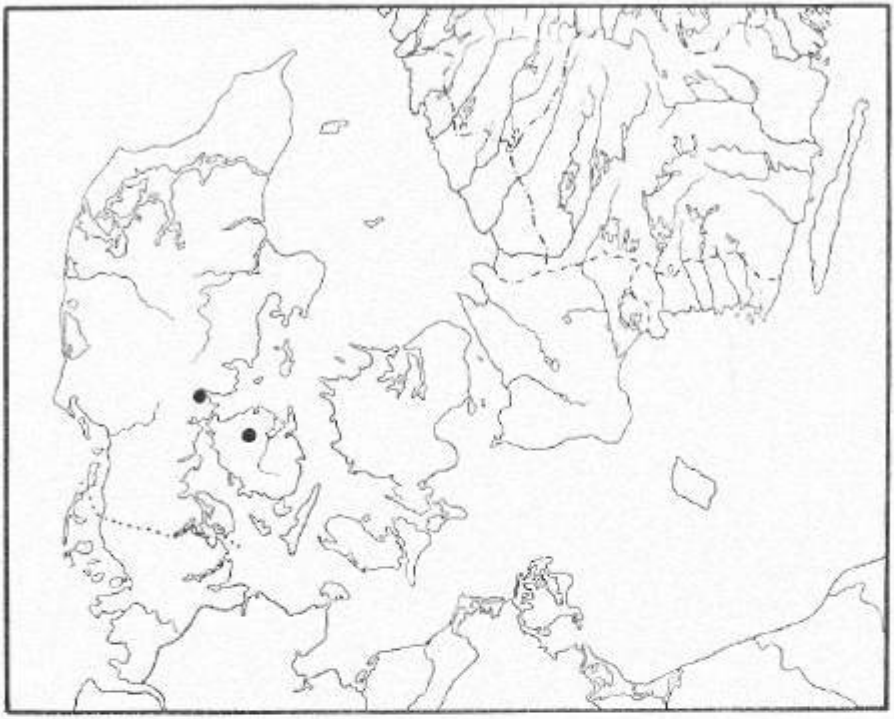


Fig. 31. *Graphis elegans* in Scandinavia.

There are some statements in the literature from E. Europe but I have seen no specimens. An old record from the East Carpathians is doubted by SUZA (1933). SULMA (1935) reported it from the Lublin hills in Poland.

Several records of *Gr. elegans* from extra-European countries must be regarded with suspicion, owing to be the great polymorphy of the genus in tropical districts. It is recorded from Japan (NYLANDER 1890) and New Zealand (HOOKER 1867).

FINK (1935) reported it as found »from N. Jersey to Florida and westward to Texas».

If *Graphis striatula* (Ach.) Spreng. is regarded as a variety of *Gr. elegans* (cf. MAGNUSSON 1943) the total area of the latter species is extended to several tropical districts. *Gr. striatula* is known from Portugal (PEREIRA 1916) and has a wide extra-European distribution: Africa (Guinea, Port Natal, and Madagascar), Asia (India, Ceylon, several provinces of China, Siam, the Philippine Islands, and the Sunda Islands), Australia, and America (S.E. States of U.S.A., Cuba, Brazil) and Oceania (the Hawaian Islands).

Habitat Ecology. — In the two Danish stations the species grew on old beeches. In W. Europe it is recorded from several kinds of tree,

Tab. XXV. Graphis elegans - communities.

On the trunks of middle-aged *Fagus*. — 1. **Fyn.** Trōstrup Korup, E. exposure. — 2. **Jl.** Gaverslund: Munkebjærg, E. exp. — 3. Ibm, W. exp.

	1	2	3		1	2	3
Arthothelium ruanideum	1—	—	—	Porina carpinea	1	—	—
Evernia prunastri	—	2	—	Pyrenula nitida	—	—	1
Graphis elegans	3	2	2				
— scripta	—	1	—	Dichaena faginea	3	—	—
Lecanora subfusca	—	3	1				
Lepraria aeruginosa	1	3	2	Coccoid Chlorophyceae	+	+	+
Opegrapha viridis	—	3	1				
Parmelia fuliginosa var. laetevirens	—	1	1	Hypnum cupressiforme	1	—	5
Pertusaria leioplaca	—	2	—	Frullania dilatata	—	1	—
— pertusa	—	4	2	Metzgeria furcata	—	1	—
— Wulfenii	—	1	1	Radula complanata	—	1	—
Phlyctis argena	—	3	—				

especially *Ilex*. I have searched for it in vain in the occurrences of *Ilex* in Denmark and Norway, which, however, have a very scanty and trivial epiphytic vegetation.

The scarce material available from the localities investigated by me cannot allow of too extensive conclusions as to its ecology. Evidently it is a pronouncedly photophobus plant. ERICHSEN (1939 b) recorded it from the Hamburg district as growing near the base of the trunks, which would suggest a hygrophilous lichen. In the Danish stations I found it at about 1 m above the ground. Among the accompanying species, which, on the whole, are typical for shadowy beech trunks, *Lepraria aeruginosa* and green algae played prominent parts.

Affinity and Variation. — *Graphis elegans* is well separated from the common *Gr. scripta* (cf. further ALMBORN l.c.).

Gr. striatula (cf. above) differs from *Gr. elegans* mainly in the shape of the apothecia: in *striatula* slender and curved, usually branched, with an indistinctly striate exciple, in *elegans* short and wide, rarely branched, with a thick, 1—4 times striate exciple. The internal morphology is mainly the same. The delimitation between the two types is not always clear. I am inclined to treat this mainly tropical and subtropical type as *Gr. elegans* var. *striatula* (Ach.) Tuck.

Otherwise, the European population of *Gr. elegans* contains no peculiar forms or varieties.

IV. Critical or Insufficiently Known Species.

Several lichens have about the same Scandinavian distribution as the species treated in Chapter III. In several cases their areas are no doubt determined by the same phytogeographical factors as are valid for these species. Some of them belong to critical groups not yet disentangled from a taxonomical point of view, others are known from a solitary or some few stations not directly connected with an extra-Scandinavian area and not allowing trustworthy conclusions as to their phytogeographical position. The following enumeration contains some South-Scandinavian species which, on this account, have not been subject to a more thorough investigation in the present work.

The list does not claim to be complete. Several rare lichens with detached South-Scandinavian stations have not been taken into consideration. Nor have calcareous lichens been mentioned. Of the last-mentioned group, some species are restricted to Öland (e.g. *Caloplaca Schistidii, Lecanora fragilis*), Gotland (e.g. *Buellia Dubyana, Caloplaca erythrocarpa, Porina linearis*), Öland and Gotland (e.g. *Caloplaca Agardhiana, C. fulgens, Staurothele caesia, Verrucaria canella*), the calcareous districts of Öland, Gotland, Västergötland, Östergötland, Närke, Västmanland, and the Stockholm district (e.g. *Caloplaca variabilis*), or to the South Swedish and South Norwegian (the Oslo district) occurrences of limestone rocks (e.g. *Lecanora crassa, Thelidium pyrenophorum*). A remarkable type of distribution is represented by e.g. *Acarospora cervina* (Öland, Gotland, and the Oslo district) and *Petractis clausa* (Gotland and the Oslo district).[1] These lichens are lacking in Skåne,[2] Denmark, and N. Germany but have wide distributional areas in the limestone districts of Central, Western, and Southern Europe. No doubt they constitute a southern element in the Scandinavian lichen

[1] A similar Scandinavian area (Öland, Gotland, and S.E. Norway) is shown by some phanerogams, e.g. *Coronilla Emerus* and *Galium scabrum*.

[2] As indicated by Malme (1895 p. 141) calcareous lichens are rare in Skåne. None of the above-mentioned species have been found on the Scanian limestone rocks.

flora, their northern limits being determined by climatic as well as by edaphic conditions. A thorough investigation of their Scandinavian occurrences based on ecological studies of the South Scandinavian communities of calciphilous plants, would be an interesting subject.

To the *Pyrenula nitida* Group.

Arthonia byssacea (Weig.) Almqu. — Mainly on the trunks of old oaks. Known from the following stations. Cf. S. ALMQUIST 1880 p. 25.

Sweden.

Skåne. Torrlösa: Trolleholm. E. Fries. ALMQUIST l.c.

Östergötland. V. Tollstad: Omberg. Sthr (S, U). — Häradshammar: Yxnö. Sthr (G, L, S).

Närke. Götlunda: Hamrarna. Blomb. (G, K, L, S, U); ibm. Alb. Blomberg and C. Indebetou (S) BLOMBERG 1895 p. 104.

Västmanland. Kungsör: on *Quercus* and *Tilia*. Blomb. (G, L, U) BLOMBERG l.c.

This species seems to be rare nowadays, not collected in Sweden in the present century. I have searched for it in vain on old oaks in S. Sweden and Denmark.

Arthopyrenia biformis (Borr.) Mass. — Not uncommon on deciduous trees (especially middle-aged and old *Fraxinus*) in Denmark, Skåne, Öland, and Gotland. Further recorded from:

Sweden.

Småland. Misterhult: Island of Jungfrun. DR. (Dz, U).

Halland. Släp: Särö. Magn. (M) MAGNUSSON 1919 p. 76.

Bohuslän. Dragsmark. Magn. (M) MAGNUSSON l.c. — Skaftö. Magn. (G, M); ibm. Deg. (Ds, U) DEGELIUS 1939 p. 108.

Östergötland. Krokek: Orrekullen. Hult. (B, T, U). — V. Tollstad: Omberg. Me and Vrang (Dz, L, M, S, U, MALME exs. 243) MALME 1912 p. 101; ibm. Deg. (Ds) DEGELIUS 1944 b p. 12.

Närke. Götlunda: Hamrarna. Blomb. (L, U).

Södermanland. Mörkö and Vagnhärad. Me (S) MALME 1927 p. 361. — Ornö. Deg. (Ds) DEGELIUS 1942 p. 19.

Uppland. Vaxholm: Oskar Fredriksborg. Hult. HULTING 1897 p. 217.

Not known from Norway. Its Scandinavian area is similar to that of e.g. *Opegrapha viridis*, and it might well defend its place in this group. Anyhow, it belongs to a critical group of *Arthopyrenia* together with *A. gemmata* and *sphaeroides*. A taxonomical revision of these species seems to be necessary.

A. cinereopruinosa (Schaer.) Kbr.

Sweden.

Gotland. Visby: on *Hedera*. Deg. (Ds) DEGELIUS 1944 p. 36.

Norway.

Rogaland. Forsand: Frafjorddalen, Brådlandsåsen, on *Populus tremula*. Deg. (Ds).

A suboceanic species, not uncommon in Central, Western, and Southern Europe.

A. Persoonii Mass. — On trunks and twigs of deciduous trees.

Sweden.

Blekinge. Hjortsberga: N. end of Lake Sännen.! (L)

Gotland. Kräklingbo: Torsburgen. Deg. (Ds) DEGELIUS 1936 p. 62. — Follingbo: Dede. Deg. (Ds) DEGELIUS 1944 p. 36.

Bohuslän. Skaftö: Vägeröd. Deg. (Ds) DEGELIUS 1939 p. 109.

Södermanland. Nämdö. Deg. (Ds) DEGELIUS 1943 b p. 408.

Sec. KRISSLER (1938 p. 95) *A. cortitecta* Norm. is probably the same species. It is collected in Norway: Hordaland, »Isdalen prope Bergen». NORMAN 1884 p. 37.

An inconspicuous and somewhat critical lichen, probably to be found elsewhere in the S. Scandinavian provinces.

A. submicans (Nyl.) Arn. — On deciduous trees.

Sweden.

Skåne. Brunnby: Kullen. ERICHSEN 1913 p. 36.

Öland. Resmo: the churchyard.! (L).

Södermanland. Ornö: Grönskär. Deg. (Ds) DEGELIUS 1942 p. 19.

Denmark.

Jylland. Agri: Mols Bjærge and Femmöller. Chr. (K) CHRISTIANSEN 1946 p. 74.

As the preceding species.

Bacidia Auerswaldii (Stiz.) Mig. — On deciduous trees.

Sweden.

Skåne. S. Melby: Kiviks Esperöd. Malme (L, S, U) MALME 1895 p. 140.

Öland. Borgholm. Vrang. (L, S). — Högsrum: Halltorp. W. Molér (U) TH. FRIES 1874 p. 386.

Gotland. Ardre. Me (S) MALME 1924 p. 316. — Eke: N.E. of the church. Deg. (Ds) DEGELIUS 1944 p. 45. — Lummelunda. Me (S) MALME 1895 p. 140. — Vamlingbo: near Bottarve. Deg. (Ds) DEGELIUS 1936 p. 71. — Visby. Me (L, S) MALME 1924 p. 316.

Västergötland. Forshem. Magn. (M).

Östergötland. V. Tollstad: Alvastra. Me (L, S) MALME 1909 p. (82).

Södermanland. Trosa: Turcholm. Me (S) MALME 1926 p. 54.

Not known from other Scandinavian countries.

Bacidia Friesiana (Hepp) Kbr. — Mainly on the bark of *Sambucus*. Rather common in S. Jylland, the Danish Islands, Skåne, and Blekinge. Further known from:

Sweden.

Öland. Borgholm. J. E. Zetterstedt (U) TH. FRIES 1874 p. 357; ibm. DR. (Ds, Dz, G, L, M, S, T, U, MALME exs. 463).

Gotland. Visby. Me. MALME 1924 p. 316; ibm. DR. (Dz, U); ibm. Deg. (Ds, S) DEGELIUS 1944 p. 45. — Öja: Burgsvik. Me. MALME l.c.; ibm. DR. (Dz, S, U).

Småland. Väckelsång: Lidhem. O. Lundholm (f. *contraria*) (U) TH. FRIES 1874 p. 358.

Bohuslän. Skaftö: N. of Evensås. Deg. (Ds) DEGELIUS 1939 p. 132.

Västergötland. Kållered: Labacka. Magn. (M, S).

Södermanland. Ornö. Deg. (Ds) DEGELIUS 1942 p. 30.

Denmark.

Læsö. Vesterö: Nr Rönner, Langholm. Deg. (Ds) DEGELIUS 1933 b p. 402.

Finland.

Tavastia australis. Hollola. Vainio. [var. *Norrlinii* (Lamy) Vain. + subsp. *hollolensis* Vain.] (H) VAINIO 1922 p. 197. — Mustiala. A. Kullhem (var. *leprarioides* Vain.) (H) VAINIO l.c.

Its distribution area in the Scandinavian Peninsula agrees well with that of *Opegrapha viridis*. The Finnish specimens, as well as the northernmost Swedish and Danish collections — on substrata other than *Sambucus* — are rather different from the main type occurring in the South-Scandinavian districts. A taxonomic revision of this and related species will be necessary, before it can be subject to further treatment.

Bacidia perpusilla (Lahm) Th. Fr. — On the bark of coniferous trees.

Sweden.

Skåne. Brunnby: Mölle. Er. ERICHSEN 1913 p. 51.

Blekinge. Jämshög: Holje. Hult. (S, U) HULTING 1872 p. 18.

Gotland. Vamlingbo. Deg. (Ds) DEGELIUS 1936 p. 71.

An inconspicuous and perhaps overlooked lichen.

Bactrospora dryina (Ach.) Mass. Syn. *B. corticola* (Ach.) Mass. — On the trunks of old oaks. Cf. S. ALMQUIST 1869 p. 25.

Sweden.

Skåne. Torekov: Hallands Väderö. Hellb. (G, K, S) HELLBOM 1887 p. 67. **Blekinge.** Förkärla: Tromtö! (L, S). — Sölvesborg: Valje. Hult. HULTING 1872 p. 21. **Öland.** Borgholm. Sthr (S). — Böda. Sthr (S): ibm. B. kronopark. Deg. (Ds). — Högby. Sthr (S). **Gotland.** Lojsta. Lönnroth (U). — Lummelunda: Kams. Sthr (L). **Småland.** Femsjö: Råknen. Th. Fries (U). — Misterhult: Island of Jungfrun. DR, (G, Dz, S, U). **Östergötland.** Häradshammar: Yxnö. Sthr (G, L, M, S). — V. Tollstad: Omberg. Several collections by Acharius (?), Wahlenberg, Sthr, Theorin, Indebetou, Hult., Me (G, K, L, S, U) STENHAMMAR 1864 p. 474, THEORIN 1874 p. 11, 1875 p. 154, MALME 1892 p. 130. **Södermanland.** Sorunda: Ramsö. Me (S). **Närke.** Göttunda: Hamrarna (U) and Vimnäset. Blomb. (G, L, S, U). — Hammar: St. Röknen. Hellb. (U). — Lännäs: near Läppe. Hellb. — St. Mellösa: Essön. Hellb. (S, U). — All from HELLBOM 1871 p. 110, 1871 b p. 78. **Västmanland.** Kungsör. Blomb. (G, K, L, S, U) BLOMBERG 1895 p. 104. **Uppland.** Funbo: Halmbyboda. Th. Fries (U); ibm. B. & M. Floderus (U). Sine loco. E. FRIES exs. 273. STHR exs. 172.

Denmark.

Sjælland. Halagerlille: Plessens Overdrev. Branth. — Taarborg: Charlottenlund. Several collections by Benzon, Grönlund, Feilberg, Rostrup, Warming (G, K, L, S, U) MORTENSEN 1872 p. 65. **Fyn.** Gudbjærg: Brænderup Skov, Rostrup (K). **Jylland.** Dollerup: Hald. — Rödding: Södal. Branth (K, U) BRANTH 1867 p. 86.

The other Danish stations from BRANTH & ROSTRUP 1869 p. 249.

Perhaps distributed within the whole oak region. In agreement with ZAHLBRUCKNER's Cat. Lich. II (1924 p. 143), I regard *B. corticola* and *B. dryina* as the same species. It could also be referred to the fungi (cf. LETTAU 1932 p. 42).

Buellia stellulata (Tayl.) Mudd. — On stones, mainly near the shore.

Sweden.

Skåne. Brunnby: between Mölle and Höganäs. Berg (L, U) BERG 1890 p. 170; ibm. B. Nilson (L, U) B. NILSON 1903 p. 488; ibm. S. of Mölle. Deg. and ! (Ds, L, S); E. of Arild. Er. ERICHSEN 1913 p. 80; Arild. Sthm (G). — S. Mellby: Stensknuvud! (A). **Öland.** Alböke: Gullehamn. Deg. (Ds, S) DEGELIUS 1945 p. 38. — Högby: Horns strand. Sthm (G, M, S) DEGELIUS l.c.

Norway.

Rogaland. Molde: S. of Moldemoen. Magn. (M, S).

Denmark.

Sjælland. Herslev: Bognæs. Chr. (K). — Odden: Yderby. T. Böcher (K, L). — Omö. Branth (K, U) Branth & Rostrup 1869 p. 237 Th. Fries 1874 p. 603.

[Fyn. The collections cited by Th. Fries l.c. belong to *B. aethalea* and *B. sororia* (K).]

Jylland. Hirtshals. Branth, Lange & Mortensen 1877—79 p. 166. — Hoed: Glatved Strand. Branth (G, K, S, U). — Raabjærg. Branth, Lange & Mortensen l.c. — Skagen. Branth (K) Lange & Mortensen l.c.; ihm. Warming (K) Gallöe 1932 p. 22. — Skanderborg. Branth (L).

Læsö. Vesterö: Nr Rönner, Langholm. Deg. (Ds) Degelius 1933 b p. 403, 1945 p. 39.

Bornholm. Nexö. Hellb. (G) Hellbom 1890 p. 91.

Externally similar to *B. aethalea* and *B. punctiformis*. Its distribution along the Scandinavian shores is still little known.

Buellia verruculosa (Sm.) Mudd. — On rocks, stone walls etc. Not uncommon in Denmark and Skåne. Further stations:

Sweden.

Öland. Algutsrum: between Aledal and Saxnäs. DR. (Dz) Degelius 1945 p. 39. — Ås: »Schäferiängen». Deg. (Ds) Degelius l.c.

Halland. Getinge. Berg. Berg 1890 p. 170.

Bohuslän. Torp: Rundsberget. Hellb. (G) Hellbom 1887 p. 64.

Västergötland. Skörstorp. Magn. (M).

Södermanland. St. Malm: Bränkärr. Me (S) Malme 1895 p. 142.

Unknown from Norway. Its northern limit in Sweden is still unknown.

Cladonia foliacea (Huds.) Schaer. Syn. *Cl. alcicornis* (Lightf.) Flk. — On sandy soil. Rather frequent in Denmark and the coast districts (incl. the Vener district) of Sweden from Dalsland and Bohuslän to S. Uppland. Very common on Öland and Gotland [here often as var. *convoluta* (Lam.) Vain.].

Inland stations:

Sweden.

Småland. Femsjö. Th. Fries (L, S, U) Th. Fries 1871 p. 94. — Skärstad: Vistakulle. Hedv. (L) Degelius 1934 b p. 417.

Östergötland. V. Tollstad: Omberg. Me (S, U) Malme 1892 p. 130.

Northernmost Swedish stations:

Uppland. Blidö: Svartlöga. Hülphers (S). — Uppsala: Galgbacken. Several collections by T. Hedlund, E. Holmgren, J. Timander (G, L, S, U); Husbyborg. R. Sernander. SERNANDER 1912 p. 826.

In Norway it is a common plant along the south coast (LYNGE 1921 p. 75). On the west coast it is known from Lille Kalsö in Rogaland (LYNGE l.c.) and Askvoll in Sogn og Fjordane (DEGELIUS 1934 p. 17).

In Finland it is known chiefly from Åland (Jurmo, Kökar, Signilskär, see. E. NYLANDER 1857 p. 81).

A collection from Kyrkslätt in Nyland (leg. Kullhem) is cited by TH. FRIES l.c. but is not recorded by VAINIO (1921).

Cladonia incrassata Flk. — In bogs, on the border of old peat haggs.

Sweden.

Skåne. Halmstad: Duveke, Alvthin (G, L).

Småland. Annerstad: W. of Kanarp, DR. (Dz) HASSELROT 1942 b p. 32. — Femsjö. E. Fries (U) E. FRIES 1825—26 p. 20. — Högsby: Berga. Hasselrot (Ht, L, S, U) HASSELROT l.c. — Tegnaby: Bramstorp. Hedv. (S, U). — Växjö: Spetsamossen. Several collections by P. Mårtensson, J. A. Z. Brundin, Deg., and Hedv. (Ds, L, S).

Halland. Gunnarp: Kornarp. Sthm (G, S, U, MAGN. exs. 3 b). — Svartrå: Kinnadungen (G, L, S) and Slåryd (L, S). Sthm. MAGNUSSON 1925 b p. 112. — Ullared: Övre Hjärtared. Sthm (G).

Västergötland. Fässberg; several stations. Sthm (G, SANDSTEDE exs. 908) MAGNUSSON l.c. — Kållered: Tulebo. Sthm (G). — Råda: Hårsjöröd (G) and Ögärde (G, MAGN. exs. 3 a). — Skölvene: Mosslanda. Hasselrot (Ht, S).

Östergötland. Svanhals: Svanhalsheden. E. v. Goes (U) TH. FRIES 1871 p. 71.

Denmark.

Sjælland, Fyn, and **Jylland.** Several stations. MØLHOLM HANSEN & LUND 1929 p. 38.

An overlooked species, probably to be found elsewhere in the southern parts of our district.

Gyalecta Flotowii Kbr. — On the trunks of old trees, chiefly *Fraxinus, Quercus,* and *Ulmus.*

Sweden.

Gotland. Gammelgarn (Ds), Hejnum (Ds), Visby (Ds), and Vesterhejde (Ds, S) Deg. DEGELIUS 1936 p. 65.

Dalsland. Laxarby: Emaus near Billingsfors. Hult. (G). — Skållerud: Håverud. Hult. (G, S, U) HULTING 1900 p. 74.

Östergötland. V. Tollstad: Omberg, Theorin (L, S, U); ibm. Me and Vrang (S, U, MALME exs. 982); ibm. Deg. (Ds) THEORIN 1875 p. 150, MALME 1909 p. (81), DEGELIUS 1944 b p. 18.

A rare species, not only in Scandinavia but also in other parts of Europe (cf. LETTAU 1937 p. 172).

Opegrapha betulina Sm. — On old trees.

Sweden.

Skåne. Brunnby: Kullen, S. Almquist (S); ibm. Er. EHRENSEN 1913 p. 41. — S. Mellby: Åsperöd and Kivik, Me (S) MALME 1935 p. 10. — Svalöv: Axelvold, Stihm (G).

Öland. Ås: Ottenby, J. E. Zetterstedt (U) S. ALMQUIST 1869 p. 17.

Gotland. Fide, Lönnroth (U as *O. atra*). — Fårö: Vinor, Deg. (Ds) DEGELIUS 1936 p. 64.

Bohuslän. Marstrand: Koön, Blomb. (G, L, U) S. ALMQUIST l.c. — Torp: Valberget, M. M. Floderus (U as *O. atra*).

Västergötland. Od: St. Mollungen, Hult. (G); ibm. Hasselrot (Ht). — Medelplana: Hällekis, Deg. (Ds).

Denmark.

Fyn. Husby: Wedellsborg.! (A, L).

Jylland. Skörping: Skindbjærg, Branth, S. ALMQUIST l.c.

[Bornholm, Aaker: Rischeck, Hellb. (G) HELLBOM 1887 p. 96. Refers to *O. atra*.]

A rare or overlooked species with a wide distribution in Central and Western Europe (cf. REDINGER 1938 p. 330).

Opegrapha confluens (Ach.) Stiz., *O. Mougeotii* Mass., *O. saxatilis* DC., and *O. saxicola* Ach.

The few Scandinavian stations of these species are situated within the district of our group III. The highly need taxonomical revision.

Opegrapha subsiderella (Nyl.) Arn. — Chiefly on deciduous trees. Not uncommon in Denmark, Skåne, and Blekinge. Further Swedish stations:

Öland. Borgholm, Deg. (Ds); ibm.! (L, S).

Gotland. Ekstа: St. Karlsö (Ds, S, U), Hablingbo (Ds, no pycnoconidia seen), and Västerhejde: Högklint (Ds). All Deg. DEGELIUS 1944 p. 39.

Småland. Femsjö: Hallaböke.! (L, no pycnoconidia).

Halland. Slåp: Särö, Magn. (M) MAGNUSSON 1919 p. 77.

Bohuslän. Skaftö: Lunnevik, Me (S as *O. vulgata*); between Evensås and Vägeröd, Deg. (Ds) DEGELIUS 1939 p. 114.

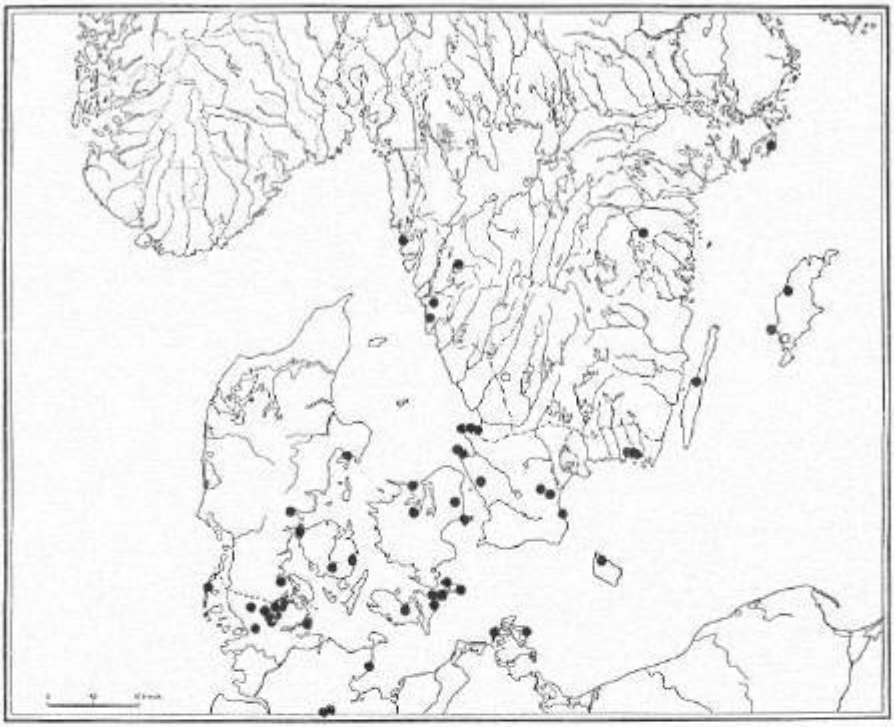


Fig. 32. *Opegrapha subsiderella* in Scandinavia.

Västergötland. Askim: Billdal. Deg. (Ds). — Långared: Hällnäs udde. Hasselrot (H). — Mölndal: Bunketorp. Deg. (Ds).

Östergötland. Grebo. Sthr (S as *O. atra*).

Södermanland. Ornö: Grönskär. Deg. (Ds) DEGELIUS 1942 p. 22.

Widely distributed in Central and Western Europe (cf. REDINGER 1938 p. 355). Its distribution in Scandinavia is still insufficiently known, as it can only be certainly distinguished from *O. vulgata* by a microscopic investigation of the pycnoconidia.

Pannaria nebulosa (Hoffm.) Nyl. — On sandy soil.

Sweden.

Skåne. Hyby: Holmeja. Deg. (Ds, L, S). — Hjärsås: Immeln. Me (S) MALME 1924 p. 314.

Småland. Rydaholm: Mahyttan. Deg. (Ds, S).

Västergötland. Angered: Agnesberg. Deg. (Ds, L, S, U). — Kölaby: Trädet. Vrang (S) Malme l.c.

Östergötland. V. Tollstad: Omberg. G. Wahlenberg (U).

Denmark.

Sjælland. Haslev: Bregentved, Branth (K). — Helsingör, Liebmann (K). — Hörsholm: Grönnegade, Grönlund (K). — Tibirke: Tisvilde Hegn, Gallöe (K) GALLÖE 1939 p. 63.

Fyn. Middelfart: Hinsgavl, J. Lange (K, L). — Nyborg: the brick yard wood, Rostrup (K).

Jylland. Dal: Dal Hede, Branth (K, L, U). — Ferslev: F. Mölleholm, Branth (K). — Ho: Skallingen, Chr. (K). — Oksby: Hornsbjerge, near Blaavandshuk, Chr. (K).

Anholt. J. Jacobsen (K).

An overlooked species, probably to be found elsewhere in the S. parts of Scandinavia.

To the *Parmelia laciniatula* Group.

Toninia caradocensis (Leight.) Lahm. — On bark, especially coniferous trees and *Betula*, and on lignum.

Sweden.

Bohuslän. Uddevalla: Skansberget, Magn. (M, S).

Västergötland. Angered: Forsbäck, Magn. and Sthm (G, M, S, U) MAGNUSSON 1927 p. 121. — Göteborg: Lärjeholm (M), St. Torp (MAGN. exs. 57) and Änggården (M, S), All Magn.; Slottsskogen, Er. ERICHSEN 1933 p. 17; Änggården,! (A, L).

Denmark.

Sjælland. Taarbæk: Jægersborg Dyrehave, Chr. (K, L) CHRISTIANSEN 1947 p. 184.

Jylland. Gram, Raabjærg: Jerup, and Römö: Sönderby, Er. ERICHSEN 1933 p. 17, 1942 p. 144.

An oceanic species with a wide distribution in England (A. L. SMITH 1926 p. 144) and W. Europe at least to N. W. Germany (ERICHSEN 1929 p. 112). Often sterile and easily overlooked owing to its similarity to forms of *Lecidea scalaris*. Its distribution in Sweden and Denmark should be studied further.

Usnea ceratina Ach. — On trees, especially *Fagus*.

Sweden.

Blekinge. Eringsboda, Falk. (L, U) FALK 1874 p. 7.

Widely distributed in the oceanic districts of Europe (MOTYKA 1936—38 p. 368). In Germany it is known northernmost from Holstein (ERICHSEN 1934 p. 354). Owing to the degeneration of the *Usnea* vegetation of the Scandinavian beech forests in recent time, it is little probable that more stations will be detected in our districts.

To the *Buellia canescens* Group.

Maronea constans (Nyl.) Hepp. — On trees, especially *Fagus*.

Sweden.

Skåne. Hjärsås: near Immeln, S. Almquist; Gyvik. Me (L, S) MALME 1895 p. 139, 1923 p. 369.

An easily overlooked species being externally similar to *Lecanora atra*. It has a wide distribution in Central Europe (cf. MAGNUSSON 1934 p. 53) and should be searched for in the Scandinavian beech district.

Lecidea sarcogynoides Kbr. — On siliceaceous rocks, in our district only near the shore.

Sweden.

Skåne. Brunnby: Kullen. B. Nilson (L) B. NILSON 1903 p. 473; Mölle. Sthm (M). — S. Mellby: Stenshuvud. Me (S) MALME 1935 p. 10. — Viken: N. of the village.! (L).

Denmark.

Sjælland. Rörvig: Nakkeland. Chr. (K).

Jylland. Lild: Troldsting. Chr. (K). — Raabjærg: near the church. Chr. (K, L). — All sec. CHRISTIANSEN 1947 p. 179.

Bornholm. Gudhjem-Allinge: Hammeren. Hellb. (S as *L. auriculata* β *diducens*) HELLBOM 1890 p. 86, MALME 1937 p. 182.

Its extension to the North in Scandinavia remains still to be investigated.

Opegrapha Chevallieri Leight. — On calcareous walls, brick walls etc.

Sweden.

Skåne. Falsterbo: the church-wall. Berg (L as *O. Persoonii*) BERG 1890 p. 172, ALMBORN 1942 p. 389.

Denmark.

Jylland. Hansted: the churchyard wall. Grönlund (?) (K as *O. saxicola* var. *Decandollei*); ibm. Chr. (K). — Tömmerby: the church wall, cementicolous, Chr. (K).

Bornholm. Sandvig-Allinge: Salomons Kapel, cementicolous. Grönlund (K as *O. rupestris* v. *saxigena*); ibm. Hellb. (K as *O. Persoonii*).

Danish stations sec. CHRISTIANSEN in litt.

A frequent species in England, France, and N.W. Germany (REDINGER 1938 p. 269). In Schleswig it is a characteristic species of old church walls (ERICHSEN 1928 p. 80).

Pertusaria slesvicensis Erichs. — On old trees, especially *Quercus* and *Fagus*.

Sweden.

Skåne. Brunnby: Kullen, near Ransgården.! (A, Ds, G, K, L, M, O, S, U) ALMBORN 1939 p. 778; ibm. Deg. (Ds). — Kågeröd: E. of Knutstorp.! (L, S).

Denmark.

Sjælland. Hornbæk-Hellebæk: Tegistrup Hegn. Chr. (K). — Nöddebo: Grib Skov. Chr. (A, K, L). Both sec. CHRISTIANSEN 1947 p. 183.

Jylland. Gaverslund: Munkebjærg! (L as »*var. intermedia*», det. Erichsen).

Known from several stations in Germany and one in Corsica (ERICHSEN 1936 p. 555, 1940 p. 38 with map). In its extreme forms it gives the impression of a good species. Var. *intermedia* Erichs. with its papillae mingled with soredia, however, forms a connection to *P. amara*. The variety occurred together with the main form on both Swedish stations. I am inclined to regard the whole formcircle as belonging to the polymorphus *P. amara*.

Xanthoria aureola (Ach.) Erichs. — Chiefly on stone walls, especially at churchyards, also on trees.

Sweden.

Skåne. Not uncommon in the S. and W. parts.!

Denmark.

Frequent in the Danish Islands and S.E. Jylland. Gelt. and !

The taxonomy and distribution of this lichen which was previously regarded as a variety of *X. parietina* (cf. HILLMANN 1935 p. 17) will be treated in a paper by GELTING.

To the *Graphis elegans* Group.

Parmelia quercina (Willd.) Vain. — On trees, especially the twigs of old oaks.

Denmark.

Sjælland. S:t Jörgensbjærg: Boserup. C. Thomsen (K) LYNGE 1923 p. 76.

Lolland. Vesterborg: Rosningen. Rostrup (K, L) LYNGE l.c. — »Stenskov» (probably = Sandby: Stensgaard). J. Lange and Rostrup (K) LYNGE l.c.

Fyn. Ore: Knarreborg Vandmölle. Gelt. (K). — Skaarup. Rostrup (K) LYNGE l.c.

The Danish stations are rather isolated from the main distributional area of this species. It is not unfrequent in S. and W. Europe and distributed also in S. and Central Germany but not reaching the N.W. German lowland (cf. HILLMANN 1936 p. 190).

Ramalina Duriaei (De Not.) Jatta. Syn. *R. evernioides* Nyl. — On stone walls and on old oaks.

Denmark.

Sjælland. Vemmetofte: V. Vesterskov.! (L).

Fyn. Sönderby: Frederiksgave, Er. Erichsen 1930 p. 25.

Jylland. Haderslev: Fredsted, Er. (K) Erichsen l.c. — Nr Vilstrup: Kelstrup, Viktoriahøj, Er. Erichsen l.c.

A critical lichen probably not specifically different from *R. pollinaria*. Its extreme forms look very characteristic, but analogous forms with broad, reticulate lobes are known also in other *Ramalinae*, e.g. *R. fraxinea*. My collection from Vemmetofte showed several transitional stages to *R. pollinaria*.

Stereocaulon spissum Nyl. — Chiefly on erratic rocks.

Denmark.

Jylland. Løgumkloster: between Overby and Klöjing, Er. Erichsen 1929 p. 121. — Vedsted (S. of Haderslev), Er. Erichsen l.c.

Anholt: in the »desert», Chr. (K, L).

Besides the above mentioned stations, this species is only known from N.W. Germany where it is not uncommon in many districts (Sandstede 1912 p. 132, Magnusson 1926 p. 42, Erichsen l.c., Frey 1933 p. 138). A somewhat critical species, sometimes difficult to distinguish from *St. coralloides, evolutum*, or *tomentosum*. According to Frey »verlangt die Art noch ein weiteres Studium in der Natur».

V. Analogous Distributional Areas among Phanerogams and Bryophytes.

Several of the lichens treated in Chapter III have Scandinavian areas which agree well with those of certain phanerogams and bryophytes. It must, however, be emphasized that such a congruence in the distribution of various plants within a rather limited area must not lead to far-reaching conclusions as to their having the same edaphic and climatic demands or the same history of immigration. For instance, the Swedish area of *Arthonia impolita* (Skåne, Blekinge, Öland, Gotland, cf. p. 122) agrees with that of *Orchis ustulata*, but the former is an acidiphilous plant with a decidedly south-western type of distribution in Europe (common in N.W. Germany), whereas the latter is mainly calciphilous with a wide distribution in the xerothermous districts of Europe (lacking in N.W. Germany).

In general, the species of lichens dealt with here are south-western (often suboceanic) in their European areas, the continental element having no representative among them. Hence it is convenient to restrict a comparison with Scandinavian distributional types from other plant groups to species with a generally southern (mediterranean) or south-western (oceanic) tendency in their European distribution, and to omit species with very special ecological demands. Thus the analogies in Scandinavian areas recorded in the following will in most cases be due to similar thermal demands in our districts (cf. Chapter VI B.). A thorough comparison regarding the whole European areas is not possible at present, as the distribution of several lichens in parts of Europe (e.g. Spain, Russia) is still imperfectly known.

A detailed survey of our present knowledge of the distribution of the Scandinavian phanerogams will be given in a forthcoming treatise by E. Hultén, whose maps I have had the opportunity to make use of. For other information about the phanerogams recorded below, I refer to i.a. Hård av Segerstad (1924), Holmberg (1922, 1926), Lid

(1944), LINDMAN (1926), NORDHAGEN (1940), RAUNKIÆR (1941), ROSTRUP (1943), and STERNER (1922). Considering the bryophytes, cf. ARNELL (1928) and JENSEN (1939).

The *Pyrenula nitida* Group.

The areas of the beech lichens belonging to this group (cf. p. 217) show only a rough accordance with the Scandinavian beech area (fig. 3) and thus the investigations on the thermal relations of the beech limit (ENQUIST 1924, HJELMQVIST 1940) are not immediately applicable to these lichens.

The *Opegrapha atra* type which has the northernmost extension within this group — with its Scandinavian area concentrated in Denmark and the S.W. coastal districts of Götaland, but extending to the coasts of S. and W. Norway (to Möre) in the West, and to the S.E. Swedish coasts (incl. Öland and Gotland), often reaching the S.W. coast of Finland in the East — has several analogies among the phanerogams, i.a.:[1]

Ammophila arenaria [2]
Aira praecox [3]
Corynephorus canescens [2, 3]
Melica uniflora
Agropyron junceum [2]
Carex paniculata
Juncus macer [3]
Ranunculus arvensis [3]
Crambe maritima [2]
Prunus spinosa
Rubus plicatus
Vicia lathyroides
Hedera Helix
Centunculus minimus (0 in Srm.)
Myosotis discolor
Lamium Galeobdolon [3]
Galium hercynicum
Hypochoeris radicata

Some bryophytes show similar areas, e.g.:

Hylocomium brevirostre
Orthotrichum diaphanum
— *Lyellii*
Tortula papillosa
Martinellia compacta (0 in Öl., Gtl.)
Reboulia hemisphaerica

The *Pertusaria Wulfenii* type, which is somewhat more oceanic — reaching Hordaland in Norway, but very rare in S.E. Sweden (not

[1] As a rule, isolated adventitious northern occurrences of otherwise indigenous plants have not been taken into consideration.

[2] Only along the shores, not inland.

[3] Including adventitious occurrences.

reaching the Stockholm district), and lacking in Finland — can be compared to some phanerogams:

Fagus silvatica
Rumex sanguineus
Teesdalea nudicaulis
Radiola linoides
Circaea lutetiana
Hydrocotyle vulgaris
Eryngium maritimum
Betula erecta
Gentiana baltica

Similar bryophyte areas:

Campylopus piriformis
Cirriphyllum crassinervium
Dicranum fulvum
Aplozia riparia
Metzgeria conjugata

The *Bacidia rosella* type — in Norway restricted to the south coast or the Oslo district, in Sweden as a rule reaching the Mälar district, mostly lacking in Finland — is among the phanerogams represented by

Glyceria plicata (0 in Srm.)
Bromus commutatus
Rubus sulcatus
Cornus sanguinea (0 in Srm.)

A somewhat similar type is represented by the bryophyte *Tortula pulvinata* (reaching Dsl., Nrk.; 0 in Ög., Srm.).

The *Opegrapha viridis* type — lacking in Norway, in Sweden as a rule reaching the Stockholm district, lacking in Finland — has similar types among some phanerogams:

Aira caryophyllea [1]
Bromus racemosus [1]
Cerastium glutinosum
Viola Reichenbachiana
Epilobium adnatum [1]
Arnoseris minima [1]
Hypochoeris glabra (0 in Gtl., Ög., Srm.)

A similar distribution is represented by the bryophyte *Tortula mutica*.

The *Thelotrema lepadinum* type — with about the same area as *Opegrapha atra*, but a diminished frequency in the eutrophic districts of Skåne and the Danish Islands — has some analogies among the phanerogams:

Deschampsia setacea
Scirpus multicaulis
Quercus petraea

[1] Including some adventitious occurrences.

At least *Deschampsia* and *Scirpus*, however, have a clear oceanic tendency, lacking in the S.E. Swedish coastal districts. They can also be compared with some types (*Catinaria Laureri, Pertusaria leptospora*) in the following group, though the latter two lichens are lacking in Norway.

The *Lecanactis amylacea* type — lacking in Norway and on the Swedish West Coast, reaching Öland, Gotland, Östergötland, and Södermanland in the East — resembles the areas of some phanerogams (apart from some species with their main European areas in the S.E. European steppe districts):

Cuviera europaea (also in N. Upl.)
Carex divulsa (also in S. Norw.)
Stellaria neglecta
Cerastium brachypetalum (also in S. Norw.)
Veronica triphylla (also in S. Hl.)

The peculiar type represented by *Lecidea cyathoides* var. *corticola* — concentrated to the S.W. Swedish oceanic district but lacking in W. Norway and in Denmark — has no direct correspondence among the phanerogams. Among the bryophytes its has a certain analogy with the Scandinavian area of *Pleuridium palustre* [N. Sk., Sm., Hl., Vg.; Vestf. (one station); 0 in Denm.].

The *Parmelia laciniatula* Group.

The *Parmelia laciniatula* type — (S. Norway-) Swedish West Coast- Skåne- (Blekinge) -Denmark — is represented in various variations among the following phanerogams:

Sparganium ramosum ssp. *neglectum*
Potamogeton trichoides
Digitaria Ischaemum [1]
Scirpus setaceus
Thalictrum minus
Rorippa Nasturtium aquaticum
Ononis spinosa
Apium graveolens [1]
Solanum alatum [1]
Arnoseris minima [1]

Among the bryophytes, *Atrichum angustatum* has a similar area (0 in Norw.).

[1] Main Scandinavian area, excluding some isolated northern adventitious stations; *Arnoseris* cf. above.

The *Opegrapha fuscella* type — Skåne-Blekinge-Öland-Denmark — can be compared with the Scandinavian areas of

Juncus maritimus (also in the Kalmar district)
Carpinus Betulus (also in S. Hl., S. Sm.)
Montia verna
Pulicaria vulgaris (old stations; now extinct at least in Sweden)

The *Arthonia impolita* type — Skåne-Blekinge-Öland-Gotland-Denmark — has a certain resemblance with the following phanerogamous areas:

Stellaria apetala (also in S. Hl.)
Euonymus europaeus (also in S. Hl., S. Sm.)
Bupleurum tenuissimum (also in the Kalmar district)

Analogous Scandinavian areas are also met with in a number of xerothermous steppe plants with their general distribution in the continental districts of Europe.

The type is known among some bryophytes (both with their general distribution in Central, Western, and Southern Europe):

Eurhynchium speciosum
Rhynchostegium megapolitanum (also in Brnh.; 0 in Bl.) (map. ap. Waldheim 1935 p. 453).

The *Buellia canescens* Group.

The *Buellia canescens* type — Skåne-Denmark — is met with in the distribution of several phanerogams:

Equisetum telmateia
Dactylis Aschersoniana [1]
Vulpia bromoides [1]
Lepturus filiformis [2]
Hordeum nodosum [1]
Arum maculatum
Rumex palustris
Sagina apetala
— *ciliata*
Ceratophyllum submersum (also an old record from Ög.)
Potentilla sterilis
Melilotus dentatus [2]
Acer campestre
Hypericum tetrapterum
Primula elatior
Ajuga genevensis
Kickxia Elatine [1]
Veronica montana
Filago apiculata
— *germanica*
Petasites albus (also in S. Norw.: Kristiansand)
Senecio erucifolius

[1] Main Scandinavian area, excl. some isolated northern adventitious stations.
[2] Only along the shores.

Some analogous bryophytes:

Eurhynchium Schleicheri (also in Norw.: Östf., one station)
Rhynchostegium confertum (also in Norw.: Östf.—Aust-Agd.)
Tortula laevipila

The *Enterographa graphidioides* type — with some isolated stations also in S. Blekinge — can be compared to

Oenanthe Lachenalii (0 in Sk.) *Sonchus palustris*

The *Arthonia cinnabarina* type — with extensions to W. Norway and Gotland — can be compared to:

Potamogeton coloratus (Gtl.; 0 in Norway)
Cyperus fuscus (d:o)
Luzula silvatica (W. Norw.; 0 in Gtl.)
Rumex conglomeratus (Gtl.; Norw. only adv.)
Alchemilla xanthochlora (W. Norw.; S. Bl.; 0 in Gtl.)
Lysimachia nemorum (W. Norw.; 0 in Gtl.)
Primula vulgaris (W. Norw.; 0 in Gtl.)

The *Pertusaria velata* type — Sk. Hallands Väderö-(disjunction in Denmark)-Schleswig — can be compared with the known N. European occurrence of *Scutellaria minor* — Sk. Torekov (disjunction in Denmark)-Hannover — in both cases outcrops of oceanic areas. Cf. also the area of the oceanic bryophyte *Eurhynchium pumilum* [Sk. (Kullen), Gtl. (one station); Fyn (one station); otherwise in N.W. Germany, reaching Rügen].

The *Parmelia trichotera* Group.

This type — W. Norway-Denmark, lacking in Sweden — is represented among several phanerogams, as a rule with their general distributional centres in the oceanic districts of Europe. Most of the following species have somewhat wider areas than *P. trichotera* with extensions to the Danish Islands or to S. Tröndelag in Norway. Cf. further DEGELIUS (1935) with several maps.

Corydalis claviculata *Polygala serpyllifolia*
Chrysosplenium oppositifolium *Ilex Aquifolium*
Trifolium micranthum *Centaurea pseudophrygia*
Vicia Orobus

Among the bryophytes *Campylopus brevipilus* is a similar type (map ap. DEGELIUS l.c.).

The *Graphis elegans* Group.

The southernmost distributional type among the Scandinavian lichens has analogies among some phanerogams with their northern limits in S. Jylland (in some cases reaching the Danish Islands):

Potamogeton densus (previously also in S. Hl. and Östf.)
Carex strigosa
Carex pendula
Juncus acutiflorus
Orchis purpurea
Chenopodium botryodes
Illecebrum verticillatum

A similar area is represented by the South European bryophyte *Scleropodium illecebrum* (Fyn, Jl., each one station).

VI. Some Causal Aspects of the Ecology and Distribution of the South Scandinavian Lichens.

A. The Habitat Factors.

1. **Structure of the Bark.** — The species treated in the present work are corticolous lichens, though exceptionally some of them can be met with on lignum or on rocks. It is a well-known fact that several epiphytic lichens are preferably restricted to the bark of special kinds of tree. For descriptions of the lichen vegetation of various arboreal species can be referred to i.a. HELLBOM 1871 b, GALLÖE 1908, GALLÖE & HAUCH 1925 (beech lichens), RÄSÄNEN 1927, ERICHSEN 1928, and SCHULZ-KORTH 1931. This varying lichen vegetation depends partly on differences in the mechanical structure of the bark (mainly if it is smooth or rough) and on the differences caused thereby in the power of retaining moisture, partly on the varying capacity of transmitting light, proper to different arboreal species. Very few lichens, however, are exclusively restricted to the bark of one special kind of tree. Of the species treated in Chapter III, all have, at least at some time, been observed on more than one kind of tree (except the oak lichen *Lecanactis amylacea* and the very rare beech lichens *Pertusaria velata* and *Graphis elegans*, which, outside our district, have been found on substrata other than *Fagus*). Thus e.g. beech lichens often grow also on *Carpinus*, sometimes on *Fraxinus*, young *Acer*, or *Tilia*, oak lichens sometimes on old *Ulmus* or *Tilia*. Several of the 27 species grow preferably on one special kind of tree, as will be seen by the following survey:

Mainly on *Fagus*:

Bacidia rosella
Catinaria Laureri
Enterographa crassa
Graphis elegans
Lecanora glabrata
Opegrapha viridis
Pertusaria velata
— *Wulfenii*
Pyrenula nitida

Mainly on (young) *Fraxinus*:

Arthonia cinnabarina
Arthothelium ruanideum
Opegrapha atra

Mainly on (old) *Quercus*:

Arthonia impolita
Lecanactis amylacea

Mainly on *Alnus*:

Parmelia revoluta

On various deciduous trees:

Buellia canescens
Enterographa graphidioides
Lecidea cyathoides var. *corticola*
Opegrapha fuscella
Parmelia elegantula
— *laciniatula*
Parmelia trichotera
Pertusaria hemisphaerica
— *leptospora*
— *subviridis*
Thelotrema lepadinum
Usnea florida

In many cases the age of the tree plays an important part for its epiphytic vegetation. Several of the lichens treated here are restricted to old trees with very rough bark, above all *Arthonia impolita, Buellia canescens, Lecanactis amylacea,* and *Opegrapha fuscella.* On the other hand, species characteristic of *Opegraphetum herpeticae* (*Arthonia cinnabarina, Arthothelium ruanideum,* and *Opegrapha atra*) prefer young *Fraxinus* with not yet cracked bark (also on other trees with similar cortical structure, as *Acer, Sorbus aucuparia,* and also young *Fagus*). The above-mentioned beech lichens are as a rule lacking on too young trees (cf. p. 220).

The connection between the distributional areas of these lichens and those of corresponding arboreal species is not very remarkable. The above mentioned ash, oak, and alder lichens have their Scandinavian northern limits far more to the South than the kind of trees. Certainly the more common beech lichens (*Bacidia rosella, Lecanora glabrata, Opegrapha viridis, Pertusaria Wulfenii,* and *Pyrenula nitida*) coincide with respect to their main Scandinavian areas with the beech district, but they are lacking in most northern beech occurrences in Götaland and Norway (cf. fig. 3), as well as on cultivated beeches in Central Sweden. On the other hand the northernmost Scandinavian records of these lichens are from other substrata than *Fagus,* and thus the correlation with the beech district is still less conspicuous.

2. **Moisture.** — Though several lichens can endure a considerable desiccation, the majority prefer a none too scarce supply of moisture.

Pronouncedly hygrophilous are the above-mentioned *Arthonia impolita*, *Buellia canescens*, *Lecanactis amylacea*, and *Opegrapha fuscella*, which grow on very rough bark of old trees, and further *Parmelia revoluta*, which prefers alder bark. *Thelotrema* often forms a component, at least on beech bark, of a community where mosses retaining moisture play an essential part. *Enterographa crassa* also chooses stations characterized by a humid local climate: the bases of beeches in the close vicinity of the sea. Generally the lichen vegetation of the beech is rather xerophilous owing to the rapid evaporation on the smooth bark, which, however, is restricted to some extent by the relatively small illumination in beech woods. The same thing is valid for the smooth ash bark. Of the ash lichens mentioned here, at least *Arthonia cinnabarina* and *Arthothelium* often protect themselves against desiccation by settling nearer to the moist bases of the trunks. To a certain extent this also applies to the beech lichen *Opegrapha viridis*.

3. **Illumination.** — Humidity and light in combination create, as a rule, favourable conditions for most lichens. Of the species treated here, only few, however, are pronouncedly photophilous, whereas the majority are moderately or pronouncedly photophobous. To a certain extent this is due to the fact that my species are either crustaceous lichens or rather small foliose lichens, which cannot compete with large foliose and fruticose lichens (»macrolichens») common on illuminated stations (above all *Parmelia physodes*, *P. sulcata*, and *Cetraria glauca*).

The sociology of the photophobous lichen communities has previously been subject to a rather slight interest from the phytosociologists (cf. mainly Gallöe 1908, Gallöe & Hauch 1925, and Ochsner 1928). Though they are generally poor in species they play a not unimportant rôle, especially in the epiphytic vegetation of the beech forests. In the preceding (Chapter III, »habitat ecology»), an effort has been made to classify some of these communities. I divide the photophobous communities into *Graphidion* (on smooth bark) and *Lepraria* (on rugged bark). Both are constituted by mainly crustaceous lichens; in the latter, which is more hygrophilous (cf. above), *Lepraria aeruginosa* is dominant. This species is, however, no differential species between the two federations as it can occur, in small amounts, also in the *Graphidion*. The differentiation within the *Graphidion*, with respect to the light conditions, can be summed up thus (only the two unions and some of the chief societies dealt with here, are taken into consideration):

Graphidion

Opegraphetum herpeticae (mainly on young *Fraxinus*)		*Pyrenuletum nitidae* (mainly on *Fagus*)
Bacidia rosella -soc. *Opegrapha viridis* -soc.	*Pyrenula nitida* -soc.	*Lecanora glabrata* -soc. *Pertusaria Wulfenii* -soc.

Increasing illumination.

The union *Opegraphetum herpeticae* with i.a. *Arthonia cinnabarina, Arthothelium ruanideum,* and *Opegrapha atra* is rather extremely photophobous, containing only crustaceous lichens.

Photophobous, though not so extremely, are also the lichens constituting the *Pyrenuletum nitidae* of the beech bark (*Bacidia rosella, Catinaria Laureri, Enterographa crassa, Graphis elegans, Lecanora glabrata, Opegrapha viridis, Pertusaria velata, P. Wulfenii,* and *Pyrenula nitida*). A rather photophilous facies (under the circumstances usually existing in beech woods) of *Pyrenuletum nitidae* is formed on somewhat more illuminated beech trunks, where *Lecanora glabrata* and *Pertusaria Wulfenii* are often dominants. On young beeches, where the dry leaves remain during the winter, the supply of light is so scarce that very few lichens can endure, and thus *Pyrenuletum,* as a rule, is optimally developed on old beeches (cf. GALLÖE 1908 p. 327).

To the federation *Leprarion* belong i.a. the unions *Arthonietum impolitae* on the northern sides of old oak trunks (with *Arthonia impolita, Lecanactis amylacea,* and other oak epiphytes) and *Opegraphetum fuscellae,* mainly restricted to old elms in a dense vegetation. *Buellietum canescentis* from old trees (oaks etc.) near roads is a transitional stage to *Xanthorion* (cf. below).

The federations *Physodion* and *Xanthorion* with dominating macrolichens should, in my opinion, be restricted to photophilous communities (cf. below).

Of the *Parmelia* species treated here *P. elegantula, P. laciniatula,* and *P. revoluta,* like most foliose lichens, are comparatively photophilous. The first two, however, belong to a somewhat less illuminated facies of the *Xanthorion* of solitary trees near roads etc., which otherwise is pronouncedly photophilous. *P. revoluta* belongs to the photophilous *Physodeto-sulcatetum* of *Physodion,* where also the crustaceous lichen *Lecidea cyathoides* var. *corticola* belongs. Rather photophilous are also the *Pertusaria* species *hemisphaerica, leptospora,* and *subviridis,* as a rule growing in glades in the woods or on solitary

trees. Like most filamentous lichens, *Usnea florida* is a photophilous species. When growing in beech woods it often prefers twigs in the tree-tops, where the supply of light is greater than on the trunks.

4. **Acidity.** — In lectures (from 1940 on), DU RIETZ divided the corticolous vegetation into »poor bark» and »rich bark» (cf. DU RIETZ 1945 p. 147, WALDHEIM 1944 p. 90, KRUSENSTJERNA 1945 p. 88). The poor bark with the federation *Physodion* is divided into »extreme-poor-bark», often with the union *Euphysodetum* (very poor in species), characteristic of the very acid pine and spruce bark (pH under 4), and »transitional-poor-bark», often with the union *Physodeto-sulcatetum* (somewhat more rich in species) characteristic of the not equally acid bark of oaks, birches, and alders (pH c. 4—5, in the oak bark sometimes lower). The rich bark, with the federation *Xanthorion* (rich in species) is met with in thin bark of chiefly *Populus tremula*, but also *Fraxinus*, *Acer*, and *Ulmus* (pH c. 5—7). Through the influence of dust containing nitrogenous compounds (on high road trees etc.), the poor bark of different kinds of tree can change into bearing rich bark vegetation (with *Xanthorion*), with pH values nearing 7 (sec. DU RIETZ l.c.); these values correspond on the whole to those communicated by TRÜMPENER (1926).

This correlation between low pH and a small number of species in the community on one hand and higher pH and an increasing number of species on the other hand, holds true mainly as to photophilous communities, whereas the photophobous federations *Graphidion* and *Lepraria* cannot fit in this scheme.

My pH measurements in the communities containing the lichens treated here have not dealt with the bark of conifers (*Euphysodetum*), nor *Xanthorion* in its most extreme form on very dusty and very illuminated high way trees (with dominating *Xanthoriae*, *Physciae*, *Ramalinae*, etc.). A survey of some values found in barks of other kinds is given in fig. 33 (for further details I refer to the ecological treatment of each species in Chapter III). The extremely acid *Arthonietum impolitae* on old oaks shows a small number of species (cf. tab. XIII), whereas the nearly equally acid (both with pH under 5) *Parmelia revoluta*-societies of *Physodeto-sulcatetum* on alders have a far larger number of species (cf. tab. XIX). Of the two *Graphidion* unions, *Opegraphetum herpeticae* on ashes is exceedingly poor in species (tab. V, XIV, XXI), whereas *Pyrenuletum nitidae* on beeches has a considerably larger number of species (tab. I, III, VI, IX, X, XV). Yet both unions have

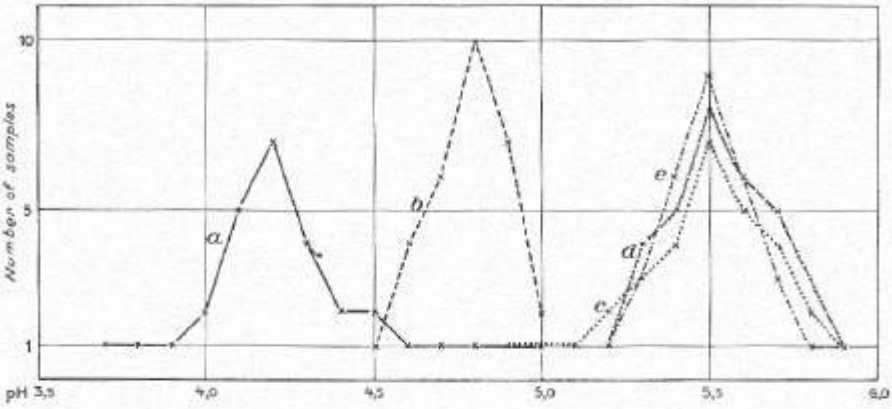


Fig. 33. pH amplitudes of some corticolous lichen communities (30 samples from each type).

a. *Leprarion*: *Arthonia impolita*-soc. (*Quercus*).
b. *Physodion*: *Parmelia revoluta*-soc. (*Alnus*).
c. *Xanthorion*: *Parmelia laciniatula*-soc. (various deciduous trees).
d. *Graphidion*: *Pyrenuletum nitidae* (*Fagus*).
e. —: *Opegraphetum herpeticae* (*Fraxinus*).

about the same pH-values (c. 5.5). The same values are shown by the *Parmelia laciniatula*-communities of *Xanthorion*, which are extremely rich in species (tab. XVIII). The essential factor deciding the number of species of the communities treated here, is, in my opinion, the supply of light: *Arthonietum impolitae* and *Opegraphetum herpeticae* (both poor in species) are very photophobous, while the others have a greater supply of light.

A more detailed discussion of these questions will have to be deferred to a future work on South-Swedish epiphytic lichens.

5. **Mineral nutrition.** — In a fundamental work on »nitrophilous lichens», SERNANDER (1912) has pointed out that tree-trunks impregnated with highway dust containing animal excreta have a characteristic lichen vegetation (coniophilous lichens) strikingly resembling that found on »bird tops», i.e. stones manured with bird excreta, often on shores (ornithocoprophilous lichens). As to some earlier records on the same subject, cf. A. L. SMITH (1921 p. 233). SERNANDER also observed (l.c.) that, even without dust impregnation, the aspen has a lichen vegetation showing affinity to nitrophilous vegetation. DU RIETZ (1945) later united the epiphyte vegetation of dust-

impregnated bark and that of the bark of *Populus* (and some another deciduous trees) under the name of »rich bark» (cf. above).

Through chemical analyses NIENBURG (1919 p. 1) showed that the nitrogen compound obtained by these lichens from their substrata is ammonia (not nitrite or nitrate). According to him, the ammonia is formed chiefly through the influence of fungi (or bacteria) on the sap of the trunks, which dripping out especially at the »branch-holes», affects the lichen vegetation. In a high degree of concentration this ammoniacal sap damages the lichen vegetation, in a moderate degree, however, it is favourable to several species. Partly agreeing with NIENBURG, RÄSÄNEN (1927 p. 177) proposed the term »ammonophilous» for »nitrophilous» lichens, sensu SERNANDER. In order to solve the question of the nutritional supply of lichens, however, detailed physiological and biochemical investigations are necessary. In my opinion it is far from proved that the species in question are exclusively favoured by nitrogen compounds. The influence of phosphoric compounds will certainly need an investigation (cf. DU RIETZ 1932 p. 107). In this connection statements of a rich lichen vegetation with i.a. *Xanthoriae*, *Caloplacae*, and *Physciae*, on bones in Northern Siberia (ERNST ALMQUIST 1880 p. 56) and finds of *Buellia canescens* on whale bones in N.W. Germany (SANDSTEDE 1912 p. 230, ERICHSEN 1943 p. 213) are of a certain interest. In the present work I use SERNANDER's term c o n i o p h i l o u s about the lichen vegetation of dust-impregnated highway trees and c o n i o p h o b o u s about lichen vegetation in a dust-free position.

Of the lichens treated in Chapter III the majority are decidedly coniophobous. Especially is this true of the union *Opegraphetum herpeticae* (with *Arthonia cinnabarina*, *Arthothelium ruanideum*, and *Opegrapha atra*) and further also of *Pyrenuletum nitidae*. The characteristic beech lichens (cf. p. 217) are as a rule coniophobous, as is *Pertusaria hemisphaerica*, too. At least *Bacidia rosella* and *Lecanora glabrata* have exceptionally been found on dust-impregnated bark (of other trees than the beech). Pronouncedly coniophilous are *Buellia canescens*, *Parmelia elegantula*, *P. laciniatula*, and *Pertusaria subviridis*. *Arthonia impolita* and *Lecanactis amylacea*, often growing both on dusty and dust-free bark, seem to be relatively neutral in this respect.

Measurements of the electrolytic conductivity of bark samples from coniophilous communities (*Parmelia laciniatula*-soc. and *Pertusaria subviridis*-soc.) gave considerably higher values than such from coniophobous communities (*Opegrapha atra*-soc. and *Pyrenula nitida*-soc.), thus indicating a

higher total concentration of electrolytes in the former communities than in the latter. As the analytical methods used, however, are not quite free from objections, a publication of such measurements will be deferred to a later treatise.

A closer knowledge of the nutritional physiology of lichens is also needed to explain the decreased frequency shown by certain species [of those treated here, *Thelotrema lepadinum* (fig. 15), *Usnea florida* (fig. 16), and *Catinaria Laureri* (fig. 19)] in the »meadow beech woods» on eutrophic soil in S. Skåne, the Danish Islands, and S.E. Jylland in comparison with the »heath beech woods» on oligotrophic soil outside these districts. The fact has been observed since the time of BRANTH (1869 p. 212) by several Danish botanists. ROSTRUP (1902) points out the rapid growth of the periderm of beeches on eutrophic soil, causing the exterior parts of the bark to fall off quickly, thus preventing a permanent colonisation of lichens. This certainly holds true in several cases but cannot explain the decreased frequency of just these three species. GALLÖE (1908 p. 332; cf. also GALLÖE & HAUCH 1925) draws attention to the fact that the dense meadow beech wood transmits far less light than the sparsely growing heath beech wood, which is a main reason for the richer epiphytic lichen vegetation of the later. The light factor is sure to be of importance for these three species (at least with regard to the decidedly photophilous *Usnea florida)* but it is not sufficient to explain why some relatively photophilous species in the *Pyrenuletum* (*Lecanora glabrata, Pertusaria Wulfenii*) do not show the corresponding decrease in frequency in the meadow beech wood district. It seems not improbable that the three species do avoid the eutrophic soil of the meadow beech woods, thus forming a certain analogy to the mesotrophic phanerogams treated by HÅRD (1924) from the South Swedish high plateau.

B. The Climate Factors.

In the foregoing there have been pointed out some of the factors (»microclimatic» and edaphic) determining the distribution of the lichen species on different stations. In the following, »climate» means some of the »macroclimatic» factors of importance for the distribution of the species within a larger area, viz. hygric and thermic factors (the influence of light climate on the regional distribution of the species is left out of consideration). A more detailed survey of the extensive climatological and general phytogeographical literature is to be found

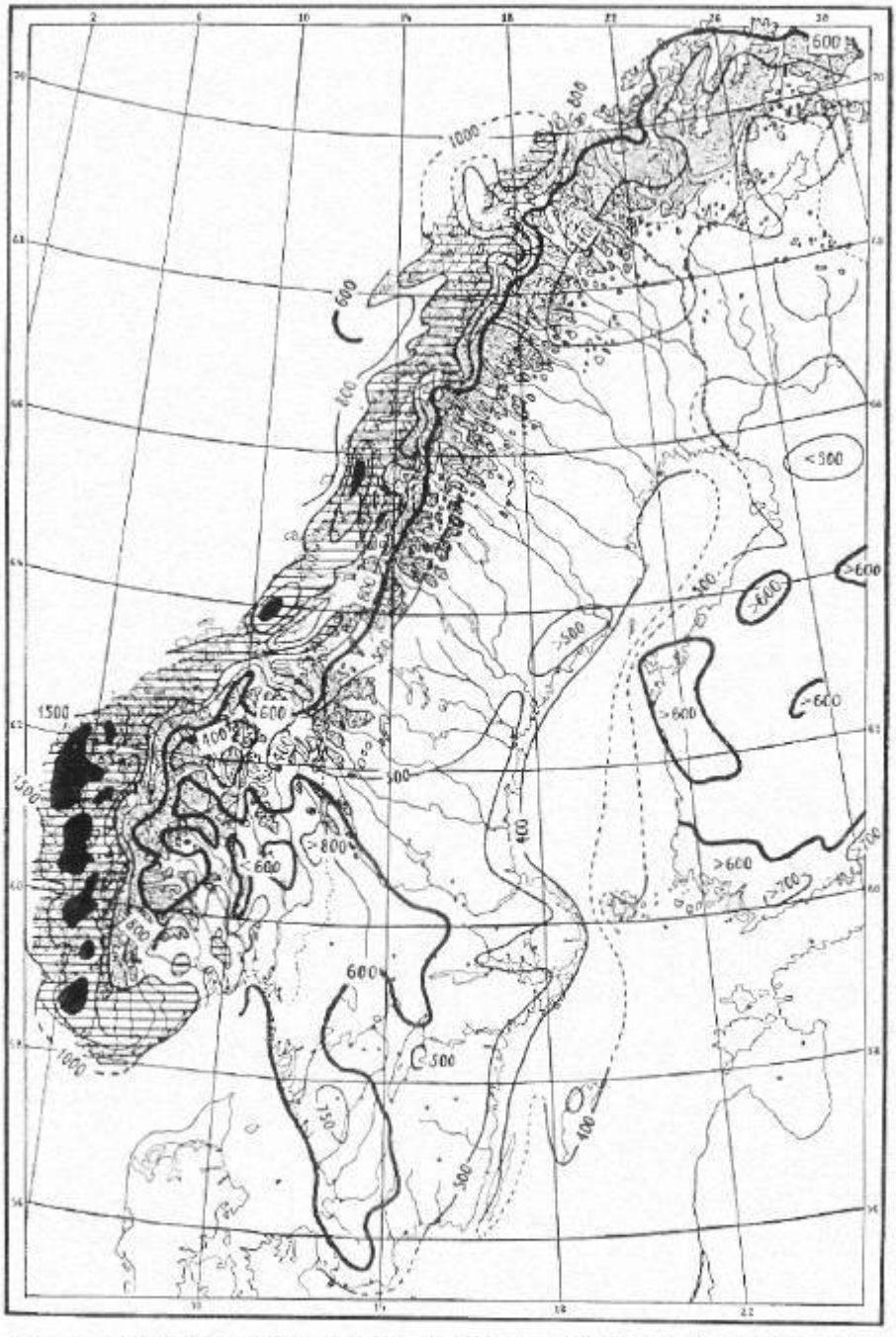


Fig. 34. Annual precipitation (in mm) in Sweden, Norway, and W. Finland. From Ekman 1922. Black districts: more than 2000 mm.

in earlier treatises, i.a. STERNER 1922 p. 244, HÅRD 1924 p. 12, ERIK ALMQUIST 1929 p. 18, LUNDEGÅRDH 1930 p. 147, SAMUELSSON 1934 p. 149, and DEGELIUS 1935 p. 240.

1. **Hygric Factors.** — Though thermic factors are likely to be those mainly determining the Scandinavian distribution of the lichen species dealt with here, it is obvious that hygric factors (precipitation and atmospheric humidity) are of a certain importance. The annual precipitation (cf. fig. 34) reaches its Scandinavian maximum — apart from some high mountain districts — in Western Norway (1000—nearly 3000 mm) and in W. Småland, S. Västergötland, and the interior parts of Halland (800—nearly 1100 mm). None of the species treated in Chapter III show any increased frequency in both these areas. Beside the direct precipitation, the relative atmospheric humidity plays an important part in the hygric climate of a district. Comparatively high atmospheric humidity can thus give a relatively high »degree of oceanity» (cf. KOTILAINEN 1933) to a district with otherwise low precipitation. The map of the annual frequency of fogs in Sweden (fig. 35) shows a high amount of foggy days on the coasts of Skåne and Blekinge, and on Öland and Gotland, as well as in the Skärgård of Stockholm. A similar frequency is prevailing in the Danish Islands. Along with thermic factors, this increased oceanity is certainly favourable to most species of the *Pyrenula nitida* group occurring on Öland and Gotland and in the Skärgård of Stockholm.

Some species show an obviously increased frequency within the South-Swedish district of high precipitation.

Lecidia cyathoides var. *corticola* is here a relatively common lichen, but as far as is known, it is totally lacking in S. Skåne and Denmark, where the annual precipitation is considerably lower, only exceptionally approaching to 800 mm (on Jylland). Its absence from the West Norwegian high precipitation area, as well as in Western France and in the British Isles, is probably due to a temperature factor (cf. below).

Thelotrema lepadinum has a noticeable concentration of stations in South-Western Sweden (and besides in the provinces of Blekinge and Gotland where the atmospheric humidity is high). Its oceanic tendency is thus obvious, which also agrees with its extra-Scandinavian main occurrences (W. Europe and the Central European mountainous districts with high precipitation).

Pertusaria leptospora has also its known Swedish area in the W. Swedish precipitation districts, but too far-reaching conclusions

should not be drawn from this fact, owing to the small number of its stations.

The solitary northern Swedish occurrences of *Pertusaria hemisphaerica* and *Thelotrema* near waterfalls where a favourable humid local climate has developed, has been mentioned under these species (Chapter III).

A preference to districts with high precipitation and high atmospheric humidity (Skåne, Gotland, W. Norway, Denmark) is also shown by *Arthonia cinnabarina*, which, however, for thermoclimatic reasons, is lacking in the S.W. Swedish precipitation district. Its extra-Scandinavian area has a clearly oceanic tendency. The same is the case of the species belonging to groups E—G (*Buellia canescens, Enterographa crassa, Pertusaria velata, Parmelia trichotera, Graphis elegans*), which are southern and oceanic, in the rest of Europe having distinct distributional centres in the oceanic districts (*E. crassa, P. velata*, and *Gr. elegans* wholly restricted to the maritime districts, however).

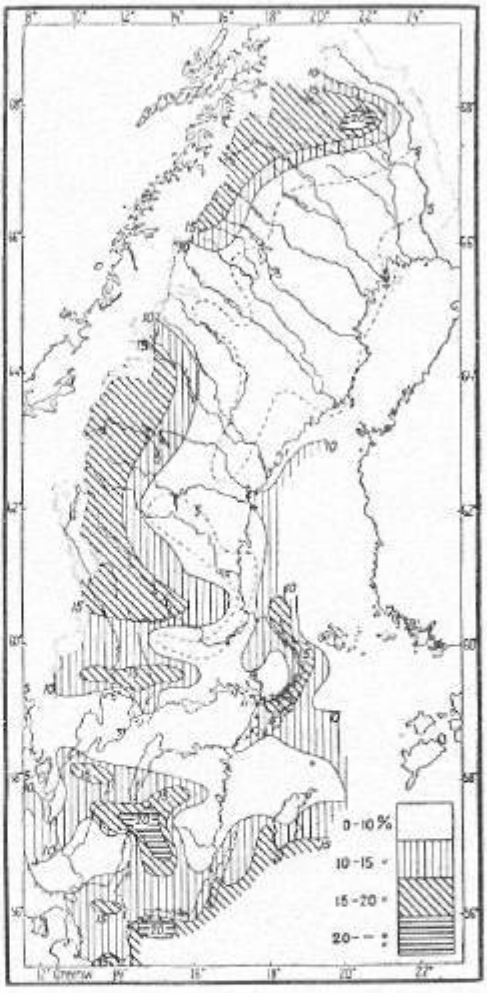


Fig. 35. Annual frequency of fogs (% of days) in Sweden. From ÅNGSTRÖM 1946.

2. **Thermic Factors.** — Ever since the time of WAHLENBERG and HUMBOLDT phytogeographers have studied the question of the relations between temperature and plant limits. Numerous authors have used data obtained from meteorological material (mainly annual and

monthly mean temperature) to explain phytogeographic limits. The question of the temperature most favourable to a certain plant species is an exceedingly complicated one with many aspects of chiefly physiological character. The thermic factor is only a part of the great complex of climatic, edaphic, and historic factors determining the distribution of a species. Against a casual construction of such connections there has also been a good deal of criticism, partly from physiologists (i.a. LUNDEGÅRDH 1930), partly from phytogeographers (i.a. BROCKMANN-JEROSCH 1925, and in Sweden STERNER 1922, ERIK ALMQUIST 1929, and SAMUELSSON 1934). Especially has it been emphasized that the temperature values used are as a rule mean values of atmospheric temperatures from relatively few stations, giving no true picture of the thermic conditions of the soil, which are essential to most plants. LUNDEGÅRDH (1930 p. 143) has shown with tables that two neighbouring stations (meadow and wood) can show considerable difference of temperature.

New aspects on this problem have been laid by ENQUIST (1924 p. 202, 1929 p. 7, 1933 p. 145), who emphasizes the relatively small biological importance of mean temperatures compared with extreme temperatures. Instead, the duration of certain maximum and minimum temperatures has a deciding influence. According to ENQUIST, four demands determine the area of a species. A certain number of days must exceed a certain maximum temperature and a certain number of days a certain minimum temperature (»warmth demands»). Further a certain maximum temperature must not be exceeded during a certain number of days, neither must a certain minimum temperature be exceeded during a certain number of days (»cold demands»). ENQUIST (ll.cc.) gives maps of the European distribution of *Fagus silvatica*, *Ilex Aquifolium*, *Quercus Robur*, *Picea Abies*, and *Pinus silvestris*, connecting the distributional limits of these species with »durability numbers» (Swedish: »varaktighetstal») calculated according to these principles. Later this method has been used by GRANLUND (1925 p. 81; the southern limit of *Betula nana* in Sweden) and HJELMQVIST (1940; the total area of *Fagus silvatica*). Sec. ENQUIST (ap. GRANLUND l.c.) it should preferably be used with reference to trees and shrubs, whose dependence on atmospheric temperature seems to be more obvious than that of the herbs. The use of the method is complicated by the difficulty of surveying the meteorological material. Available publications contain preferably mean temperatures, whereas extreme temperatures have been published only to a small extent. When the extensive material

treated by ENQUIST has been printed, a more reliable judgement of the method will be possible.

Epiphytic lichens, like trees and shrubs, will be more directly dependent on atmospheric temperature than several terrestrial or aquatic plants. Yet I will make no attempt at constructing exact temperature limits of the species treated here, partly because the meteorological material, as mentioned before, is still rather difficult to survey, and partly, what is more important, the extra-Scandinavian areas of my species are not yet known in such detail that, with available material, it has been possible to make exact maps of them. Also, as regards Scandinavia, it must be remembered that here we have many cases of species whose distribution has been investigated only during the last decade. Thus we cannot disregard the fact that continued research may to a certain extent change the distributional maps published here. This, together with the essential objection to the isolation of temperature from other phytogeographical factors, can justify a rather brief treatment of the temperature demands of the species. An explanation of the northern limit of each species founded on thermic data is not possible. The northern limits (or rather limit zones) of the groups distinguished here show certain rough but yet obvious resemblances to certain isotherms or »durability numbers» (represented here by the number of frosty days). At the same time it must of course be emphasized that each species has its own thermic demands.

The Scandinavian northern limits of the southern lichens are no doubt mainly cold limits. Their warmth demands can shortly be formulated thus: they need a not too cold (or long) winter and also a not too cold summer.

The very heterogeneous group A (the *Umbilicaria pustulata* group) with Swedish northern limits in Central Norrland or in the coastland of Upper Norrland will not be particularly treated here, neither group B (the *Parmelia acetabulum* group), whose northern limits, at least in Sweden, on the whole coincide with the northern limit of *Quercus robur*. The oak limit which, next to the alpine tree limits, is the most important border line of our floral district, is, according to ENQUIST (1929 p. 24) influenced by the summer as well as the winter: more than 117 summer days must exceed a maximum temperature of 12.5° and no more than 214 days must have a minimum temperature of less than +2.5°. DU RIETZ (1935 p. 5) connects the »limes Norrlandicus» (the zone where i.a. the oak, the ash, and the hazel have their northern-

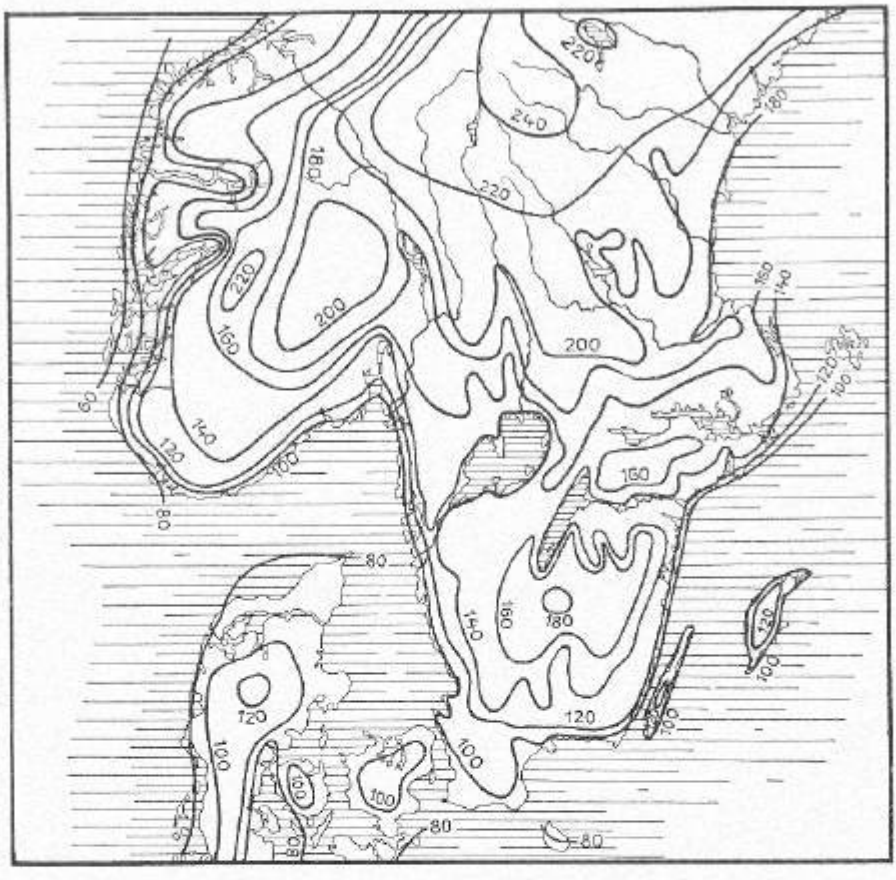


Fig. 36. Number of frosty days in S. Sweden, S. Norway and Denmark. Data from ENQUIST (unpublished material), BIRKELAND (1936) and »Danmarks Klima» (1933).

most occurrences) with the isochrone of 180 frosty days (cf. fig. 36), which somewhat holds true in Sweden but considerably less in Norway.[1]

Even though winter temperature, no doubt, plays a prominent part, especially with regard to the species of this group having a northern extension along the Norwegian west coast, we should not disregard the limiting factor in many cases constituted by summer

[1] Owing to the great topographical contrasts in Norway with accompanying considerable thermal differences between neighbouring stations, the temperature maps (fig. 36—38) are not so exact concerning Norway as concerning Sweden and Denmark. The scanty meteorological material has necessitated a schematic drawing; in reality the curves are far more winding along the valleys.

Fig. 37. Mean temperature in January. From ÅNGSTRÖM (1946), NISSEN (1921) and »Danmarks Klima» (1933).

temperature. SAMUELSSON (1934) has compared the northern limits of several of his South Scandinavian aquatic plants to certain July isotherms. Here I will restrict myself to pointing out a certain correspondence of the northern limit of *Parmelia acetabulum* in the Scandinavian peninsula (fig. 4) to the July isotherm of $+16°$. It seems probable that the absence of this species on the Norwegian West Coast is due to insufficient summer temperature.

The cold limits of the more southern groups (C—G) seem to be influenced by both winter and summer, but to isolate these two factors from each other meets with considerable difficulties. The species be-

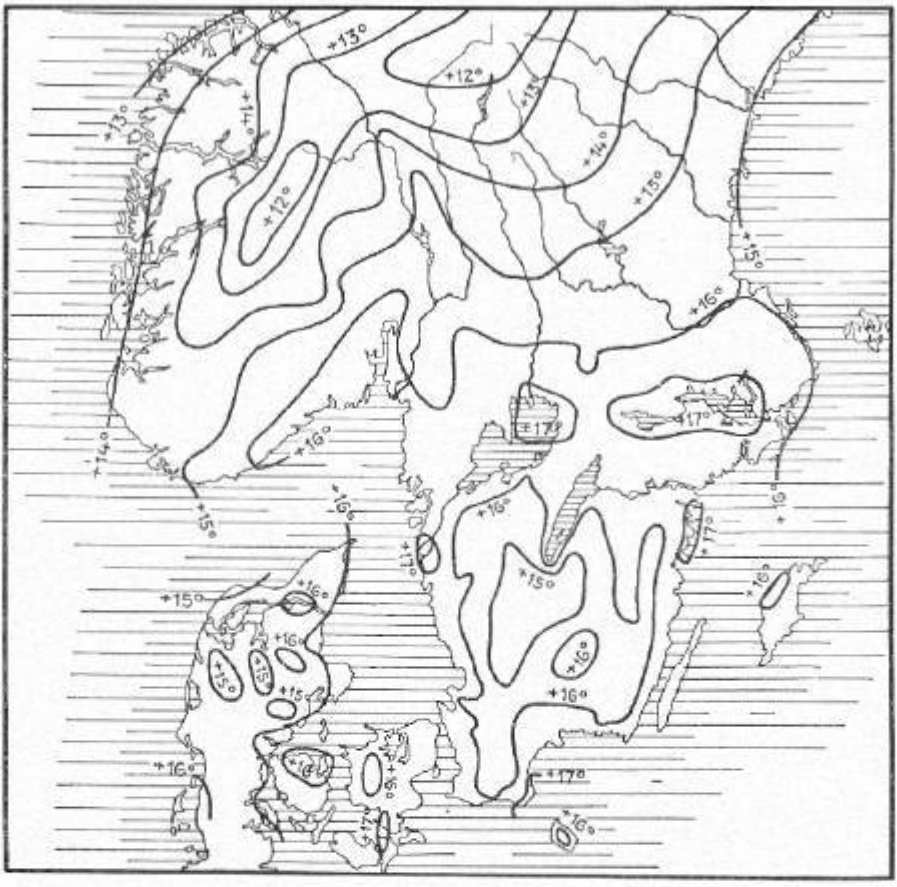


Fig. 38. Mean temperature in July. Data as in fig. 37.

longing to this group have their northernmost Swedish occurrences within the Central Swedish lake district with its about 140 frosty days per annum, and the northern limits of their more general occurrences in a zone with about 130 frosty days. With a use of isotherms this would correspond to the January isotherm of — 3° for the northernmost outposts and — 2° for the more general occurrences. Winter temperature factors of this kind would, however, admit an extension of the areas of the species up to Lofoten in Norway, while in fact they only reach Hordaland and in several cases (*Bacidia rosella, Lecanora glabrata, Lecidea cyathoides* var. *corticola*, and *Usnea florida*) are found only on the South Coast. As far as is known, *Opegrapha viridis*

is lacking in Norway. To all appearances, their rarity or absence in Western Norway is due to the comparatively low summer temperature. While in the Scandinavian centres of the species (S.W. Sweden and the Danish Islands) the July mean temperatures reach about 16—17°, they remain at about 11—12° in Lofoten and at about 13—15° in the Norwegian Vestland. Even the last-mentioned values are obviously insufficient to render the occurrence of several of these species possible in W. Norway. In W. Jylland, too, these species are lacking, as far as is known. This may probably also be due to insufficient summer temperature (July mean temperature about 15°). Of importance is also — this can partly be said of Norway, too — the absence of the beech, due to the same low summer warmth, the beech being their chief substratum (though they are not exclusively beech lichens), as well as the rarity of deciduous forests in general.

Lecidea cyathoides var. *corticola* is a unique type within this group. We should expect it to occur in Denmark, even if, on account of insufficient summer temperature, it cannot grow in W. Norway or W. Jylland. As suggested earlier (p. 45) its absence in the whole of Denmark can possibly be due to the lack of the saxicolous form.

The species of the *Parmelia laciniatula* group (D) have their northern limits in S.W. Götaland, in districts with about 120 frosty days per annum, somewhat corresponding to a zone with the January isotherm about —1°. In the same way their absence in W. Jylland and great rarity in Norway (where *Catinaria Laureri* and *Pertusaria leptospora* are quite lacking) may be connected with insufficient summer temperature. This summer warmth factor is also to a certain extent perceivable in Sweden and the Danish Islands. Thus *Parmelia laciniatula*, otherwise rather common in S. Skåne, is in general absent in the immediate vicinity of the coasts. As suitable localities are by no means lacking there, it seems likely that this absence is due to the lower summer temperature along the coasts. That this difference is considerable even at a short distance can be shown by an example from the meteorological material. According to »Danmarks Klima» (1933, tab. XXI), the mean of annual absolute maximum temperatures of a station in Köbenhavn situated close by the Öresund is stated as 25.6°, whereas that of another situated in the western part of the city is 28.9°.

The majority of species within this group have a southwestern tendency, probably under the influence of precipitation factors. The

isolated type *Arthonia impolita* forms a noticeable exception from this rule.

Group E, in Scandinavia restricted to Skåne and Denmark and with *Buellia canescens* as its type species, demands still greater amounts of warmth. The number of frosty days within its area is still lower (<100). This isochrone corresponds approximately to the January isotherm of 0°. At the same time the summer temperature is relatively high. For these species, hygric factors, as stated, have a very great importance beside the thermic factors. This is especially true of *Enterographa crassa* and *Pertusaria velata* which have limited areas within the district.

The stations of *Parmelia trichotera* in S. Jylland and S.W. Norway are, as stated before, situated within the area of *Ilex Aquifolium*. Roughly this also holds true of its European area. ENQUIST (1924) connects the *Ilex* area with a maximum temperature, which must exceed 0° during 345 days per annum.

The rare *Graphis elegans*, in our district wholly restricted to S.W. Denmark, will, together with relatively high precipitation, demand still higher degrees of warmth than the species mentioned before. Of course it is not advisable to form far-reaching conclusions as to the warmth demands of this species founded on the situation of the two known localities. Here it will only be pointed out that the Vejle station, where several southern phanerogams also have their northernmost Scandinavian occurrences, has an exceedingly favourable temperature climate. An adjacent meteorological station at the Vejlefjord has an average of only 77 annual frosty days, one of the lowest amounts in Denmark, while the mean of the July temperatures at Vejle is 16.8°, sec. »Danmarks Klima» (tab. XII) the highest amount recorded from Jylland.

C. The Historic Factors.

Very few facts are available to elucidate the lichen flora during previous geological periods. A review of literary statements of fossil and subfossil lichens was given by SERNANDER (1918 p. 703). Most of these records are little trustworthy.

DEGELIUS (1935 p. 297) considered that the oceanic lichen element may be regarded as a Tertiary relict, which survived the last glacial period in ice-free coastal regions of N.W. Europe. This corresponds with the common view of the origin of oceanic phanerogams and

mosses. If we apply this interpretation to the lichens considered in the present work, at least *Arthonia cinnabarina, Graphis elegans* s. lat., *Parmelia revoluta, P. trichotera,* and *Pertusaria velata* may be suspected as Tertiary relicts. Their European areas are clearly oceanic, and their total distribution is mainly concentrated in tropical and subtropical districts. Yet there is no fossil material of these species to support this supposition.

The beech epiphytes among the lichens treated here, whose Scandinavian areas largely coincide with the beech area (i.a. *Bacidia rosella, Catinaria Laureri, Lecanora glabrata, Opegrapha viridis, Pertusaria Wulfenii, Pyrenula nitida*) have probably immigrated together with the beech. Sec. LINDQUIST (1931 and literature cited there), the beech immigrated to North Europe at the end of the atlantic period. During the subboreal period it had a far wider Scandinavian area than nowadays (reaching Hälsingland, Öland, and Gotland). During the subatlantic period (up to the first century A. D.) it reached its maximum with numerous occurrences in Värmland, Västmanland, Närke, and Uppland, and at the same time it also colonized W. Jylland and Norway. During this period, however, climatical conditions caused its regression from its easternmost stations (Gotland). The areas of the beech lichens have probably been enlarged in a correspondent manner in these periods. Their present distribution is reduced by the regression of the beech forests during the last thousand years and especially, owing to the increasing human activity, during the last centuries. According to old statements, at least *Catinaria Laureri* seems to have been more common during the past century, and this is still more valid for *Usnea florida* which has now quite disappeared from several districts.

Subfossil Scandinavian finds of lichen species treated in the present work are known only of *Opegrapha atra* (from the lakes Nedsjöarna in Västergötland, sec. SERNANDER l.c.) and *Thelotrema lepadinum* (from Ormholt in N. Jylland, sec. BRANTH 1867 p. 83, 1869 p. 212).

SERNANDER (l.c.) considered the three lichen species *Graphis elegans, Graphina sophistica,* and *Chiodecton crassum* (syn. *Enterographa crassa*), none of which was known from Scandinavia at that time, as an element to be compared to the *Ilex* vegetation.[1] He also suggested that the *Ilex* vegetation made a progression to the north-east during the atlantic period, and for that reason subfossils of these species should be searched for in the Scandinavian *Ilex* and *Fagus* regions.

[1] Yet they are unknown from Norway!

But as long as there is no subfossil material (not even of *Ilex Aquifolium*) to confirm such a progression, these conclusions must remain hypotheses.

The coniophilous lichens among the species treated here (*Buellia canescens, Parmelia elegantula, P. laciniatula, Pertusaria subviridis*) which prefer the vicinity of roads and human dwellings, have probably reached their positions in more recent time than other species. Yet no facts are known to judge their progression in historical time.

Bibliography.

ABBAYES, H. DES, La végétation lichénique du Massif Armoricain. Étude chorologique et écologique. — Bull. Soc. Sc. Nat. Ouest France. Sér. 5, T. 3 (1933). Nantes 1934.

ACHARIUS, E., Lichenographiæ Suecicæ Prodromus. Linkopiae 1798.

— Methodus Lichenum. — Stockholmiae 1803.

— Förteckning på de i Sverige växande arter af Lafvarnas Familj. — K. Vet. Acad. Nya Handl. Stockholm 1808.

— Lichenographia Universalis. — Gottingiae 1810.

— Synopsis methodica Lichenum. — Lundae 1814.

AHLNER, S., Weitere Beiträge zur Strauch- und Laubflechtenflora von Åsele Lappmark. — Ark. f. Bot. 29 A. No 9. Uppsala 1938.

— Några lavar från Västergötland och Småland. — Bot. Not. Lund 1945.

ALMBORN, O., Nya svenska lokaler för Parmelia laciniatula (Flag.) Zahlbr. — Bot. Not. Lund 1935.

— Lichenological Notes I. — Bot. Not. Lund 1939.

— Lichenological Notes II. — Bot. Not. Lund 1942.

— Lichenes (Lavar) (ap. KROK, TH. & ALMQUIST, S., Svensk Flora II. Sjätte uppl., ed. ERIK ALMQUIST) — Stockholm 1947.

ALMQUIST, ERIK, Upplands vegetation och flora. — Acta Phytogeogr. Suec. I. (Diss.). Uppsala 1929.

ALMQUIST, ERNST, Lichenologiska iakttagelser på Sibiriens nordkust. — Öfvers. K. Vet. Akad. Förh. 1879. No. 9. Stockholm 1880.

ALMQUIST, S., Om de skandinaviska arterna af lafslägtena Schismatomma, Opegrapha och Bactrospora. (Diss.). Upsala 1869.

— Monographia Arthoniarum Scandinaviae. — K. Vet. Akad. Handl. Vol. 17. N:r 6. Stockholm 1880.

ALVTHIN, N., Bidrag till kännedom om Skånes lafflora. — I. Laffloran i Kvistoftadalen. Ark. f. Bot. 2. No. 6. Stockholm 1904.

— Bidrag till kännedom om Skånes lafflora. II. Söderåsens lafflora. — Ark. f. Bot. 12. No. 1. Stockholm 1912.

ANDERS, J., Die Flechten Nordböhmens. III. Nachtrag. — Hedwigia 63. Dresden 1922.

— Die Strauch- und Laubflechten Mitteleuropas. — Jena 1928.

— Im Verschwinden begriffene und verschwundene Flechtenarten in Nordböhmen. — Ber. deutsch. bot. Ges. 53. Berlin-Dahlem 1935.

ANDERSSON, G. & BIRGER, S., Den norrländska florans geografiska fördelning och invandringshistoria med särskild hänsyn till dess sydskandinaviska arter. — Norrländskt Handbibliotek 5. — Uppsala 1912.

ÅNGSTRÖM, A., Sveriges klimat. — Stockholm 1946.

Arnell, H. W., Leverinossor (ap. Holmberg, O. R., Skandinaviens Flora). — Stockholm 1928.

Arnell, H. W., & Jensen, C., Die Moose des Sarekgebietes. — Naturw. Unters. d. Sarekgebirges in Schw. Lappland. III. Lief. 3. Stockholm 1910.

Arnold, F., Die Lichenen des fränkischen Jura. 396—428. — Flora 67. Regensburg 1884.

— Lichenologische Fragmente. 28. — Flora 70. Regensburg 1887.

— (ap. Rehm in Rabenhorst's Kryptogamen-Flora von Deutschland, Oesterreich und der Schweiz. Leipzig 1891.

Aspegren, G. C., Försök till en Blekingsk Flora. — Carlskrona 1823.

Bachmann, E. & Fr. Litauische Flechten. — Hedwigia 61. Dresden 1919.

Baroni, E., Contribuzione alla lichenografia della Toscana. — Nuovo Giorn. Bot. Ital. 23. Firenze 1891.

Bausch, W., Uebersicht der Flechten des Grossherzogthums Baden. — Verh. Naturw. Ver. Carlsruhe 4. Carlsruhe 1869.

Beckhaus, K., Zur Kryptogamen-Flora Westphalen's. Lichenen, welche bis jetzt in Westphalen gefunden. — Verh. Naturh. Ver. preuss. Rheinl. u. Westphalens 16. Bonn 1859.

Berg, A., Lichenologiska anteckningar. — Bot. Not. Lund 1890.

Birkeland, B. J., Mittel und Extreme der Lufttemperatur. — Geofysiske publikasjoner 14. No. 1. Oslo 1936.

Blomberg, O. G., Bidrag till kännedomen om Kinnekulles Lafvegetation. — Öfvers. K. Vet. Akad. Förh. 1867. N:o 4. Stockholm 1867.

— Bidrag till kännedomen om Bohuslänska skärens lafflora. — Bot. Not. 1868. Upsala 1869.

— Bidrag till kännedomen om lafvarnas utbredning m.m. i Skandinavien. — Bot. Not. Lund 1895.

Blytt, A., Botaniske Observationer fra Soga. — Nyt Mag. f. Naturv. 16. Christiania 1869.

Blytt, M. N., Botaniske Optegnelser paa en Reise i Sommeren 1826. — Mag. f. Naturv. 9. Christiania 1829.

Bohman, J., Omberg och dess omgifningar. — Linköping 1829.

— Wettern och dess kuster. Andra Resan. — Örebro 1840.

Bornmüller, J., Zur Flechtenflora Macedoniens. — Mag. Bot. Lapok 1928. Budapest 1929.

Bouly de Lesdain, M., Liste des Lichens recueillis à Spa. — Bull. Soc. Bot. France 52. Paris 1905.

— Notes lichenologiques. Liste des lichens recueillis au Maroc par M. Vaucher. — Bull. Soc. Bot. France 52. Paris 1905(b).

— Lichens des environs de Versailles. Suppl. — Bull. Soc. Bot. France 54. Paris 1907.

— Recherches sur les lichens des environs de Dunkerque. — Dunkerque 1910.

Branth, J. S. Deichmann, Lavernes Udbredelse i den nordlige Deel af Jylland. — Bot. Tidsskr. 2. Kjöbenhavn 1867.

Branth, J. S. Deichmann & Rostrup, E., Lichenes Daniae eller Danmarks Laver. — Bot. Tidsskr. 3. Kjöbenhavn 1869.

Briquet, J., International Rules of Botanical Nomenclature. 3rd ed. — Jena 1935.

Brockmann-Jerosch, H., Die Vegetation der Schweiz. — Beitr. Geobot. Landesaufn. Schweiz 12. Zürich 1925.

Cedergren, G. R., Svall-is och forsdimma, två föga beaktade växtekologiska faktorer. — Bot. Not. Lund 1922.

Cengia Sambo, Maria, Licheni della Patagonia. — Contr. scient. Miss. Sales. del Beato don Bosco. Torino 1931.

Christiansen, M. Skytte, Lavfloraen paa det fredede Areal ved Strandkær paa Mols. — Bot. Tidsskr. 48. København 1946.

— Lav-Exkursionen till Rudeskov den 13 Maj 1945. — Bot. Tidsskr. 48. København 1946 (b).

— Bidrag til Danmarks Lavflora I. — Bot. Tidsskr. 48. København 1947.

Colmeiro, M., Enumeracion de las plantas de España y Portugal. — Madrid 1867—1868.

Cretzoiu, P., Lichenii din Transsilvania si Banat publicati in Szatala, Lichenes Hungariae. — Publicatiuni referitoare la flora lichenologica a Romaniei. Bucuresti 1935.

Crozals, A. de, Lichens du Massif de l'Espinouze. — Bull. Geogr. Bot. 24. Le Mans 1914.

Dalla Torre, K. W. v. & Sarnthein, L. v., Die Flechten (Lichenes) von Tirol, Vorarlberg und Lichtenstein. — Flora der gefürsteten Grafschaft Tirol. IV. Innsbruck 1902.

Danmarks Klima (ed. Det danske meteorologiske Institut). — København 1933.

De Candolle, A. P., (ap. Lamarck, J. B. de & De Candolle, A. P.) Flore Française. Paris 1805.

Degelius (Nilsson), G., Lichenologiska bidrag I. En lichenologisk exkursion till Halleberg. — Bot. Not. Lund 1929.

— Lichenologiska bidrag II. — Bot. Not. Lund 1929 (b).

— Zur Flechtenflora von Ångermanland. — Arkiv f. Bot. Bd. 24 A. N:o 3. Uppsala 1931.

— Zur Flechtenflora des südlichsten Lapplands (Åsele Lappmark) I. Strauch- und Laubflechten. — Ark. f. Bot. Bd. 25 A. N:o 1. Uppsala 1932.

— Lichenologiska bidrag IV. — Bot. Not. Lund 1932 (b).

— Lichenologiska bidrag V. Fynd av sällsynta Parmelia-arter. — Bot. Not. Lund 1933.

— Om lavfloran på holmarna Nordre Rönner i Kattegatt. — Bot. Tidsskr. 42. H. 4. København 1933 (b).

— Flechten aus Nordfjord und Sunnfjord (Norwegen). — Bergens Museums Årbok 1934. Bergen 1934.

— Anteckningar till Smålands busk- och bladlavflora. — Svensk Bot. Tidskr. 28. Uppsala 1934 (b).

— Das ozeanische Element der Strauch- und Laubflechtenflora von Skandinavien. — Acta Phytogeogr. Suec. 7. (Diss.). Uppsala 1935.

— Till kännedomen om lavfloran på bark, lignum och urbergsblock på Gotland. — Bot. Not. Lund 1936.

— Lichenologiska anteckningar från Bornholm. — Bot. Tidsskr. 43. København 1936 (b).

— Nytt fynd av Parmelia revoluta Flk. — Bot. Not. Lund 1937.

— Lavar från Moskenesöy. Ett bidrag till kännedomen om lavfloran i yttersta Lofoten. — Nytt Mag. f. Naturv. 78. Oslo 1938.
— Die Flechten von Norra Skaftön. — Uppsala Univ. Årsskr. 1939: 11. Uppsala 1939.
— Fynd av märkligare busk- och bladlavar i sydvästra Sverige sommaren 1938. — Bot. Not. Lund 1939 (b).
— Bidrag till norra Sjællands lavflora. — Bot. Tidsskr. 45. København 1940.
— Märkligt lavfynd vid Stygglorsen i Dalarna. — Bot. Not. Lund 1940 (b).
— Contributions to the Lichen Flora of North America. — I. Lichens from Maine. — Ark. f. Bot. 30. Uppsala 1940 (c).
— — II. The Lichen Flora of the Great Smoky Mountains. — Ark. f. Bot. 30. Uppsala 1941.
— Lichens from the Azores, mainly collected by dr. H. Persson. — Göteborgs Kungl. Vet. och Vitterhetssamh. Handl. Sjätte följden ser. B. Band 1. N:o 7. Göteborg 1941 (b).
— Die Flechten der Insel Ornö. — Svensk Bot. Tidskr. 36. Uppsala 1942.
— Zur Kenntnis der Flechtenflora um den See Virihaure in Lule Lappmark (Schwedisch-Lappland). — Bot. Not. Lund 1943.
— Några lavar från Nämdö och angränsande öar i Stockholms skärgårds barrskogsregion. — Svensk Bot. Tidskr. 37. Uppsala 1943 (b).
— Nya bidrag till kännedomen om lavfloran på bark, lignum och urbergsblock på Gotland. — Svensk Bot. Tidskr. 38. Uppsala 1944.
— Lavfloran inom Ombergs skyddsområde. — K. Svenska Vet. Akad. Skr. i Naturskyddsär. N:r 46. Uppsala 1944 (b).
— Usnea florida (L.) Web. i Uppland, ett nordligt fynd av arten. — Svensk Bot. Tidskr. 38. Uppsala 1944 (c).
— Till kännedomen om Ölands silikatstenslavar. — Svensk Bot. Tidskr. 39. Uppsala 1945.
— Ett sydberg i Kebnekaise-området och dess lavflora. — Bot. Not. Lund 1945 (b).
Degen, A. v., Flora Velebitica III. — Budapest 1938.
Del Amo (y Mora), M., Flora cryptogamica de la Peninsula Iberica. — Granada 1870.
De Wildeman, E. & Durand, Th., Prodrome de la Flore Belge. — Bruxelles 1898—1907.
Du Rietz, G. E., En ny fyndort för Nephroma lusitanicum Schaer. — Svensk Bot. Tidskr. 7. Stockholm 1913.
— Några nordliga lokaler för Catillaria premnea Körb. — Svensk Bot. Tidskr. 8. Stockholm 1914.
— Zur methodologischen Grundlage der modernen Pflanzensoziologie. — (Diss.). Wien 1921.
— Lichenologiska fragment (summary of lecture). — Svensk Bot. Tidskr. 15. Stockholm 1921 (b).
— Kritische Bemerkungen über die Parmelia perlata-Gruppe. — Nyt Mag. f. Naturv. 62. Kristiania 1924.
— Flechtensystematische Studien III. — Bot. Not. Lund 1924 (b).
— Die regionale Gliederung der skandinavischen Vegetation. — Svenska Växtsoc. Sällsk. Handl. 8. Uppsala 1925.

— Vorarbeiten zu einer »Synopsis Lichenum» I. Die Gattungen Alectoria, Oropogon und Cornicularia. — Ark. f. Bot. Bd. 20 A, N:o 11. Uppsala 1926.
— The Fundamental Units of Biological Taxonomy. — Svensk Bot. Tidskr. 24. Uppsala 1930.
— Zur Vegetationsökologie der ostschwedischen Küstenfelsen. — Beih. Bot. Centralbl. 44. Erg.-Band. Dresden-N. 1932.
— Klimat och jordmån. — Hantverkets bok 3: 1. — Trädgårdskonst 1. Stockholm 1935.
— Classification and Nomenclature of Vegetation Units 1930—1935. — Svensk Bot. Tidskr. 30. Uppsala 1936.
— Om fattigbark- och rikbarksamhällen (summary of lecture). — Svensk Bot. Tidskr. 39. Uppsala 1945.
— (ap. Nannfeldt, J. A. & Du Rietz, G. E., Vilda växter i Norden. Mossor, lavar, svampar, alger). Lichenes. — Stockholm 1945 (b).
Duvigneaud, P., Lichens récoltés lors l'herborisation de la Société Royale de Botanique Belgique, les 19 et 20 juin 1937, dans la region jurassique. — Bull. Soc. Roy. Bot. Belg. 70. Gembloux 1938.
Duvigneaud, P. & Giltay, L., Catalogue des Lichens de Belgique. — Bull. Soc. Roy. Bot. Belg. 70. Suppl. Gembloux 1938.
Ekman, S., Djurvärldens utbredningshistoria på skandinaviska halvön. — Stockholm 1922.
Elenkin, A., Lichenes florae Rossiae mediae I—V. — Jurjev 1906—1911.
Engler, A., Syllabus der Pflanzenfamilien. — Neunte und zehnte, mehrfach ergänzte Auflage mit Unterstützung von Ernst Gilg. Berlin 1924.
Enquist, Fr., Sambandet mellan klimat och växtgränser. (Summary of lecture.) — Geol. För. Förh. 46. Stockholm 1924.
— Studier över samtidiga växlingar i klimat och växtlighet. — Svensk Geogr. Årsbok. Lund 1929.
— Trädgränsundersökningar. — Sv. Skogsvårdsför. Tidskr. 31. — Stockholm 1933.
Erichsen, C. F. E., Die Flechten von Kullen in Schweden. — Verh. Naturw. Ver. Hamburg 21. Hamburg 1913.
— Nachtrag zur Flechtenflora der Umgegend von Hamburg. — Verh. Nat. Ver. Hamburg. 3. Folge. 24. Hamburg 1916.
— Die Flechten des Moränengebiets von Ostschleswig mit Berücksichtigung der angrenzenden Gebiete. — Verh. Bot. Ver. Prov. Brandenburg 70—72. Berlin-Dahlem 1928—30.
— Lichenologische Beiträge. — Hedwigia 70. Dresden 1930 (b).
— Neue und bemerkenswerte atlantische Flechten im deutschen Küstengebiet. — Hedwigia 73. Dresden-N. 1933.
— Zur Flechtenflora von Schleswig-Holstein und des Gebiets der Unterelbe. — Schr. Naturw. Ver. Schleswig-Holstein 20. Kiel 1934.
— Einige rumaenische Pertusarien. — Acta pro Fauna et Flora universali. Ser. II. Vol. I. Nr. 11—12. Bucuresti 1934 (b).
— Pertusariaceae. — Rabenhorst's Kryptogamen-Flora von Deutschland, Österreich und der Schweiz. Ed. 2. IX. Band, 5. Abt., 1. Teil. Leipzig 1936.
— Ein kleiner Beitrag zur Kenntnis der Flechten Finnlands. — Mem. Soc. pro Fauna et Flora Fenn. 12. 1935—1936. Helsingforsiae 1936 (b).

— Ein lichenologischer Ausflug nach Mecklenburg. — Arch. Ver. d. Freunde der Naturg. in Mecklenburg 11. Rostock 1936 (c).
— Weitere Beiträge zur Flechtenflora Schleswig-Holsteins und des Gebiets der Unterelbe. — Schr. Naturw. Ver. Schleswig-Holstein 22. Kiel 1937.
— Neue Beiträge (3.) zur Kenntnis der Flechtenflora Schleswig-Holsteins und des Gebiets der Unterelbe. — Ann. Myc. 36. Berlin 1938.
— Neue Pertusarien aus Europa und dem Mittelmeergebiet. — Rev. de Mycol. Tome III (N.S.) Paris 1938 (b).
— Sclerographa squalida Erichs. n. sp., eine neue europäische Art dieser Gattung. — Hedwigia 78. Berlin 1938 (c).
— 4. Beitrag zur Kenntnis der Flechtenflora Schleswig-Holsteins und des Gebiets der Unterelbe. — Ann. Mycol. 37. Berlin 1939.
— Neue und kritische deutsche Lichenen. — Mitt. Inst. allg. Bot. in Hamburg 10. Hamburg 1939 (b).
— Revision der Flechtenfamilie der Pertusariaceae im Herbar des Instituts für Allgemeine Botanik in Hamburg. — Mitt. Inst. allg. Bot. in Hamburg 10. Hamburg 1939 (c).
— Neue Pertusarien nebst Mitteilungen über die geographische Verbreitung der europäischen Arten. — Ann. Mycol. 38. Berlin 1940.
— Lichenologische Beiträge III. — Ann. Mycol. 38. Berlin 1940 (b).
— 5. Beitrag zur Kenntnis der Flechtenflora Schleswig-Holsteins und des Gebiets der Unterelbe. — Ann. Mycol. 39. Berlin 1941.
— Neue dänische Flechten. — Ann. Mycol. 40. Berlin 1942.
— 6. Beitrag zur Kenntnis der Flechtenflora Schleswig-Holsteins und des Gebiets der Unterelbe. — Ann. Mycol. 40. Berlin 1942 (b).
— Neue Flechtenfunde aus Schleswig-Holstein und dem Nordwestdeutschen Tiefland. — Ann. Mycol. 41. Berlin 1943.
— Neue Flechtenfunde aus Schleswig-Holstein und dem Nordwestdeutschen Tiefland II. — Ann. Mycol. 42. Berlin 1944.

Falk, H. G., Om östra Blekinges lafflora. — (Diss.). Carlskrona 1874.

Fink, B., The Lichen Flora of the United States. — Ann Arbor 1935.

Flagey, C., Flore des Lichens de Franche-Comté I. — Mém. Soc. d'emulation du Doubs 1882. Besançon 1883.
— (ap. Olivier, H.), Étude sur les principaux Parmelia, Parmeliopsis, Physcia et Xanthoria de la Flore Française. — Rev. de Bot. 12. Toulouse 1894.
— Catalogue des Lichens de l'Algérie. — Alger 1896.

Floderus, M. M., Botaniska anteckningar under en resa på Öland och Örö-skären, sommaren 1853. — Bot. Not. Stockholm 1854.

Floerke, H. G., Deutsche Lichenen gesammelt und mit Anmerkungen herausgegeben. 2. Lief. — Berlin 1815.

Flora Danica (ed. G. C. Oeder, O. F. Müller, M. Vahl, J. W. Hornemann, J. F. Schouw, J. Vahl, F. M. Liebmann, J. Steenstrup, J. Lange) Vol. I—XVII + suppl. — Hafniae (Hauniae) 1761—1874.

Frey, E., Flechten. — Ber. Schweiz. Bot. Ges. 32. Zürich 1923.
— Cladoniaceae. Umbilicariaceae. — Rabenhorst's Kryptogamen-Flora von Deutschland, Oesterreich und der Schweiz. Ed. 2., IX. Band. 4. Abt. 1. Teil. Leipzig 1933.

FRIES, E., Stirpes agri Femsionensis. — Londini Gothorum 1825—1826.
— Lichenographia europaea reformata. — Lundae 1831.
— Corpus florarum provincialium Sueciae I. Floram Scaniam (scripsit E.F.). — Upsaliae 1835.
FRIES, TH. C. E., Botanische Untersuchungen im nördlichsten Schweden. Ein Beitrag zur Kenntnis der alpinen und subalpinen Vegetation in Torne Lappmark. — (Diss.). — Vetensk. o. prakt. unders. i Lappl. anordn. af Luossavaara-Kirunavaara A.-B. Uppsala 1913.
FRIES, TH. M., Botaniska anteckningar rörande Femsjö socken i Småland. — Bot. Not. Stockholm 1852.
— Lichenes arctoi Europae Groenlandiaeque hactenus cogniti. — Acta Reg. Soc. Scient. Ups. Ser. III, Vol. III. Upsaliae 1860.
— Lichenographia scandinavica I—II. — Upsaliae 1871—74.
GALLÖE, O., Danske Likeners Økologi. — Bot. Tidsskr. 28. København 1908.
— Natural History of the Danish Lichens I—VI. — København 1927—1939.
GALLÖE, O., & HAUCH, I. A., Likener paa Bögens Bark. — Det forstlige Forsögsvæsen i Danmark. VIII. København 1925.
GATTEFOSSÉ, J. & WERNER, R. G., Catalogus lichenum marocanum adhuc cognitorum. — Bull. Soc. Nat. Maroc. 11 Rochefort-sur-mer 1931.
GELTING, P., Et Bidrag til Danmarks Lavflora. — Bot. Tidsskr. 44. København 1938.
— Bidrag til Sjællands Lavflora. — Bot. Tidsskr. 45. København 1941.
— Buellia canescens (Dicks.) DNot. i Skåne. — Bot. Not. Lund. 1945.
GRANLUND, E., Några växtgeografiska regiongränser. — Geogr. Annaler 7. Stockholm 1925.
GYELNIK, V., Beiträge zur Flechtenvegetation Ungarns II. — Folia Cryptogamica I. Szeged 1928.
HÄRD AV SEGERSTAD, F., Sydsvenska florans växtgeografiska huvudgrupper. — (Diss.). Malmö 1924.
HARMAND, J., Catalogue descriptif des Lichens observés dans la Lorraine. — Bull. Soc. Sc. Nancy 1895—99. Nancy 1895—99.
— Lichens de France 1—5. — Paris 1905—13.
HARTMAN, R., Gefle-traktens växter. Andra upplagan. Gefle 1863.
HASSELROT, T. E., Till kännedomen om några nordiska umbilicariaceers utbredning. — Acta Phytogeogr. Suec. 15. Uppsala 1941.
— Till kännedomen om busk- och bladlavfloran i sydligaste Norge. — Bot. Not. Lund 1942.
— Nytt material till Smålands busk- och bladlavflora. — Göteb. K. Vet. och Vitt. samh. Handl. Sjätte följden. Ser. B. Bd. 1. No. 12. Göteborg 1942 (b).
— Fynd av sällsynta eller förbisedda lavar i Västergötland. — Svensk Bot. Tidskr. 39. Uppsala 1945.
HAVÅS, J. J., Nye findesteder for nogle sjeldnere lichener. — Bergens Museums Aarbok. Bergen 1899.
— Beiträge zur Kenntnis der westnorwegischen Flechtenflora I. — Bergens Museums Aarbok. Bergen 1900.
— Lichenvegetationen ved Mosterhavn. — Bergens Museums Aarbok. Naturv. Række Nr. 2. Bergen 1917—1918.
— Om lichenvegetasjonen på Stadtlandet. — Bergens Museums Årbok. Naturv. rekke Nr. 2. Bergen 1935.

HELLBOM, P. J., Nerikes lafflora. — Örebro 1871.
— Om Nerikes lafvegetation. — K. Svenska Vet.-Akad. Handl. Bd. 9. N:o 11. Stockholm 1871 (b).
— Norrlands lafvar. — K. Svenska Vet.-Akad. Handl. Bd. 20. N:o 8. Stockholm 1884.
— Lafvegetationen på öarne vid Sveriges Vestkust. — Bih. K. Svenska Vet.-Akad. Handl. Bd. 12. Afd. III. N:o 4. Stockholm 1887.
— Bornholms lafflora. — Bih. K. Svenska Vet.-Akad. Handl. Bd. 16. Afd. III. N:o 1. Stockholm 1890.
— Lichenaea neo-zeelandica. — Bih. K. Svenska Vet.-Akad. Handl. Bd. 21. Afd. III. N:o 13. Stockholm 1896.
HILITZER, A., Addenda ad lichenographiam Bohemiae. — Acta Bot. Bohem. 3. Pragae 1924.
— Addenda ad lichenographiam Bohemiae. Series II. — Acta Bot. Bohem. 4. Pragae 1926.
HILLMANN, J., Übersicht über die in der Provinz Brandenburg bisher beobachteten Flechten. — Verh. Bot. Ver. Prov. Brandenburg 65. Berlin-Dahlem 1923.
— Teloschistaceae. — Rabenhorst's Kryptogamen-Flora von Deutschland, Österreich und der Schweiz. Ed. 2. IX. Band, 6. Abt. 1. Teil. Leipzig 1935.
— Parmeliaceae. — Rabenhorst's Kryptogamen-Flora von Deutschland, Österreich und der Schweiz. Ed. 2. IX. Band, 5. Abt., 3. Teil. Leipzig 1936.
— Bemerkungen über einige Arten der Flechtengattung Parmelia I. — Hedwigia 78. Dresden-N. 1939.
HJELMQVIST, H., Studien über die Abhängigkeit der Baumgrenzen von den Temperaturverhältnissen. — (Diss.). Lund 1940.
HÖEG, O., The Corticolous Norwegian Pertusariaceae and Thelotremaceae. — Nyt Mag. f. Naturv. 61. Kristiania 1923.
HOLMBERG, O. R., Skandinaviens Flora I—II. — Stockholm 1922, 1926.
HOOKER, J. D., Handbook of the New Zealand Flora. Lichenes. — London 1867.
HORNEMANN, J. W., Dansk Oeconomisk Plantelære II. — Kjöbenhavn 1836.
HUE, A., Causerie sur les Parmelia. — Journal de Botanique 12. Paris 1898.
HULTING, J., Lichenologiska exkursioner i Vestra Bleking. — (Diss.). Norrköping 1872.
— Lichenes nonnulli Scandinaviae III. — Bot. Not. Lund 1897.
— Några ord om Fagus silvatica L. och lafvegetationen på densamma. — Bot. Not. Lund 1899.
— Dalslands lafvar. — Bih. K. Svenska Vet.-Akad. Handl. Bd. 26. Afd. III. N:o 3. Stockholm 1900.
— En bokskog i Västergötland och dess lafflora — Svensk Bot. Tidskr. 6. Stockholm 1912.
— Lavar från Östergötland. — Ark. f. Bot. Bd 20 A, N:o 2. Uppsala 1925.
HYLANDER, N., Förteckning över Skandinaviens växter. 1. Kärlväxter. — Lund 1941.
JATTA, A., Sylloge lichenum italicorum. — Trani 1900.
— Flora italica cryptogama. Paris III. Lichenes I—VI. — Soc. Bot. Ital. Rocca S. Casciano 1909—11.
JENSEN, C., Skandinaviens bladmossflora. — Köbenhavn 1939.
KAJANUS (NILSON), B., Die Flechtenvegetation von Kullen. — Ark. f. Bot. Bd. 1. Stockholm 1903.

Keissler, K. v., Pyrenulaceae bis Mycoporaceae. Coniocarpineae. — Rabenhorst's Kryptogamen-Flora von Deutschland, Österreich und der Schweiz. Ed. 2. IX. Band, 1. Abt. 2. Teil. Leipzig 1938.

Knowles, Matilda C., The Lichens of Ireland. — Proc. Roy. Irish Acad., 38. Dublin 1929.

Koltz, J.-P.-J., Prodrome de la flore du grand-duché de Luxembourg. II: 2, Lichenées. — Recueil Mém. et travaux Soc. Bot. du Gr.-Duch. de Luxembourg 13. Luxembourg 1897.

Koerber, G. W., Systema lichenum Germaniae. — Breslau 1855.

— Parerga lichenologica. — Breslau 1865.

Kotilainen, M. J., Zur Frage der Verbreitung des atlantischen Florenelementes Fennoskandias. — Ann. Bot. Soc. Zool.-Bot. Fenn. Vanamo. Tom. 4. N:o 1. Helsinki 1933.

Krempelhuber, A. v., Die Lichenen-Flora Bayerns. — Denkschr. Bayer. Bot. Ges. Regensburg 4. Regensburg 1861.

v. Krusenstjerna, E., Bladmossvegetation och bladmossflora i Uppsalatrakten. — Acta Phytogeogr. Suec. 19. (Diss.). Uppsala 1945.

Kušan, F., Beitrag zur Kenntnis der Flechtenflora des Papuk-Gebirges in Slawonien. — Hedwigia 74. Dresden-N. 1935.

Lahm, G., Zusammenstellung der in Westfalen beobachteten Flechten. — Münster (1883) 1885.

Lamy de la Chapelle, E., Catalogue des lichens du Mont-Dore et de la Haute-Vienne. — Bull. Soc. Bot. France 25. Paris 1880.

Lange, J., Oversigt over de i Aarene 1869—71 i Danmark fundne sjeldne eller for den danske Flora nye Arter. — Bot. Tidsskr. 2. Række. 1. København 1872.

Lange, J. & Mortensen, H., Oversigt over de i Aarene 1872—78 i Danmark fundne sjeldnere eller for den danske Flora nye Arter. — Bot. Tidsskr. Række 3, Bd. 2. København 1877—79.

Leighton, W. A., Monograph of the British Graphideae. — Ann. and Magaz. Nat. Hist. Ser. 2: 13. London 1854.

Lettau, C., Beiträge zur Lichenographie von Thüringen. — Hedwigia 51—52. Dresden 1912.

— Beiträge zur Lichenenflora von Ost- und Westpreussen. — Festschr. Preuss. Bot. Ver. 1912 (b).

— Beiträge zur Lichenographie von Thüringen. 1. Nachtrag. — Hedwigia 61. Dresden 1919.

— Monographische Bearbeitung einiger Flechtenfamilien. 1. Lief. — Fedde, Rep. spec. nov. Beih. 69: 1. Berlin-Dahlem 1932.

— Monographische Bearbeitung einiger Flechtenfamilien. 2. Lief. Fedde, Rep. spec. nov. Beih. 69: 2. Berlin-Dahlem 1937.

— Flechten aus Mitteleuropa III—IV. — Fedde, Rep., spec. nov. Beih. 119: 3. Berlin-Dahlem 1940.

— Flechten aus Mitteleuropa V—VI. — Fedde, Rep. spec. nov. Beih. 119: 4. Berlin-Dahlem 1941.

— Flechten aus Mitteleuropa VIII. — Fedde, Rep. spec. nov. 54. — Berlin 1944.

Lid, J., Norsk Flora. — Oslo 1944.

Lindau, G., Kryptogamenflora für Anfänger. Bd. 3. Die Flechten. Zweite Auflage. — Berlin 1923.

LINDMAN, C., Svensk Fanerogamflora. Andra uppl. — Stockholm 1926.
LINDQUIST, B., Den skandinaviska bokskogens biologi. — Svenska Skogsvårdsför. Tidskr. 29. (Diss.). Stockholm 1931.
LINKOLA, K., Eräiden asutusta suosivien kaarnajäkälien levinneisyydestä maassamme. — Luonnon Ystävä 42. No. 3. Helsinki 1938.
LINNAEUS (LINNÉ), C., Hortus Cliffortianus. — Amstelaedami 1737.
— Flora Svecica. — Ed. 1. Stockholmiae 1745.
— Species plantarum. Ed. 1. Holmiae 1753.
LJUNGSTEDT, G. C. (ap. FRIES, E.), Schedulae criticae de Lichenibus suecanis. — Fasc. VII. Lundae 1826.
LLENAS Y FERNÁNDEZ, M., Ensaig d'una Flora Liquénica de Catalunya. — Butll. Inst. Catalana Hist. Nat. Ep. 2. Any 6. Barcelona 1909.
LÖNNROTH, K. J., Till Gotlands Laf-flora. — Öfvers. K. Vet.-Akad. Förhandl. 14 (1857). Stockholm 1858.
LUNDEGÅRDH, H., Klima und Boden in ihrer Wirkung auf das Pflanzenleben. Zweite Aufl. — Jena 1930.
LYNGE, B., De norske busk- og bladlaver. — Bergens Museums Aarbok. Bergen 1910.
— Index specierum et varietatum »Lichenum exsiccatorum» I—II + suppl. — Nyt Mag. f. Naturv. 53—79. Kristiania (Oslo) 1915—1929.
— Studies on the Lichen Flora of Norway. — Videnskapsselskapets Skrifter. I. Mat.-Naturv. Klasse. 1921. No. 7. Kristiania 1921.
— Om lavenes utbredelse i Norge. — Naturen 1921. Bergen 1921 (b).
— Lavslegten Parmelia i Danmark. — Bot. Tidsskr. 38. København 1923.
MAAS GEESTERANUS, R. G., Revision of the lichens of the Netherlands. I. Parmeliaceae. — (Diss.) Leiden 1947.
MACOUN, J., Catalogue of Canadian Plants VII. Lichenes and Hepaticae. — Geol. Survey of Canada. Ottawa 1902.
MAGNUSSON, A. H., Om de bruna Parmelia-arternas och hypogymniernas förekomst och fertilitet, särskilt på Västkusten. — Svensk Bot. Tidskr. 10. Stockholm 1916.
— Material till västkustens lavflora. — Svensk Bot. Tidskr. 13. Stockholm 1919.
— Studies in the rivulosa Group of the genus Lecidea. — Göteborgs K. Vet.- och Vitt.-samh. Handl. Fjärde följden. Band 29. N:o 4. Göteborg 1925.
— Några märkligare lavfynd. — Svensk Bot. Tidskr. 19. Uppsala 1925 (b).
— Studies on Boreal Stereocaula. — Göteborgs K. Vet.- och Vitt.-samh. Handl. Fjärde följden. Band 30. N:o 7. Göteborg 1926.
— New or Interesting Swedish Lichens IV. — Bot. Not. Lund 1927.
— Flora över Skandinaviens busk- och bladlavar. — Stockholm 1929.
— Beiträge zur Systematik der Flechtengruppe Lecanora subfusca. — Medd. Göteborgs bot. trädg. 7. Göteborg 1932.
— Die Flechtengattung Maronea. — Medd. Göteborgs Bot. Trädg. 9. Göteborg 1934.
— Om några västliga skorplavars utbredning på Sveriges västkust. — Svensk Bot. Tidskr. 29. Uppsala 1935.
— Några märkligare lavfynd, huvudsakligen från Västkusten. — Svensk Bot. Tidskr. 29. Uppsala 1935 (b).
— Två lavexkursioner i västra Sverige. — Medd. Göteborgs Bot. trädg. 11. Göteborg 1936.

— New or otherwise Interesting Swedish Lichens IX. — Bot. Not. Lund 1937.
— Förteckning över Skandinaviens växter. 4. Lavar. — Lund 1937 (b).
— New or otherwise Interesting Swedish Lichens. XI. — Bot. Not. Lund 1942.
— Hawaiian Lichens I. — Ark. f. Bot. Bd. 31 A. N:o 1. Uppsala 1943.
— — II. — Ark. f. Bot. Bd. 31 A. N:o 6. Uppsala 1944.
— (ap. Grimvall, N.), Ranebo lund — ett numera fredat lövskogsområde i Bohuslän. — Medd. Göteborgs Bot. Trädg. 16. Göteborg 1946.
— Lichens from Lyksele Lappmark and adjacent part of Norway. — Ark. f. Bot. Band 33 A. N:o 1. Uppsala 1946 (b).
Mathieu, J. & Gillet, A., Contribution à l'étude des Lichens des Iles Baléares. — Bull. Soc. Bot. France 69. Paris 1922.
Malme, G. O. A:son, Lichenologiska notiser I—II. — Bot. Not. Lund 1892.
— Lichenologiska notiser III. Bidrag till södra Sveriges lafflora. — Bot. Not. Lund 1895.
— Ett litet bidrag till Ombergs lafflora. — Svensk Bot. Tidskr. 3. Stockholm 1909.
— Stockholmstraktens bruna Parmelia-arter. — Svensk Bot. Tidskr. 4. Stockholm 1910.
— Malme, Lichenes suecici exsiccati 201—250. — Svensk Bot. Tidskr. 6. Stockholm 1912.
— Catillaria grossa (Pers.) Koerb. i Jämtland. — Svensk Bot. Tidskr. 6. Stockholm 1912 (b).
— Några ord om alpina lavars förekomst i barrskogsregionen. — Svensk Bot. Tidskr. 12. Stockholm 1918.
— Lichenologiska notiser 27—34. — Svensk Bot. Tidskr. 17. Uppsala 1923.
— — 35—41. — Svensk Bot. Tidskr. 18. Uppsala 1924.
— Några lavar från Trosatrakten. — Svensk Bot. Tidskr. 20. Uppsala 1926.
— Ytterligare några lavar från Trosatrakten. — Svensk Bot. Tidskr. 21. Uppsala 1927.
— Lavvegetationen i Dalby-Söderskogens nationalpark. — K. Svenska Vet. Akad. Skrift. i Naturskyddsärenden 27. Uppsala 1934.
— Stenshuvuds lavflora. — K. Svenska Vet.-Akad. Skrift. i Naturskyddsärenden 28. Uppsala 1935.
— Pertusariae expeditionis Regnellianae primae. — Ark. f. Bot. Bd. 28 A. N:o 9. Uppsala 1936.
— Lichenologiska notiser 47—52. — Svensk Bot. Tidskr. 31. Uppsala 1937.
Mathiesen, Fr. J., Nye Findesteder for nogle i Danmark sjældnere forekommende Lichener. — Bot. Tidsskr. 37. København 1922.
Mathieu, C., Flore Générale de la Belgique. 2. — Bruxelles 1853.
Miniaev, N. A., Novye lichainiki dlja flory okrestnostej Leningrada. (New lichens from the flora of the neighbourhood of Leningrad.) — Act. Inst. Bot. Ac. Scient. Ser. II. Pl. crypt. Fasc. III. Leningrad 1936.
Mölholm Hansen, H. & Lund, M., De danske Arter af Slægten Cladonia. — Bot. Tidsskr. 41. København 1929.
Mortensen, H., Nordostsjællands Flora. — Bot. Tidsskr. 2. Række. 1. København 1872.
Motyka, J., Studja nad florą porostów tatrzańskich. I. — Acta Soc. Bot. Poloniae 2. Warszawa 1924.

— Materjały do flory porostów Tatr. II. — Spraw. Kom. Fizj. Polsk. Akad. Um. 61. Warszawa 1926.
— Materjały do flory porostów Śląska. — Wydawnictwa Muzeum Śląskiego w Katowicach 3. Katowice 1930.
— Lichenum generis Usnea studium monographicum. Pars systematica. — Leopoli 1936—1938.
MÜLLER (-ARG.), J., Principes de classification des lichens et énumération des lichens des environs de Genève. — Soc. Phys. et Hist. nat. Gen. Genève 1862.
MULLER, O. F., Flora Fridrichsdalina. — Argentorati 1767.
NIENBURG, W., Studien zur Biologie der Flechten I. Nitrophile Rindenflechten. — Zeitschr. für Bot. 11. Jena 1919.
NILSON, B., vide KAJANUS.
NILSSON, G., vide DEGELIUS.
NISSEN, P., Ökonomisk-geografisk atlas över Norge. — Kristiania 1921.
NITSCHKE, G., vide sub LAHM.
NORDHAGEN, R., Norsk Flora. — Oslo 1941.
NORMAN, J. M., Nova genera et species Lichenum Florae Norvegicae. — Öfvers. K. Vet.-Akad. Förhandl. 1884. N:o 8. Stockholm 1885.
NYLANDER, E., Ålands Laf-vegetation. — Not. Sällsk. Fauna et Flora Fenn. Förhandl. 3. Helsingfors 1857.
NYLANDER, W., Additamentum in floram cryptogamicam Chilensem. — Ann. Sc. Nat., 4. sér., Bot. 3. Paris 1855.
— Essai d'une nouvelle classification des Lichens. — Mém. soc. sc. nat. Cherbourg 3. Cherbourg 1855 (b).
— Prodromus lichenographiae Galliae et Algeriae. — Actes Soc. Linn. Bordeaux 1. Bordeaux 1856.
— Lichenes Scandinaviae sive Prodromus Lichenographiae Scandinaviae. — Not. Sällsk. Fauna et Flora Fenn. Förhandl. 5. Helsingforsiae 1861.
— Note sur les lichens de Port-Natal. — Bull. Soc. Linn. Normandie, 2e sér. 3. Caen 1868.
— Addenda nova ad Lichenographiam europaeam XI. — Flora 52. Regensburg 1869.
— Lichenes Fuegiae et Patagoniae. — Paris 1888.
— Lichenes Japoniae. — Parisiis 1890.
— (ap. GASILIEN, FR., Contributions à la flore des lichens du plateau central). — Act. Soc. Linn. Bordeaux 53. Bordeaux 1898.
OCHSNER, F., Studien über die Epiphytenvegetation der Schweiz. — Jahrb. St. Gall. Naturwiss. Ges. 63. St. Gallen 1928.
OLIVIER, H., Flore analytique et dichotomique des Lichens de l'Orne I—II. — Mortagne 1882—1884.
— Exposé systématique et description des lichens de l'ouest et du nord-ouest de la France I—II. — Bazoches-au-Houlme (Orne) & Paris 1897, 1899—1903.
— Exposé systématique et description des lichens de l'ouest et du nord-ouest de la France. Supplément. — Bazoches-au-Houlme (Orne) & Paris 1900.
— Les Pertusaria de la Flore d'Europe. — Bull. Géogr. Bot. 21. 4e Sér. Le Mans 1912.
— Les Opegrapha de la Flore d'Europe. — Paris 1914.
OXNER, A. M., Viznačnik lišajnikiv URSR. — Akad. nauk. URSR. Inst. Bot. Kiev 1937.

Parrique, F.-G., Parmélies des monts du Forez. — Act. Soc. Linn. 61. Sér. 7: 1. Bordeaux 1906.

Pereira, A. X. Coutinho, Lichenum lusitanorum herbarii universitatis olisiponensis catalogus. — Lisboa 1916.

Rabenhorst, L., Kryptogamenflora von Sachsen, der Oberlausitz, Thüringen und Nordböhmen. Teil II. Die Flechten. — Leipzig 1870.

Räsänen, V., Über Flechtenstandorte und Flechtenvegetation im westlichen Nordfinnland. — Ann. Soc. Zool.-Bot. Fenn. Vanamo. Tom. 7. N:o 1. Helsinki 1927.

— Die Flechten Estlands. — Ann. Acad. Scient. Fenn., Ser. A. 34. Helsingfors 1931.

— Die Flechtenflora der nördlichen Küstengegend am Laatokka-See. — Ann. Bot. Soc. Zool.-Bot. Fenn. Vanamo. Tom. 12. N:o 1. Helsinki 1939.

— Griechische Flechten. — Hedwigia 81. Dresden 1944.

Raunkiær, C., Dansk Exkursionsflora. Sjætte Udg., ed. K. Wiinstedt. — København 1942.

Redinger, K., Thelostremaceae brasilienses. — Ark. f. Bot. 28 A. N:a 8. Uppsala 1936.

— Arthoniaceae etc. — Rabenhorst's Kryptogamen-Flora von Deutschland, Österreich und der Schweiz. Ed. 2.IX. Band. 2. Abt., 1. Teil. Leipzig 1937—38.

— Restitution und Kritische Revision der Flechtengattungen Enterographa Fée und Sclerophyton Eschw. — Fedde, Rep. Spec. nov. 43. Berlin-Dahlem 1938 (b).

Rostrup, E., Mykologiske Meddelelser. — Bot. Tidsskr. 17. Kjöbenhavn 1889.

— Plantepatologi. — København 1902.

— Den danske Flora. 16. Udg., ed. C. A. Jörgensen. — København 1943.

Russel, J., Some Notes on the Cryptogamic Vegetation of Fayal, Azores. — Proc. Essex Inst. 2. 1856—1860. Salem 1862.

Sampaio, G., Contribuïção para o estudo dos liquenes portugueses. — Ann. Acad. Polit. Porto 13. Coimbra 1918.

Sampaio, G. & Crespi, L., Liquenes de la provincia de Pontevedra. — Bol. Real. Soc. Española Hist. Nat. 27. Madrid 1927.

Samuelsson, G., Die Verbreitung der höheren Wasserpflanzen in Nordeuropa (Fennoskandien und Dänemark). — Acta Phytogeogr. Suec. 6. Uppsala 1934.

Sandstede, H., Rügen's Flechtenflora. — Verh. Bot. Ver. Prov. Brandenburg 45. Berlin 1903.

— Die Flechten des nordwestdeutschen Tieflandes und der deutschen Nordseeinseln. — Abh. Naturw. Ver. Bremen 21 (1911). Bremen 1912.

Sbarbaro, C., Contributo alla Flora Lichenologica ligure. — Archivio Botanico 7—8. Forlì 1932.

Schulz-Korth, K., Die Flechtenvegetation der Mark Brandenburg. — Fedde, Rep. Spec. nov. Beih. 67. Berlin 1931.

Sernander, Greta, Några jämtländska lavfynd. — Svensk Bot. Tidskr. 13 (1919). Stockholm 1920.

— Parmelia acetabulum (Neck.) Dub. i Skandinavien. — Svensk Bot. Tidskr. 17. Uppsala 1923.

Sernander, R., Ett bidrag till kännedomen om Sveriges ekflora. — Bot. Not. Lund 1886.

— Studier öfver lafvarnas biologi I. Nitrofila lafvar. — Svensk Bot. Tidskr. 6. Stockholm 1912.

— Exkursionen till södra Närke juli 1913. — Svensk Bot. Tidskr. 8. Stockholm 1914.
— Subfossile Flechten. — Flora, N.F. 11. Jena 1918.
Servít, M., Flechten aus Jugoslavien. — Hedwigia 69. Dresden 1929.
— Flechten aus Jugoslavien. 2. — Hedwigia 71. Dresden 1931.
— Bearbeitung der von K. H. Rechinger (fil.) im Jahre 1927 auf den Ägäischen Inseln gesammelten Flechten. — Ann. Naturhist. Hofmus. 46. Wien 1931 (b).
— Flechten aus Jugoslavien 3. — Hedwigia 74. Dresden 1934.
— Beitrag zur Flechtenflora der Jonischen Inseln und des nordwestlichen Peloponnes. — Fedde, Rep. Spec. nov. 38. Berlin-Dahlem 1935.
Smith, Annie Lorrain, A Monograph of the British Lichens I. — Ed. 2. London 1918.
— — II. — Ed. 2. London 1926.
— Lichens. — Cambridge Botanical Handbooks. Cambridge 1921.
Smith, J. E., (ap. Smith J. E. & Sowerby, J.), English Botany. — Vol. 26. London 1807.
Sommerfelt, S. C., Supplementum Florae Lapponicae. — Christianiae 1826.
Stein, B., Flechten. — Kryptog.-Flora von Schlesien. II. Band. 2. Hälfte. Breslau 1879.
Stenhammar, C., Om Gottlands Laf-Vegetation. — Svenska Vet.-Akad. Handl. 1846. Stockholm 1848.
— Bidrag till Gotlands och Ölands Laf-flora. — Öfvers. K. Vet.-Akad. Förhandl. 14 (1857). Stockholm 1858.
— Öfversigt af de viktigaste Lafformer, som innehålles i femte och sjätte fascikelarne af »Lichenes Sueciae exsiccati.» — Öfvers. K. Vet.-Akad. Förhandl. 19 (1862). Stockholm 1863.
Sterner, R., The Continental Element in the Flora of South Sweden. — (Diss.) Geogr. Annaler 4. Stockholm 1922.
Stizenberger, E., Lichenes helvetici. — Jahresb. St. Gallischen Naturw. Ges. 1880—81. St. Gallen 1882.
— Lichenaea africana. — Jahresb. St. Gallischen Naturw. Ges. 1888—1889, 1889—1890. St. Gallen 1890—1891.
Sulma, T., Beiträge zur Kenntnis der Flechtenflora des Lubliner Hügellandes. — — Acta Soc. Bot. Pol. 12. N:o 1. Warszawa 1935.
Suza, J., Lichenes Slovakiae. (Ad distributionem geographicam adnotationum pars prima.) — Acta Bot. Bohem. 2. Pragae 1923.
— Nástin zeměpisného rozšíření lišejníků na Moravě vzhledem k poměrům evropským. (A Sketch of the Distribution of Lichens in Moravia with Regard to the Conditions in Europe.) — Publ. Fac. Sc. Univ. Masaryk 55. Brno 1925.
— Lichenes Slovakiae II. — Acta Bot. Bohem. 4—5. Pragae 1925—26.
— Příspěvky k lišejníkové flore Vysokých Tater. — Sborník Klubu Přírodovědeckého v Brně 9. Brno 1926.
— Lichenes Bulgariae I. — Acta Bot. Bohem. 8. Brno 1929.
— Addenda ad Lichenographiam Bohemiae. — Acta Bot. Bohem. 8. Brno 1929 (b).
— Lichenes Slovakiae III. — Acta Bot. Bohem. 9. Pragae 1930.
— Ozeanische Züge in der epiphytischen Flechtenflora der Ostkarpathen bzw. Mitteleuropas. — Věstník Král. České Spol. Nauk. Praha 1933.

Szatala, O., Lichenes Hungariae I. — Folia Cryptogamica I. Szeged 1927.
— Adatok Magyarország zúzmóflorájának ismeretéhez III. (Beiträge zur Kenntnis der Flechtenflora Ungarns). — Magyar Bot. Lapok 27 (1928). Budapest 1929.
— — IV. — Magyar Bot. Lapok 28. Budapest 1929 (b).
— Beiträge zur Flechtenflora von Bulgarien I. — Magyar Bot. Lapok 28. Budapest 1929 (c).
— Lichenes Hungariae II. — Folia Cryptogamica I. Szeged 1930.
— Beiträge zur Flechtenflora von Bulgarien II. — Magyar Bot. Lapok 29. Budapest 1930 (b).
— Lichens du Maroc, recueillis par M. le baron G. Andreánsky en 1930. — Magyar Bot. Lapok 30. Budapest 1931.
Tavares, C. N., Notes Lichenologiques II. — Bull. Soc. Port. Scienc. Nat. 13. Porto 1941.
— Algumas espécies de Líquenes, novas para os Açores. — Act. Congr. Nac. Cienc. Nat. — Bol. Soc. Port. Cienc. Nat. 13. Supl. 2. Lisboa 1941 (b).
— Notes Lichenologiques IV. — Bol. Soc. Broteriana 19. Alcobaça 1944.
— Contribuição para o estudo des Parmeliáceas portuguesas. — Port. Act. Biol. I. Sér. B. Lisboa 1945.
— Sôbre algumas espécies do elemento oceânico em Portugal. — Bol. Soc. Broteriana 19. Alcobaça 1945 (b).
— Notes Lichenologiques V. — Port. Act. Biol. II. Sér. B. Coimbra 1946.
— Notes Lichenologiques VI. — Brotéria 16 (43). Fasc. IV. Lisboa 1947.
Theorin, P. G. E., Anteckningar om Ombergs Lafvar. — Göteborg 1874.
— Ombergs Lafvegetation. — Öfvers. K. Vet.-Akad. Förh. 32 (1875). Stockholm 1875.
Tomin, M. P., Opredelitel kustistych i listovatych lišajnikov SSSR. — Akad. nauk BSSR. Minsk 1937.
— — II. — Ibm. Minsk 1939.
Trümpener, E., Über die Bedeutung der Wasserstoffionenkonzentration für die Verbreitung von Flechten. — Beih. Bot. Centralbl. 62. Dresden 1926.
Tuckerman, E., Lichens of the Hawaiian Islands. — Proc. Am. Acad. Arts and Sc., 7. 1868.
Turner, D., Descriptions of eight new British lichens. — Transact. Linn. Soc. London 9. London 1808.
Vainio, E., Étude sur la classification naturelle et la morphologie des lichens du Brésil. — Acta Soc. pro Fauna et Flora Fenn. 7. Helsingfors 1890.
— Lichenes (ap. Schmidt, J., Flora of Koh Chang. Part IX.). — Bot. Tidsskr. 29. Copenhagen 1909.
— Lichenographia Fennica I. — Acta Soc. pro Fauna et Flora Fennica 49. N:o 2. Helsingforsiae 1921.
— — II. ibm. 53. N:o 1. Helsingforsiae 1922.
— — IV. (ed. B. Lynge) ibm. 57. N:o 2—3. Helsingforsiae 1934.
Wahlenberg, G., Flora Svecica. — Ed. 1. Upsaliae 1824, 1826.
— — Ed. 2. Upsaliae 1831, 1833.
Waldheim, S., Beiträge zur Moosflora Schwedens mit besonderer Rücksicht auf die Verbreitung einiger südlichen Vertreter. — Bot. Not. Lund 1935.
— Mossvegetationen i Dalby-Söderskogs nationalpark. — Svenska Vet. Akad. Avh. i Naturskyddsärenden N:o 4. Uppsala 1944.

— Kleinmoosgesellschaften und Bodenverhältnisse in Schonen. — Bot. Not. Suppl. Vol. 1: 1. Lund 1947.

WALLROTH, F. G., (ap. BLUFF, M. J. & FINGERHUTH, C. A.) Flora Cryptogamica Germaniae. — Norimbergae 1831.

WERNER, R. G., Contribution à la flore cryptogamique du Maroc. Fasc. V. — Bull. Soc. Sc. Nat. Maroc 12. Rochefort-sur-mer 1932.

— — Fasc. XIV. Bull. Soc. Sc. Nat. Maroc 15. Rochefort-sur-mer 1936.

— Recherches phytogéographiques comparées sur la flore cryptogamique de l'Espagne méridionale et du Maroc. — Bull. Soc. Sc. Nat. Maroc 17. Rochefort-sur-mer 1937.

— Prodrome pour une phytogéographie des Lichens. Fasc. III. — Bull. Soc. Sc. Nat. Maroc 23. Rochefort-sur-mer 1943.

WESTERBERG, F. O., Parmelia cetrarioides (Dub.) Nyl. anträffad i Östergötland. — Svensk Bot. Tidskr. 5. Stockholm 1911.

WILLEY, H., Synopsis of the genus Arthonia. — New Bedford 1890.

ZAHLBRUCKNER, A., Zur Flechtenflora des Pressburger Comitates. — Verh. des Ver. für Heil- und Naturk. in Pressburg. Pressburg 1894.

— Lichenes albanici a cl. J. Dörfler anno 1893 lecti. — Hedwigia 36. Dresden 1897.

— Vorarbeiten zu einer Flechtenflora Dalmatiens II. — Österr. Bot. Zeitschr. 53. Wien 1903.

— Neue Beiträge zur Flechtenflora des Pozsonyer Komitates. — Verh. des Ver. für Heil- und Naturk. in Pressburg. Pressburg 1904.

— Aufzählung der von Dr. H. Bretzl in Griechenland gesammelten Flechten. — Hedwigia 47. Dresden 1907.

— Beiträge zur Flechtenflora Niederösterreichs VII. — Verh. Zool.-bot. Ges. Wien 67. Wien 1916.

— Schedae ad »Kryptogamae exsiccatas». — Ann. K. K. Naturhist. Hofmus. 30. Wien 1916 (b).

— Vorarbeiten zu einer Flechtenflora Dalmatiens VII. — Österr. Bot. Zeitschr. 68. Wien 1919.

— Die Flechten der Juan Fernandez-Inseln. — Uppsala 1920.

— Catalogus lichenum universalis I—X. — Leipzig 1922—1940.

— Lichenes (Flechten) (ap. ENGLER, A., Die natürlichen Pflanzenfamilien. Zweite Aufl.). — Leipzig 1926.

— Lichenes Novae Zelandiae a cl. H. H. Allan eiusque collaboratoribus lecti. — Denkschr. Akad. Wissensch. Wien, Mat.-Naturw. Kl. Bd. 104. Wien 1941.

ZSCHACKE, H., Korsische Flechten, gesammelt in den Jahren 1914—16. — Verh. Bot. Ver. Prov. Brandenburg 69. Berlin-Dahlem 1927.

ZWACKH, W. v., Enumeratio Lichenum Florae Heidelbergensis. — Flora 45. Regensburg 1862.

ÅNGSTRÖM, A. vide sub A.

Addenda.

p. 15. *Umbilicaria pustulata.*

Two Norwegian stations (Nordland, Moskenes, leg. Lynge, and Finnmark, Lebesby, leg. Lynge & Höegl communicated to me from herb. O when part of the book was in the press, extend its area somewhat N. of the map.

p. 25. *Bacidia rosella.*

Sjælland. Taarbæk: Dyrehaven. Add: MORTENSEN 1872 p. 64.

p. 61. *Opegrapha viridis.*

Sjælland. Frederiksberg, Hornbæk-Hellebæk: Hellebæk, Lilleröd, Taarbæk: Dyrehaven, see. MORTENSEN 1872 p. 65.

p. 112. *Thelotrema lepadinum.*

To the two Sjælland stations add: MORTENSEN 1872 p. 63.

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